Exhibit K

Summary of the Reliability Standard Development Proceeding and Complete Record of Development of Proposed Reliability Standard

EXHIBIT K – Summary of the Reliability Standard Development Proceeding

SUMMARY OF THE RELIABILITY STANDARD DEVELOPMENT PROCEEDING

A. Overview of the Standard Drafting Team

The Frequency Response Standard Drafting Team is comprised of some of the foremost experts in the field. The team is chaired by David Lemmons, Senior Manager, Market Operations at Xcel Energy, and vice-chairman, Dr. Terry Bilke, Consulting Advisor in Compliance Services at the Midwest Independent System Operator, Inc. Drafting Team members include Howard Illian of Energy Mark, Inc., who has published a variety of papers on the subject of Frequency Response, including a 2010 report that was funded by the FERC, Office of Electric Reliability,[51] Sydney Niemeyer, a Control System Specialist at NRG Texas, LP, Michael Potishnak, a principal engineer at ISO New England, Inc., and Carlos Martinez, who has also published several papers on the subject of Frequency Response, including a 2010 report that was funded by the FERC, Office of Electric Reliability that reviewed the frequency performance of the Eastern, Western and ERCOT interconnections.[52]

Don Badley has been a member of the Northwest Power Pool ("NWPP") Staff since 1975. Don manages the NWPP Operating Committee. He is currently Chairman of the NERC Resources Subcommittee, a member of Western Electricity Coordinating Council's (WECC) Performance Work Group and has chaired numerous NERC and WECC groups. In the past Mr. Badley has served as Chairman of the North American Power Systems Interconnection Committee's Performance Subcommittee, a member of the WECC Technical Operations

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[51] *See e.g.*, Illian, H. (2010), *Frequency Control Performance Measurement and Requirements*, LBNL-2145E, Ernest Orlando Lawrence Berkeley National Laboratory; available at: http://www.ferc.gov/eventcalendar/Files/20110120114346-Frequency-Control-Performance-Measurement-and-Requirements.pdf; Eto, J. H., Undrill, J., Mackin, P., Daschmans, R., Williams, B., Illian, H., et al. (2010). *Use of Frequency Response Metrics to Assess the Planning and Operating Requirements for Reliable Integration of Variable Renewable Generation.* LBNL-4142E. Ernest Orlando Lawrence Berkeley National Laboratory; available at: http://www.ferc.gov/industries/electric/indus-act/reliability/frequencyresponsemetrics-report.pdf.

[52] Martinez, C., Xue, S., Martinez, M (2010), *Review of the Recent Frequency Performance of the Eastern, Western and ERCOT Interconnections*, LBNL-4144E; available at: http://www.ferc.gov/industries/electric/indus-act/reliability/interconnectionfrequencyperformance.pdf.

Subcommittee, and a member of the WECC Control Work Group. Mr. Badley is a member of the IEEE Power Engineering Society and has co-authored three IEEE papers on system control.

Mr. Clyde Loutan is presently a Senior Advisor at the California Independent System Operator Corporation ("ISO") focusing on power system operation performance, and was the lead investigator for the ISO's renewable resource integration studies published in 2007 and 2010. Mr. Loutan was also the principal investigator for the ISO's Frequency Response Study[53] done by General Electric International, Inc. and the ISO to investigate the ISO's frequency response due to large loss-of-generation under conditions with high levels of wind and solar generation published in 2011. He co-authored an IEEE technical paper on "Frequency Response of California and WECC under High Wind and Solar Conditions," which was presented at the 2012 IEEE Power & Energy Society General Meeting on July 24 in San Diego California. Mr. Loutan previously worked at the Pacific Gas and Electric Company for 14 years in various capacities such as Real Time System Operations, Transmission Planning and High Voltage Protection. Mr. Loutan is a licensed professional engineer in the State of California. He holds B.S. and M.S. degrees in Electrical Engineering from Howard University in Washington D.C., and is a senior member of the IEEE.

Darrel Richardson, with over thirty-seven years of experience in the electric industry, is the NERC Standards Developer for the project. Robert Cummings, Director of Reliability Initiatives and System Analysis, supported the drafting team via the Frequency Response Initiative and the publication of the related report, included herein as **Exhibit F**. Mr. Cummings, an IEEE Senior Member, who joined NERC in 1996, has over thirty-six years of extensive experience in the industry in system planning, operations engineering, and wide area planning.

[53] http://www.caiso.com/Documents/Report-FrequencyResponseStudy.pdf

EXHIBIT K – Summary of the Reliability Standard Development Proceeding

B. Standard Authorization Request Development

The Standard Authorization Request ("SAR") for BAL-003-1 was submitted on April 7, 2004 as a request for a new Frequency Response Standard. The initial draft of the SAR was posted from January 17, 2005 to February 17, 2005 for a 30-day public comment period. A white paper prepared by the Frequency Task Force of the NERC Resources Subcommittee was posted with the first draft of the SAR. Based on industry comments, the drafting team revised the SAR and posted a second draft for comment from April 4, 2006 to May 3, 2006. Following further modifications, a third draft of the SAR was posted from February 8, 2007 to March 9, 2007. In these successive drafts, the standard drafting team further defined the scope of the standard, identified applicability, and came to a consensus on the need to specify the quality and quantity of frequency response. A fourth and final draft of the SAR was posted on June 30, 2007 and the drafting team was formed on July 30, 2007.

C. The First Posting – Informal Comment Period

The first draft of BAL-003-1 was posted for a 30-day comment period from February 4, 2011 to March 7, 2011. Several documents were posted for guidance with the first draft, including Attachment A to the standard, a supplemental SAR identifying the modifications to BAL-003-0 that were originally part of Project 2007-18 – Reliability-based Control, a Frequency Response Survey Form that was used for data collection, and a document containing the outline of a proposed field test to be used in creating the standard. There were 36 sets of comments on the first draft, with comments from more than 139 different people from approximately 86 companies representing all 10 of the industry segments. In response to comments, the standard drafting team made several changes to the draft standard including:

- Removed the Single Event Frequency Response Data (SEFRD) definition and modified several others;
- Modified Attachment A, and created Attachment B – Process for Adjusting Bias Floor Setting;
- Modified FRS Form 1 to correct errors, allow for adjustments and provide clarity; and
- Added VRFs and VSLs.

D. The Second Posting – Formal Comment Period, Initial Ballot and Non-Binding Poll

The second draft of the standard was posted for a formal 45-day comment period from October 25, 2011 to December 9, 2011, with an initial ballot held from November 30, 2011 to December 9, 2011. The initial ballot achieved a 93.92% quorum, and an approval of 30.82%. The standard drafting team received 43 sets of comments from 133 different people from approximately 86 different companies representing all 10 industry segments. Several changes were made to the draft of the BAL-003-1 standard including:

- Modified the definitions for Frequency Response Measure (FRM) and Frequency Bias Setting;
- Removed the references to Reserve Sharing Groups (RSGs) and replaced them with a new definition Frequency Response Sharing Group (FRSG) and defined FRSG;
- Modified Requirement R2 to provide clarity and incorporate Requirement R5;
- Created a new Requirement R3 for entities using variable Frequency Bias
- Removed the requirement for operating in Tie Line Bias mode as duplicative of other requirements in other standards;
- Modified Attachment A to provide additional clarity;
- Re-wrote the Background Document to incorporate additional language for justification of requirements and provide additional clarity;
- Created a procedure document for the ERO support of the standard; and
- Adopted the Frequency Response Initiative Report methodology for calculating the Interconnection Frequency Response Obligation (IFRO)

E. Frequency Response Technical Conferences

In order to obtain industry input of the development of the Frequency Response standard, NERC held technical conferences in Arlington, Virginia on May 22, 2012, and in Denver,

Colorado on May 24, 2012. The conferences focused on discussing which Functional Entities should be responsible for Frequency Response and how Frequency Response should be measured. NERC solicited comments on the standard, the development process, and the topics discussed at the technical conference and gave a deadline of June 15, 2012 for comment submission.

F. Third Posting - Formal Comment Period, Successive Ballot, and Non-Binding Poll

The third draft of the standard was posted with the implementation plan, mapping document, Attachment A to the standard, FRS Forms 1 and 2, a procedure document for ERO support of the standard, and a background document on the development, testing and implementation of the BAL-003-1 standard. The 30-day comment period ran from October 5, 2012 to November 6, 2012, and included a successive ballot and non-binding poll from October 26, 2012 to November 6, 2012. The successive ballot for the draft of BAL-003-1 received a quorum of 82.04% and a 76.08% approval. The non-binding poll received a quorum of 76.28% and a 76.30% approval. The standard drafting team received 50 sets of comments from 144 individuals from 100 different companies representing eight of the ten industry segments. As a result of the industry comments, the standard drafting team made changes to the standard including:

- Made language and grammatical corrections in the proposed standard;
- Clarified the description of the calculation for the Interconnection Frequency Response Obligation ("IFRO") in Attachment A to the standard; and
- Modified Attachment A and the Procedure for consistency on the use of the term "resource contingency criteria."

G. Fourth Posting – Recirculation Ballot

The fourth draft of the BAL-003-1 standard was posted for a recirculation ballot from December 12, 2012 to December 21, 2012. The recirculation ballot achieved a quorum of 86.19% and an approval of 76.53%.

H. Board of Trustees Approval of BAL-003-1

The final proposed BAL-003-1 standard was presented to the NERC Board of Trustees on February 7, 2013. NERC staff provided a summary of the proposed standard, as well as a summary of minority issues and associated drafting team responses. The NERC Board of Trustees approved the standard, and NERC staff recommended that it be filed with applicable regulatory authorities.

Project 2007-12
Frequency Response

Related Files

Status:
A recirculation ballot for BAL-003-1 closed on December 21, 2012 with a quorum of 86.19% and 76.53% approval. The standard will be presented to the NERC Board of Trustees for adoption at its February meeting.

Purpose/Industry Need:
Frequency Response, a measure of an Interconnection's ability to stabilize frequency immediately following the sudden loss of generation or load, is a critical component to the reliable operation of the bulk power system, particularly during disturbances and restoration. Failure to maintain frequency can disrupt the operation of equipment and initiate disconnection of power plant equipment to prevent them from being damaged, which could lead to wide-spread blackouts. There is evidence of continuing decline in Frequency Response in the three Interconnections over the past 10 years, but no confirmed reason for the apparent decline. The proposed standard would set a minimum Frequency Response obligation for each Balancing Authority, provide a uniform calculation of Frequency Response and Frequency Bias Settings that transition to values closer to natural Frequency Response, and encourage coordinated AGC operation.

Draft	Action	Dates	Results	Consideration of Comments
Draft 4 **BAL-003-1** Clean **92**| Redline to Last Posting **93** **Attachment A** Clean **94**| Redline to Last Posting **95** **Implementation Plan** Clean **96**| Redline to Last Posting **97** **Supporting Materials:** **Procedure** Clean **98**| Redline to Last Posting **99**	Recirculation Ballot Info **117** Vote>>	12/12/12 - 12/21/12 (closed)	Summary **118** Full Record **119**	

Background Document Clean **100** | Redline to Last Posting **101** Mapping Document **102** VRFs and VSLs **103** Frequency Response Initiative Report **104** **FRS Form 1:** Multiple BA Interconnection (Eastern & Western) **105** ERCOT **106** Quebec Interconnection **107** **Excel 97 - 2003 Version** Multiple BA Interconnection (Eastern & Western)**108** ERCOT **109** Quebec Interconnection **110** **FRS Form 2:** Multiple BA Interconnection (Eastern & Western) **111**				

ERCOT **112** Quebec Interconnection **113** **Excel 97 - 2003 Version** Multiple BA Interconnection (Eastern & Western) **114** ERCOT **115** Quebec Interconnection **116**				
Draft 3 **BAL-003-1** Clean **59**| Redline to Last Posting **60** **Attachment A** Clean **61** **Implementation Plan** Clean **62**| Redline to Last Posting **63** **Supporting Materials:** Procedure **64** Background Document **65** BAL-003-0.1b **66** Unofficial Comment Form (Word) **67** Updated 10/16/12)	Successive Ballot and Non-Binding Poll Updated Info **84** Info **85** Vote>>	10/26/12 - 11/06/12 (Closed)	Summary **87** Full Record **88** Non-binding Poll Results **89**	
	Comment Period Info **86** Submit Comments>>	10/05/12 - 11/06/12 (Closed)	Comments Received **90**	Consideration of Comments **91**

Mapping Document Clean **68** | Redline to Last Posting **69** **VRF/VSL** Clean **70**|Redline to Last Posting **71** **FRS Form 1:** Multiple BA Interconnection (Eastern & Western) **72** ERCOT **73** Quebec Interconnection **74** **Excel 97 - 2003 Version** Multiple BA Interconnection (Eastern & Western) **75** ERCOT **76** Quebec Interconnection **77** **FRS Form 2:** Multiple BA Interconnection (Eastern & Western) **78** ERCOT **79** Quebec Interconnection **80**				

Excel 97 - 2003 Version Multiple BA Interconnection (Eastern & Western) **81** ERCOT **82** Quebec Interconnection **83**				
Frequency Response Technical Conferences Unofficial Comment Form (Word) **56**	Informal Comment Info **57** Submit Comments>>	05/30/12 - 06/15/12 (closed)	Comments Received **58**	
Draft 2 **BAL-003-1** Clean **27**| Redline to Last Posting **28** **Attachment A** Clean **29** **Attachment B** Clean **30** **Implementation Plan** Clean **31**| Redline to Last Posting **32** **Supporting Materials:** Background Document	Initial Ballot and Non-Binding Poll of VRFs and VSLs Vote>> Info **48**	11/30/11 - 12/09/11 (closed)	Summary **51** Full Record **52** Non-Binding Poll Results **53**	
	Formal Comment Period Info **49** Submit Comments>>	10/25/11 - 12/09/11 (closed)	Comments Received **54**	Consideration of Comments **55**
	Join Ballot Pool Initial and Non-Binding	10/25/11 - 11/23/11		

33 BAL-003-0.1b 34 Comment Form (Word) 35 Mapping Document 36 **FRS Form 1:** Eastern Interconnection 37 ERCOT 38 Quebec Interconnection 39 Western Interconnection 40 **FRS Form 2 for Interconnection with Multiple BAs:** Two-second Sample Data 41 Three-second Sample Data 42 Four-second Sample Data 43 Five-second Sample Data 44 Six-second Sample Data 45 **FRS Form 2 for Interconnection wit One BA:**	Info 50 Join>>	(closed)		

Two-second Sample Data **46** Three-second Sample Data **47**				
Draft 1 BAL-003-1 Clean **15** Attachment A **16** **Supporting Materials:** BAL-003-0 **17** Supplemental SAR **18** FRS Form 1 Instructions **19** FRS Form 1 **20** Implementation Plan **21** Comment Form (Word) **22** Field Test **23**	Formal Comment Period Info **24** Submit Comments>>	02/04/11 – 03/07/11	Comments Received **25**	Consideration of Comments **26**
Final SAR Version 3 **13**	Standard Drafting Team Nominations	07/17/07 - 07/30/07		

	Info **14** Submit Nomination>>	(closed)		
Draft 3 Frequency Response SAR Draft SAR Version 3 **9**	Comment Period Info **10** Submit Comments>>	02/08/07 - 03/09/07 (closed)	Comments Received **11**	Consideration of Comments **12**
Draft 2 Frequency Response SAR Draft SAR Version 2 **5**	Comment Period Info **6** Submit Comments>>	04/04/06 - 05/03/06 (closed)	Comments Received **7**	Consideration of Comments **8**
Draft 1 Draft SAR Version 1 **1** White Paper **2**		01/17/05 - 02/17/05 (closed)	Comments Received **3**	Consideration of Comments **4**

When completed, email to: gerry.cauley@nerc.net

Standard Authorization Request Form

Title of Proposed Standard	Frequency Response
Request Date	4/7/04

SAR Requestor Information		**SAR Type** (Put an 'x' in front of one of these selections)	
Name	Don McInnis	x	New Standard
Primary Contact	Don McInnis	☐	Revision to existing Standard
Telephone	(305) 442-5272	☐	Withdrawal of existing Standard
Fax			
E-mail	don_mcinnis@fpl.com	☐	Urgent Action

Purpose/Industry Need (Provide one or two sentences)

In regard to frequency response, one shortcoming of the recommendations in policy today is that there is no guidance regarding how much governor response (in MW) is required at the 5% droop rate. This has led to confusion among plant operators and turbine-generator manufacturers alike, and has led to confusion among CA and Generation Operators as to their responsibilities and obligations.

This SAR is suggested to ensure frequency of Interconnection remains above underfrequency load shedding setpoints during transient period following the sudden loss of generation on the Interconnection.

Reliability Functions

The Standard will Apply to the Following Functions *(Check box for each one that applies by double clicking the grey boxes.)*		
X	Reliability Authority	Ensures the reliability of the bulk transmission system within its Reliability Authority area. This is the highest reliability authority.
☒	Balancing Authority	Integrates resource plans ahead of time, and maintains load-interchange-resource balance within its metered boundary and supports system frequency in real time
☐	Interchange Authority	Authorizes valid and balanced Interchange Schedules
☐	Planning Authority	Plans the bulk electric system
☐	Resource Planner	Develops a long-term (>1year) plan for the resource adequacy of specific loads within a Planning Authority area.
☐	Transmission Planner	Develops a long-term (>1 year) plan for the reliability of transmission systems within its portion of the Planning Authority area.
☐	Transmission Service Provider	Provides transmission services to qualified market participants under applicable transmission service agreements
☐	Transmission Owner	Owns transmission facilities
☐	Transmission Operator	Operates and maintains the transmission facilities, and executes switching orders
☐	Distribution Provider	Provides and operates the “wires” between the transmission system and the customer
☐	Generator Owner	Owns and maintains generation unit(s)
☒	Generator Operator	Operates generation unit(s) and performs the functions of supplying energy and Interconnected Operations Services
☐	Purchasing-Selling Entity	The function of purchasing or selling energy, capacity and all necessary Interconnected Operations Services as required
☐	Market Operator	Integrates energy, capacity, balancing, and transmission resources to achieve an economic, reliability-constrained dispatch.
☐	Load-Serving Entity	Secures energy and transmission (and related generation services) to serve the end user

Reliability and Market Interface Principles

Applicable Reliability Principles *(Check boxes for all that apply by double clicking the grey boxes.)*	
☒	1. Interconnected bulk electric systems shall be planned and operated in a coordinated manner to perform reliably under normal and abnormal conditions as defined in the NERC Standards.
☐	2. The frequency and voltage of interconnected bulk electric systems shall be controlled within defined limits through the balancing of real and reactive power supply and demand.
☐	3. Information necessary for the planning and operation of interconnected bulk electric systems shall be made available to those entities responsible for planning and operating the systems reliably.
☐	4. Plans for emergency operation and system restoration of interconnected bulk electric systems shall be developed, coordinated, maintained and implemented.
☐	5. Facilities for communication, monitoring and control shall be provided, used and maintained for the reliability of interconnected bulk electric systems.
☐	6. Personnel responsible for planning and operating interconnected bulk electric systems shall be trained, qualified and have the responsibility and authority to implement actions.
☒	7. The security of the interconnected bulk electric systems shall be assessed, monitored and maintained on a wide area basis.

Does the proposed Standard comply with all of the following Market Interface Principles? *(Select 'yes' or 'no' from the drop-down box by double clicking the grey area.)*
1. The planning and operation of bulk electric systems shall recognize that reliability is an essential requirement of a robust North American economy. Yes
2. An Organization Standard shall not give any market participant an unfair competitive advantage.Yes
3. An Organization Standard shall neither mandate nor prohibit any specific market structure. Yes
4. An Organization Standard shall not preclude market solutions to achieving compliance with that Standard. Yes
5. An Organization Standard shall not require the public disclosure of commercially sensitive information. All market participants shall have equal opportunity to access commercially non-sensitive information that is required for compliance with reliability standards. Yes

Detailed Description (Provide enough detail so that an independent entity familiar with the industry could draft, modify, or withdraw a Standard based on this description.)

This proposed standard would coordinate with and complement the Load and Balancing SAR, which addresses Interconnection frequency control from 10 minutes and longer, by addressing the requirements for control during the seconds timeframe. Ideally, an integrated set of performance-based "balancing standards" should be in place that monitors the entire spectrum of the adequacy component of reliability. Figure 1 depicts the interrelationships of the set of "Balancing" standards, which ultimately checks that Control Areas have and deploy adequate resources to maintain reliability.

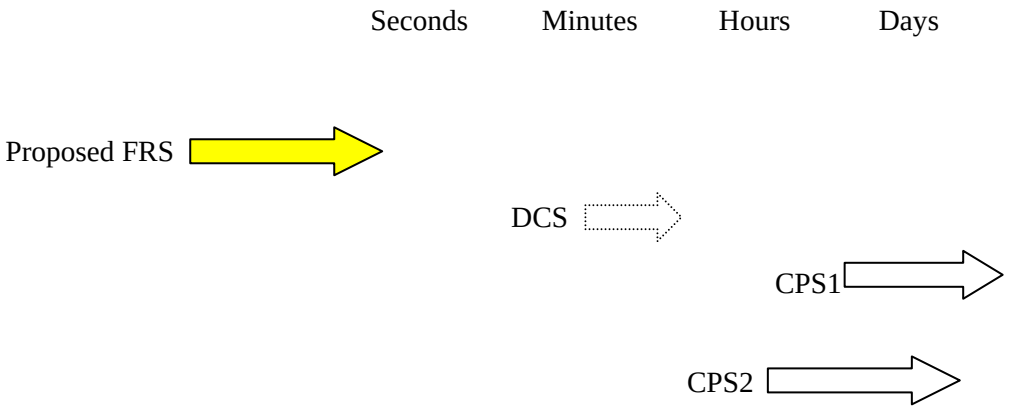


Figure 1 Interrelationships of "Balancing" Standards

The Control Performance Standards (CPS1 and CPS2) are well-defined and generally accepted by the Industry. The Disturbance Control Standard (DCS) measures deployment of reserves for specific events. This SAR is proposed to develop a standard to measure sub-minute responses to changes in frequency and to set minimum acceptable responses to system these events.

A Frequency Response Standard should address the following issues:

- There must be a minimum response for each event (rate, amount, and duration). Reliance on average response could result in all areas being short at the same time (similar to the short-term excursions seen with CPS1). The amount (depth of response) should not be under-emphasized.
- The measurement selected must be accurate and, to the extent practical, easy to implement.
- The requirements must integrate with and be consistent with the assumptions used in setting the BAAL limits within the Load and Balancing Standard (if and as ultimately adopted)
- A method of allocation must be developed
- The standard should not preclude market solutions (e.g. allow purchasing of response as long as deliverability and restoration criteria can be met).There must be a means for sale/purchase of frequency response as for any other quantity.

Related Standards

Standard No.	Explanation
300	Address frequency control during the transient period of 1-30 seconds currently not covered by the Balance Resource and Demand Standard

Related SARs

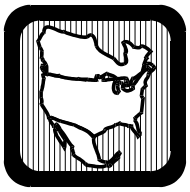
SAR ID	Explanation

Regional Differences

Region	Explanation
ECAR	
ERCOT	
FRCC	
MAAC	
MAIN	
MAPP	
NPCC	
SERC	
SPP	
WECC	

Related NERC Operating Policies or Planning Standards

ID	Explanation
Planning Standards III Section C Generation Control and Protection	The planning standards address the requirement for generator governors. This proposed standard broadens the concept to include not only governors but other equipment including load that responds to frequency.



NORTH AMERICAN ELECTRIC RELIABILITY COUNCIL

Princeton Forrestal Village, 116-390 Village Boulevard, Princeton, New Jersey 08540-5731

Frequency Response Standard Whitepaper

April 6, 2004

Prepared by the Frequency Task Force of the NERC Resources Subcommittee

PREFACE

Frequency response as used in this paper is defined as an automatic and sustained change in the power consumption or output of a device that occurs within 5-30 seconds of and is in a direction to oppose a change in the Interconnection frequency. Frequency response as so defined is declining within the Eastern and Western Interconnections when it should be increasing because of increasing load and the associated increase in generation. Frequency Response within the Texas Interconnection has been statistically constant.

The NERC Resources subcommittee posted a Frequency Response Standard for comment in 2001. The comments received against the standard centered on 1) those not understanding the metric and 2) those questioning the need for a standard.

The intent of this paper is to create an understanding of the need for a standard and the technical and economic drivers motivating its development

INTRODUCTION

The NERC Resources subcommittee drafted this paper to document the need for a frequency response standard. Provided in this paper are statistical background data showing how the frequency response of the Interconnections has declined along with an analysis of the technical and economic drivers that have contributed to the decline. Further, the paper attempts to refute through examples and simulation the arguments that this decline in the response is not a reliability issue. Instead, the paper will demonstrate that both the Western and Eastern Interconnections run a strong risk of under-frequency action if a standard is not adopted that establishes minimum levels of frequency response. The Union for the Coordination for the Transmission of Electricity (a European Standards Group) has already adopted a standard addressing the same technical issues raised within this paper. While the primary focus of the paper is the impact to each Interconnection as a whole, the need for primary frequency response also is a major consideration in islanding situations.

Background

Each Control Area's contribution to frequency support is provided by the natural response of its generators and load to frequency variations. Figure 1 depicts a typical frequency excursion caused by a loss of a large generator on an Interconnection. Frequency Response is typically comprised of two components:

"Load rejection" or the reduction in the power consumption by motors that slow down in response to a decline in frequency. This is reflected in the general slope of the line from Points A-C. Load response to a change in frequency can vary anywhere from no response from equipment like computers to 1.5 times for some motor loads. Load response occurs directly or with minimal lag as the frequency changes. In addition,

Control Areas may use "high set" interruptible loads that disconnect on a pre-determined trigger frequency.

"Generator response" or a change in the output of a generating unit due to inertia and the movement of its governor valves. Governor response from properly tuned units occurs in the 3-10 second timeframe and is responsible for the bottoming of frequency at Point C and the partial recovery of frequency to Point B.

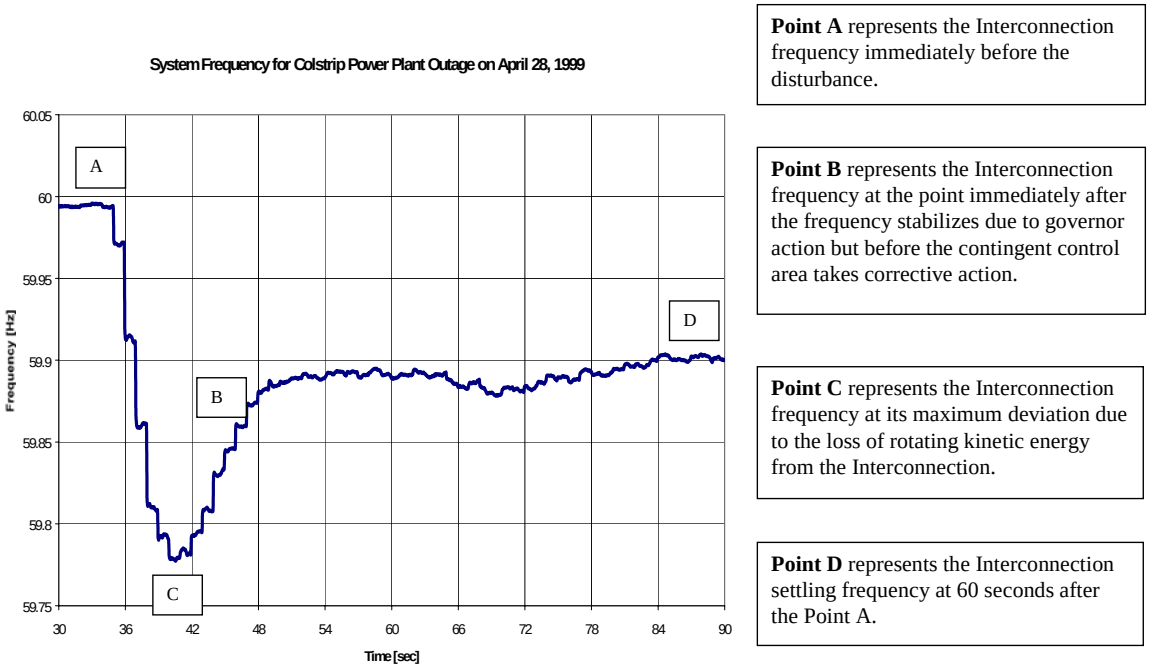


Figure 1 Typical Frequency Excursion

All else being constant, frequency will not recover to its scheduled value (typically 60 Hz) unless the Control Area that lost the resource replaces it.

The turn around in frequency from points C to B attributable to unit governor response has markedly declined and at times is non-existent in the Eastern Interconnection. The line from points C to D is shifting down and becoming horizontal. This means that on many occasions the only frequency response in the East is coming solely from load response. This critical fact is important since as will be discussed later in the paper. The changing nature of loads means that there will be markedly less load response available in the future. Therefore, reliance on load as the sole support to arrest the frequency can lead to a decline in the reliability of the grid.

One of the fundamental obligations of a Control Area as stated the Control Area Criteria of the NERC Operating Manual is the provision of frequency support. Once this support is produced it is the purpose and the intent of the frequency bias component of the ACE

equation to ensure that this response is not withdrawn after the initial transient period or through AGC action.

Ideally, an integrated set of performance-based "balancing standards" should be in place that monitors the entire spectrum of the Adequacy component of Reliability. Figure 2 shows the interrelationships of the set of "Balancing" standards, which ultimately checks that Control Areas have and deploy adequate resources to maintain reliability.

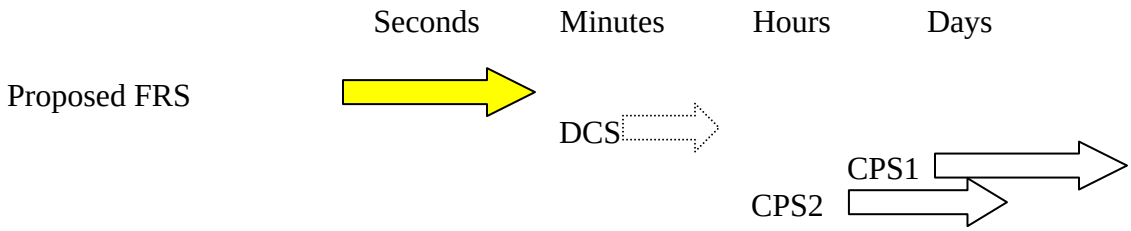
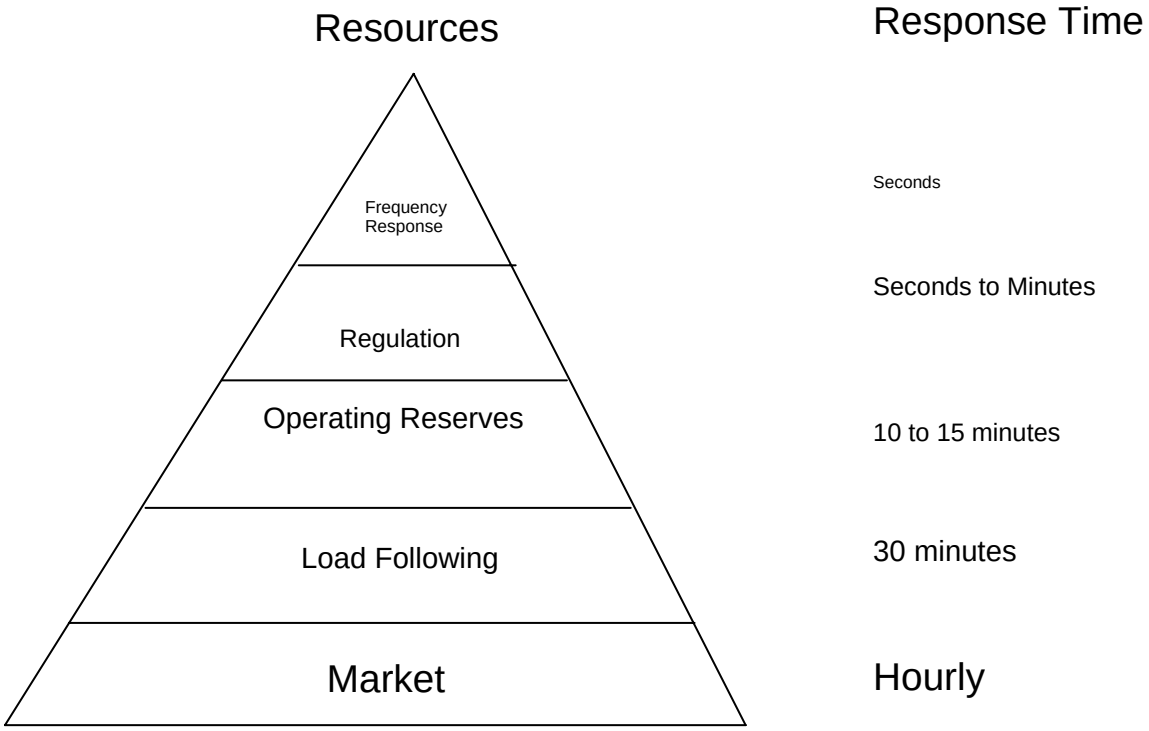


Figure 2 Interrelationships of "Balancing" Standards

The Control Performance Standards (CPS1 and CPS2) are well-defined and generally accepted by the Industry. The Disturbance Control Standard (DCS) measures deployment of reserves for specific events. This paper focuses on a proposed standard to measure sub-minute responses to changes in frequency. This sub-minute response is commonly called Governor Response (if viewed at the generator level) and Primary Frequency Control or Frequency Response (from a Control Area perspective).). The resource pyramid diagram below shows the same concept in a different fashion.



Note: Frequency Response is actually a negative value i.e. as frequency drops a generator's output should increase. When discussing Frequency Response, people generally talk about the raw numbers (i.e. 50MW/0.1Hz); the (-) sign is assumed. This should be kept in mind when reading this paper.

CURRENT SITUATION

Eastern Interconnection

Technical papers (Ingleson and Nagle) and analysis (Bourque) point to a continued decline in Eastern Interconnection Frequency Response. Figure 3 is a summary of this work.

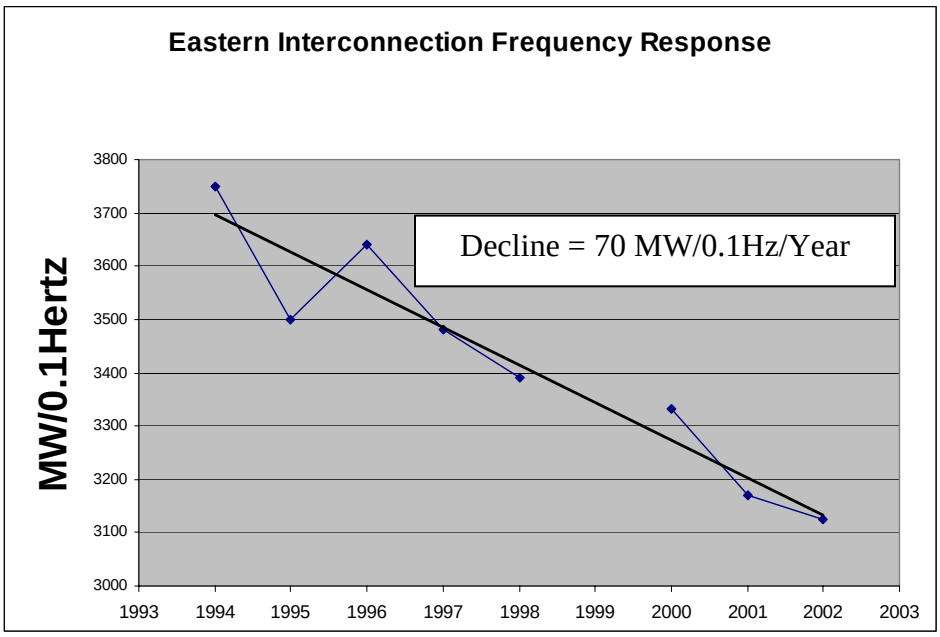


Figure 3 Trend in Eastern Interconnection Frequency Response

The plot shows an annual decline of slightly over 70 MW/0.1 Hz. This nine-year trend reflects an 18% decline in frequency response while load and generation grew nearly 20% over the same period. Frequency response should have increased proportionally with generation and load.

Western Interconnection

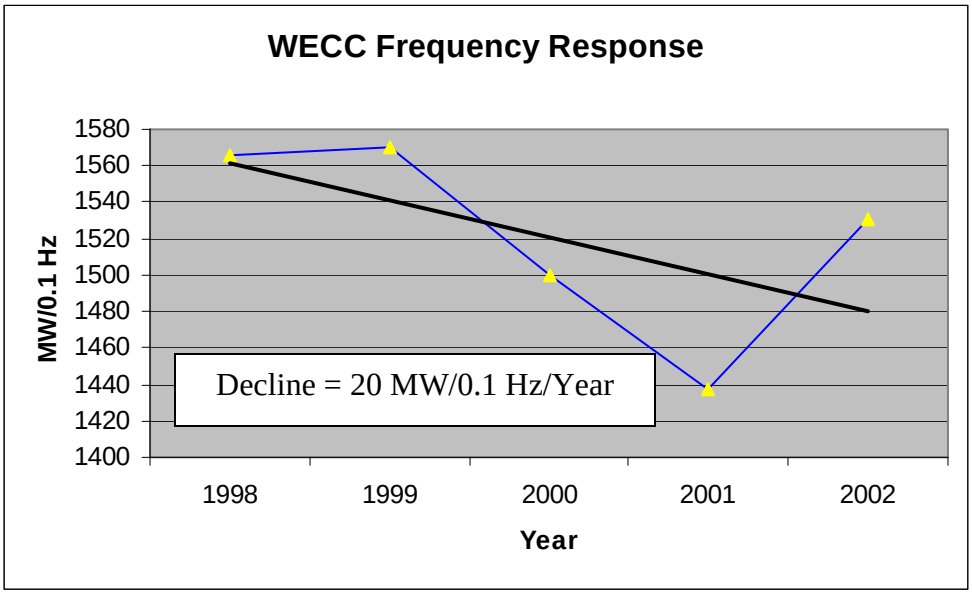


Figure 4 Trend in Western Interconnection Frequency Response

Figure 4 shows a proportionally similar decline in the Western Interconnection's Frequency Response. The graph represents response to events 25 milliHz or larger. There were a few data points available for prior years that put the West's response in the order of 1650MW/0.1Hz in 1994. This would be consistent with a decline of 20MW/year. Again, response should be increasing with increasing load and generation.

Texas Interconnection

The trend in the Texas Interconnection frequency response has been statistically flat. Figure 5 is a different representation of response over an 8-year period (1995-2002). The plot is a "box and whisker" graph. The rectangle or bar for each year represents the range of the "middle 50%" of observed events. The average value is the horizontal line within the year's rectangle. The "whiskers" attached to each box represent the upper and lower "quartiles". The asterisk in 1999 is an "outlier" or rare events. The plots represent 65 "medium sized" events over this period.

Comparing the Texas Interconnection Frequency Response to the other Interconnections is a challenge. This is because ERCOT has two groups of "high set" interruptible load. The first group trips at 59.8 Hz, the second at 59.7 Hz. Customers in the Texas Interconnection choose to participate in this and ERCOT uses it as a supplement to governor response. Once disconnected, the load provides no other assistance to frequency control such as inertial response. Additionally, this interruptible load provides no response to high frequency events.

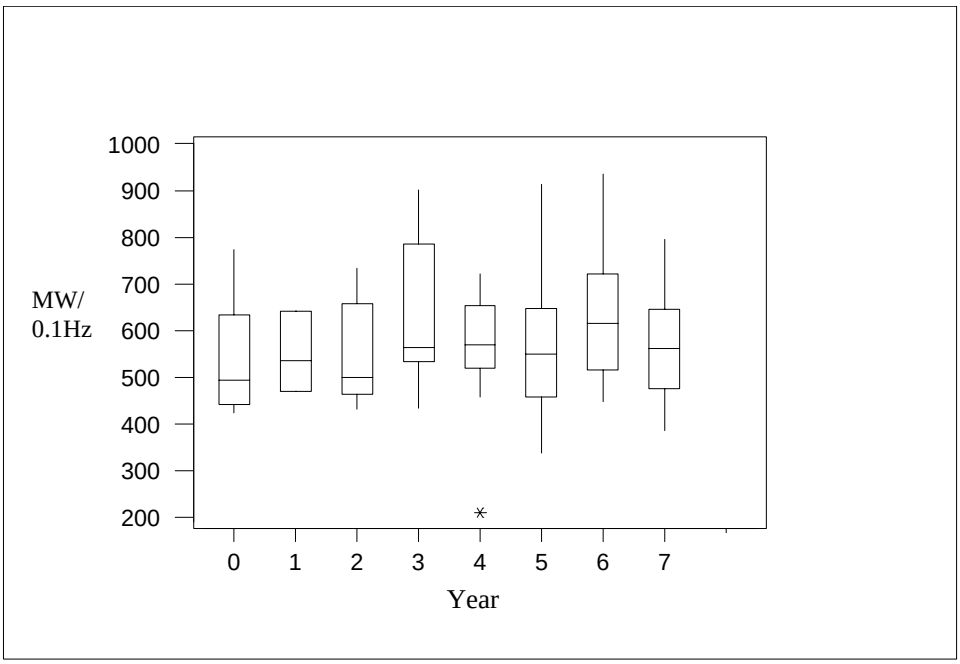


Figure 5 ERCOT Frequency Response 1995-2002

IS THERE A PROBLEM?

Those arguing against the need for a standard contend that the decline in the frequency response illustrated above is not a significant reliability problem. The argument put forward against a standard is that even if frequency response is declining there is so much margin in the system that reliability i.e. loss of load from under- frequency is not impacted. The calculation to demonstrate this argument is straightforward. The first significant amount of under-frequency load shedding in the Eastern Interconnection is set at 59.70Hz[1]. The current level of frequency response of the Eastern Interconnection is taken as 3100MW/0.1Hz. Therefore an under-frequency decline to 59.7Hz would require a generation loss of 9300MW. This is well beyond any generation loss that has ever occurred except in an islanded situation. Furthermore, at the current rate of decline of 70MW/yr, as shown in figure 3 it will be thirty-four years before the response level declines to a level where a loss of even 2400MW becomes a problem with respect to potential under-frequency load shedding.

As a starting point, this paper will show that the above logic is based on at least three incorrect assumptions.

The first assumption is that the Interconnection frequency starts at 60Hz. An examination of Eastern Interconnection frequency statistics shows significant periods when the

[1] The highest under-frequency setting in the Eastern Interconnection is 59.82 Hz. This is limited to a single Control Area. The 59.7Hz setting is widely used as a first step.

Interconnection frequency is operating at or below 59.98Hz. If 59.98 Hz is used to determine how long before the loss of 2400MW causes an under-frequency the result reduces to 25 years. This is still beyond the range of concern.

The second and most critical assumption is that the frequency response will be 3100MW/0.1 Hz. This is representative of the average frequency response within the Eastern Interconnection. However, the standard (or average) deviation of responses is ± 1870MW/0.1 Hz; giving a range of responses from 4970 to 1230 MW/0.1 Hz. If the lower response of 1230MW/0.1Hz is used in the calculation then, even today, a loss of 2400Mw has significant potential to cause under-frequency load shedding to occur. The fact that an under-frequency event has not happened yet is only coincidence. The multiple unit trips that have approached 2400MW have, fortunately, occurred when there was good response available.

A third assumption that is believed to be unfounded but is harder to disprove explicitly is, namely that the decline in frequency response will continue at a rate of only 70MW/0.1Hz. Many drivers are contributing to the response decline. Among these are:

- Steam turbine generators operating on “sliding pressure” or “boiler-follower” control and/or with “valves wide-open” (VWO) operation.
- Blocked governors on nuclear units for licensing reasons.
- Less heavy manufacturing in North America (proportionally fewer large motor loads and a reduction in “load rejection”).
- Variable-speed drives on motors that do not provide the traditional “load rejection”.
- A larger proportion of combine cycle units being installed on the system. Combined-cycle units when operating at full output operate in temperature control mode. When the frequency declines, there is a drop in combustion air volume that results from the slowing of compressor speed. This drop in combustion air volume can cause a reduction in the unit output. Figure 6 is a graph of the output of a combine cycle unit responding to a frequency decline.

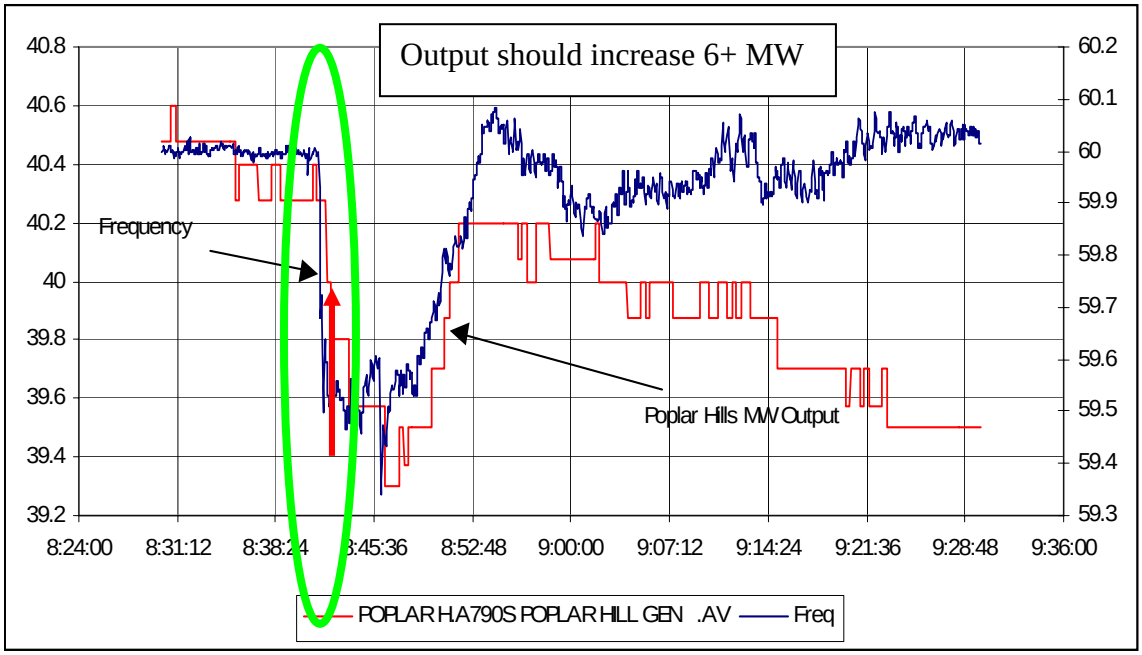


Figure 6 Combustion Turbine Response to Frequency Change

The blue line in Figure 6 is frequency and the red is MW output of the generators. The oval envelops the Frequency Response time window. For a change in frequency of -0.83%, the station lost 2.5% of machine output. If the plant provided 5% droop, its output should have increased 6.6 MW with the frequency event. The drop in output implies a POSITIVE Frequency Response characteristic.

While this is one specific model of combined-cycle unit, the graph is illustrative of this class of unit. As more of this class of unit comes on line, not only may there be no response but the response may actually decline as the frequency declines. This is of particular concern during Interconnection valley periods when these units may potentially make up a large proportion of the on-line generation. It is noteworthy that this phenomenon in the form of deloading or outright tripping after no more than one or two seconds of good response was a contributing factor in the Malaysia blackout in 1996 (Mansour 2003). Combined-cycle units can be tuned to provide correct frequency response; however, the operators need to be educated to the problem or have contractual or financial obligations and incentives to ensure that their units meet the requirements.

- Deregulation has resulted in a large increase in reserve-sharing groups. In the past, many Control Areas carried full reserves for their individual largest contingency and some for multiple contingencies. De-regulation and competitive

pressures have ended both of these practices. The majority of Control Areas have formed into Reserve Sharing Groups and each now carries its proportional share of the largest contingency.

While some of the above trends have slowed, the rate of decline has not been linear. In four out of the eight years examined, the frequency response decline has been over 100MW/0.1Hz.

Analysis of a Load Only Response

Currently, the wide variation of frequency response tends to be a self-correcting problem. During high load periods when units are operating at full output, the frequency response is available from the load. In light load periods when there is less load response, the on-line units are at less than full output and produce governor response. Without a standard in place, however, there is no guarantee that unit response will continue. What happens if it does not? A simple calculation provides the answer.

The Eastern Interconnection peaks at 600,000 MW and remains at loads of 200,000MW and below for roughly 20% of the time. At best, motor and other similar types of loads respond on a linear basis as the frequency declines. In other words a 1% change in frequency, equivalent to 0.6Hz, produces a 1% change in load. A drop in the Interconnection frequency that reaches the first step of under-frequency load shedding, 59.7 Hz, represents a 0.5% change in frequency and therefore would produce only a 0.5% change in load or 1000MW. There are roughly 16-22 single generators of this size or larger within the Eastern Interconnection. Without unit or other equivalent frequency support, a single unit trip could potentially cause the Eastern Interconnection to drop firm load.

The following simulation results show the response of the Eastern Interconnection under two scenarios. The load level analyzed is 280,000MW or about the load on 4/23/03 when there was a loss of 2500MW on the system. Figure 7 shows the response of the system assuming there had only been load response available. The model assumes a linear decline of load with frequency as stated above. At 59.5Hz, the simulation drops 7% of the load by under-frequency load shedding.

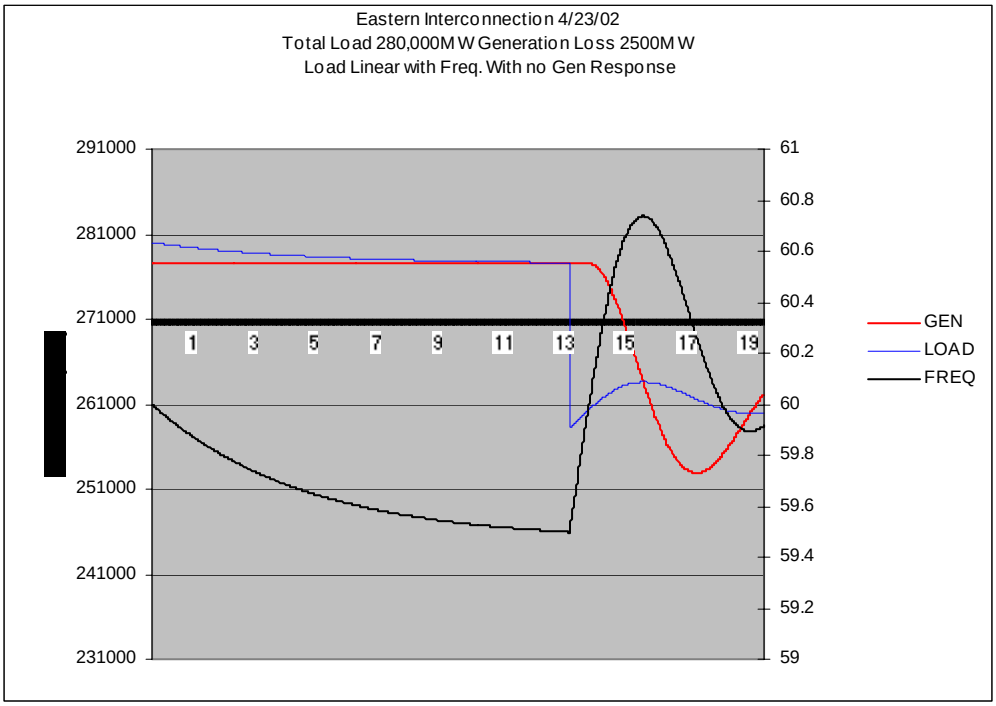


Figure 7 Simulation Assuming no Governor Response

Figure 8 shows the same system conditions and assumptions except that there is 1000MW of generator governor reserves.

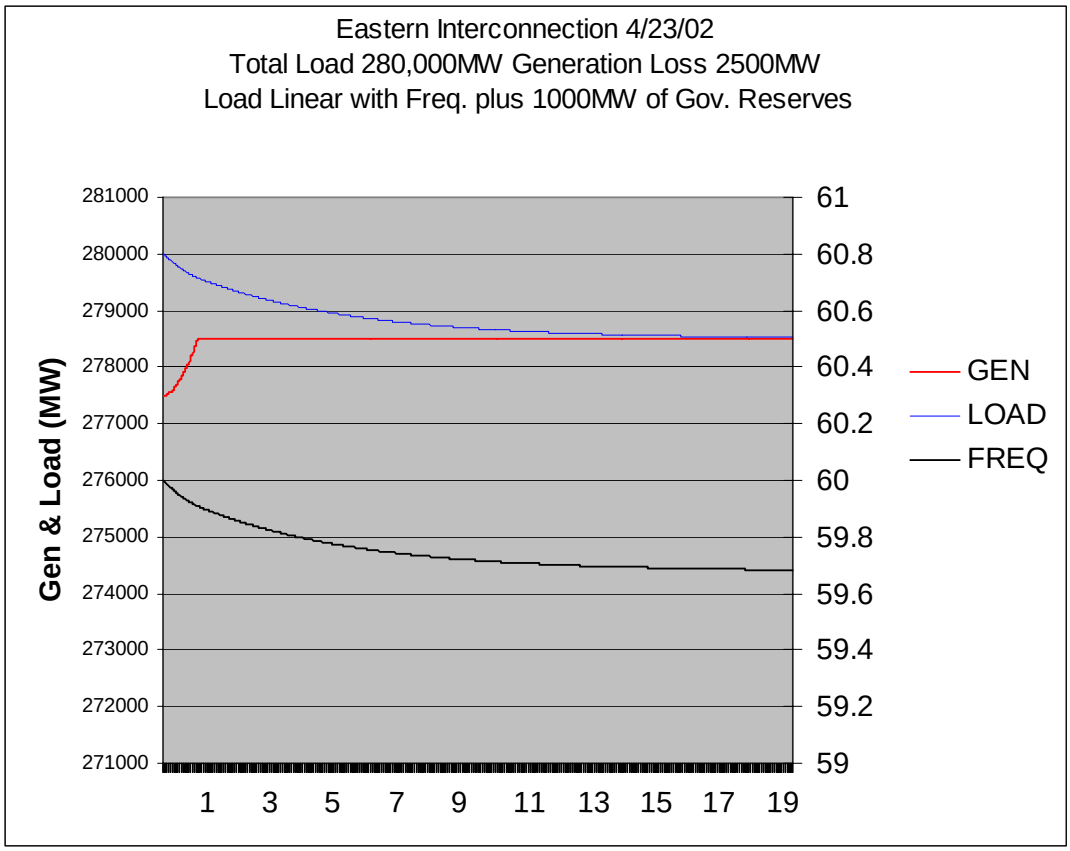


Figure 8 Simulation with 1000 MW of Governor Reserves

The impact of the governor response even though only half of the unit loss is sufficient to maintain the frequency above the under frequency tripping point.

Without a frequency response standard there is no assurance that unit response will be available in any of the Interconnections. Current economics will continue to drive most units to operate at maximum output. Presently, system operating conditions are counterbalancing and the problem is self-correcting. As pointed out above, combined-cycle units are an increasing proportion of the generation. What incentive is there for other, newer technologies to incorporate frequency response if no requirement (i.e. a standard) exists to define adequacy?

Secondary Impacts

There are many secondary effects from having an unknown and uncontrolled frequency response. Among these are:

- System oscillations may not be damped and may actually be aggravated. Recent testing of governor response in the Western Interconnection (Pereira) shows that existing models using an expected 5% governor droop are overly optimistic. Calculations indicate only 40% of expected response was obtained. As a result,

oscillations persist for roughly twice as long as models predict, and they are substantially stronger.

- Some areas may be incapable of "self restoration" during islanding and black-start conditions.
- Without a measure or requirement, market forces will likely continue to drive a decline in performance.
- Stability transfer limits will be incorrect if assumptions about frequency response are wrong.
- There is no way to tell whether the decline in response is spread among all Control Areas or whether there are regions with little or no response (and therefore not able to provide support to the Interconnection during disturbances or "self start" during restoration).

CURRENT REQUIREMENTS

This section highlights the current requirements and good practices regarding Frequency Response.

The NERC *Control Area Criteria* document outlines the fundamental obligations of the operation of the grid. In particular, it states:

> *The CONTROL AREA shall operate generation or have the necessary contracts to operate generation to… Provide its frequency bias obligations.*

Policy 1 has several guides (suggested good practices) regarding governors:

- Generating units with nameplate ratings of 10 MW or greater should be equipped with governors operational for Frequency Response unless restricted by regulatory mandates.
- Turbine governors and HVDC controls, where applicable, should respond to system frequency deviation, unless there is a temporary operating problem.
- All turbine generators equipped with governors should be capable of providing immediate and sustained response to abnormal frequency excursions. Governors should provide a 5% droop characteristic. Governors should, as a minimum, be fully responsive to frequency deviations exceeding ± 0.036 Hz.
- Turbine control systems that provide adjustable limits to governor valve movement (valve position limit or equivalent) should not restrict travel more than necessary to coordinate boiler and turbine response characteristics.

ISN'T EXISTING POLICY SUFFICIENT?

Current NERC policy, as seen above, has no "requirements" for primary frequency response. Policy 1C deals primarily with Bias, which relates more to determining regulation and Secondary Frequency Control, rather than Frequency Response. The

portions of Policy 1C regarding governors are "guides" and carry no force. This may partially explain why Frequency Response is declining. Mandatory requirements for governors, even if adopted, do not guarantee that the unit would not be operated at wide-open valves and, therefore, have no response for an under-frequency condition. In other words, both responsiveness and depth of response must be assured.

COMMENTS TO THE FIRST PROPOSED FREQUENCY RESPONSE STANDARD

A Frequency Response Standard was proposed in mid 2001 in conjunction with approval of the current version of Policy 1. Table 1 summarizes the comments received.

Summary Comment	Respondents
"Wordsmithing" or clarification or minor modification comments	62
Governor requirement needs more definition (what is a "governor" on a combined cycle unit) and should be consistent with Planning Standards.	1
In favor of a standard	3
Measure should be tested before implementation	2
Add a requirement for common set points for under-frequency load shedding so that one CONTROL AREA won't drag another one down,	1
"Loss of load" risk should not be the basis for establishing the standard.	1
There does not appear to be sufficient evidence on hand at this time to warrant rigorous Standards and possible non-compliance penalties.	1
Not sure using one-minute data will measure what's needed.	1

Table 1 Summary of Comments to Policy 1C

The Balancing SAR task force posed questions to the Industry on the need for a Frequency Response Measure (FRM) that would likely mirror the FRS suggested by the Resources Subcommittee. The NERC Director of Standards returned the proposal because of concerns raised by the Industry. A closer look at the responses reveals that the Industry was not so much opposed to the standard as they were looking for information and clarification of the requirements. Table 2 summarizes the responses.

Summary Comment	Respondents
Difficulty measuring	6
Didn't understand measure	1
Only if Generation governors required in "interconnection standard"	1
More work needed in definition	1
In favor	6
Should hold sub-entities (generators, LSEs) accountable	6

Current guides requiring generators to respond are adequate	2
Eliminate the Frequency Response Measure	1

Table 2 Summary of Comments Received on a Frequency Response Measure

FREQUENCY RESPONSE STANDARD CONSIDERATIONS

Introduction

A frequency response standard must explain clearly what is to be measured and why. This will help with the design of the process and provide direction on how it should evolve. Logical goals and considerations for a FRS include:

- Benchmark and track performance (both Control Area and Interconnection).
- Maintain historic levels of reliability (or some other level justified by an in-depth analysis).
- Be performance-based rather than commodity-based.
    - This is similar to CPS where impact on interconnection frequency is measured rather than requiring a target set-aside of regulating resources.
    - Specifically measuring Frequency Response allows more flexibility in meeting the needs of the Interconnection and Region (a target spinning reserve amount does not ensure Frequency Response)
    - Rather than telling entities how to meet the standard, let the Industry and markets find innovative solutions.
- Be "tunable", thereby providing a means to adjust the standards as information allows.
- Be empirically valid (results statistically provable).
- Be objectively calculated.
- Be consistent and verifiable in application by all parties.
- Enable simple compliance monitoring.
- Be consistent with direction of the Industry (i.e. FERC RTO rule, IOSITF, etc.).

Issues

A Frequency Response Standard should address the following issues:

- There must be a minimum response for each event (rate, amount, and duration) such that the problems described above do not occur. Reliance on average response could result in all areas being short at the same time (similar to the short-term excursions seen with CPS1). The amount (depth of response) should not be under-emphasized. One shortcoming of the recommendations in policy today is that there is no guidance regarding how much governor response (in MW) is required at the 5% droop rate. This has led to confusion among plant operators and turbine-generator manufacturers alike, and has resulted in an objectionable lack of response from some units when the

boiler controls are suppressed out of legitimate fear of tripping the unit on a frequency change.

- The measurement selected must be accurate and, to the extent practical, easy to implement.
- The requirements must integrate with and be consistent with the assumptions used in setting the BAAL limits within the Load and Balancing Standard (if and as ultimately adopted)
- A method of allocation must be developed
- The standard should not preclude market solutions (e.g. allow purchasing of response as long as deliverability and restoration criteria can be met).There must be a means for sale/purchase of frequency response as for any other quantity.

REFERENCES

Bourque, E., Frequency Response Data provided to the NERC Resources subcommittee.

Cohn, N., Control of Generation and Power Flow on Interconnected Power Systems, John Wiley and Sons, 1961.

Comments to posting of Policy 1 (Policy1-Version2-0601-comments1.doc)

EPRI Report TR-101080, Impacts of Governor Response Changes on the Security of North American Interconnections, October 1992.

Ingleson, J., Nagle, M., *"Decline of Eastern Interconnection Frequency Response"*, Prepared for the Fault and Disturbance Conference at Georgia Tech, May, 1999.

NERC Policy 1, Generation Control and Performance.

NERC *Frequency Response Characteristic Survey Training Document*.

NERC Resources Subcommittee Minutes .

NERC Training Resource Working Group *Understand and Calculate Frequency Response"*.

NERC *"Interconnected Operations Services Reference Document"*.

Pereira, L., *"NEW THERMAL TURBINE GOVERNOR MODELING FOR THE WECC"*, Presentation dated August 27, 2002.

"WSCC FRR SURVEYS CONDUCTED" (Rev. November 21, 2001) Report by WECC Performance Work Group (PWG).

Mansour, Yakout. Correspondence with investigator of the 1996 Malaysian blackout..

ACRONYMS, TERMS AND DEFINITIONS

ACE - AREA CONTROL ERROR: ACE is the algebraic sum of the net scheduled and net actual interchange and a bias term based on the difference between scheduled and actual system frequency. This parameter is used to determine a Control Area's control performance with respects to its impact on system frequency.

CPS – CONTROL PERFORMANCE STANDARD: CPS defines a standard of minimum control performance. Each Control Area is to have the best operation above this minimum that can be achieved within the bounds of reasonable economic and physical limitations. Each Control Area shall monitor its performance on a continuous basis against two standards: CPS1 and CPS2.

> **CPS1 – CONTROL PERFORMANCE STANDARD 1**: Over a (running) year, the average of the clock-minute averages of a Control Area's ACE times the clock minute average frequency error shall be less than a specific limit. This limit is a constant derived from a target frequency bound reviewed and set as necessary by the NERC Resources Subcommittee.
>
> **CPS2 – CONTROL PERFORMANCE STANDARD 2**: The average ACE for each of six ten-minute periods during the hour (i.e., 10, 20, 30, 40, 50 and 60 minutes after the hour) must be within L_{10} at least 90 % of the time during each calendar month.

DCS – DISTURBANCE CONTROL STANDARD: The standard used to monitor a Control Area's ability to recover from a disturbance.

ERCOT – ELECTRIC RELIABILITY COUNCIL OF TEXAS: One of the ten NERC regional coordinating councils.

FRC – FREQUENCY RESPONSE CHARACTERISTIC: For any change in generation/load balance in an interconnection, a frequency change occurs. FRC defines how any system (Control Area) responds to this change during any imbalance resulting from a sudden loss of load or generation. System frequency does not usually return to its pre-disturbance level until the Control Area experiencing the imbalance corrects its imbalance.

FRS – Frequency Response Standard.

IOS – INTERCONNECTED OPERATING SERVICES: IOS are the elemental 'reliability building blocks' from generation (and sometimes load) necessary to maintain bulk electric system reliability, (sometimes referred to as ancillary services, such as regulation, load following, contingency reserves, Frequency Response, reactive power supply, and black-start capability).

LSE- Load Serving Entity.

NAESB – North American Energy Standards Board.

SAR - Standards Authorization Request.

COMMENT FORM
Proposed Frequency Response Standard

This form is to be used to submit comments on the proposed Frequency Response Standard Authorization Request. Comments must be submitted by **February 17, 2005**. You may submit the completed form by emailing it to: sarcomm@nerc.com with the words "Frequency Response SAR Comments" in the subject line. If you have questions please contact Mark Ladrow at mark.ladrow@nerc.net or by telephone at 609-452-8060.

ALL DATA ON THIS FORM WILL BE TRANSFERRED AUTOMATICALLY TO A DATABASE AND IT IS THEREFORE IMPORTANT TO ADHERE TO THE FOLLOWING REQUIREMENTS:

DO: **Do** enter text only, with no formatting or styles added.
Do use punctuation and capitalization as needed (except quotations).
Do use more than one form if responses do not fit in the spaces provided.
Do submit any formatted text or markups in a separate WORD file.

DO NOT: **Do not** insert tabs or paragraph returns in any data field.
Do not use numbering or bullets in any data field.
Do not use quotation marks in any data field.
Do not submit a response in an unprotected copy of this form.

Individual Commenter Information **(Complete this page for comments from one organization or individual.)**		
Name:	Phil Creech	
Organization:	Progress Energy – Carolinas	
Telephone:	919-546-6738	
Email:	phil.creech@pgnmail.com	
NERC Region		**Registered Ballot Body Segment**
☐ ERCOT ☐ ECAR ☐ FRCC ☐ MAAC ☐ MAIN ☐ MAPP ☐ NPCC ☒ SERC ☐ SPP ☐ WECC ☐ NA - Not Applicable	☒	1 - Transmission Owners
	☐	2 - RTOs, ISOs, Regional Reliability Councils
	☒	3 - Load-serving Entities
	☐	4 - Transmission-dependent Utilities
	☒	5 - Electric Generators
	☒	6 - Electricity Brokers, Aggregators, and Marketers
	☐	7 - Large Electricity End Users
	☐	8 - Small Electricity End Users
	☐	9 - Federal, State, Provincial Regulatory or other Government Entities

Comment Form – Proposed Frequency Response Standard

Group Comments (Complete this page if comments are from a group.)

Group Name:

Lead Contact:

Contact Organization:

Contact Segment:

Contact Telephone:

Contact Email:

Additional Member Name	Additional Member Organization	Region*	Segment*

* If more than one Region or Segment applies, indicate the best fit for the purpose of these comments. Regional acronyms and segment numbers are shown on prior page.

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The requestor would like to receive industry comments on this SAR and to obtain the input of the industry prior to determining the final scope and requirements of the SAR. Accordingly, we request your comments included on this form, emailed with the subject "Frequency Response SAR Comments" by February 17, 2005.

Question 1: Do you agree there is a reliability need for a specifying the quality and quantity of frequency response?

☒ Yes

☐ No

If no, please explain in the space provided below.

Comments

Question 2: Do you agree with the scope and applicability of the proposed standard?

☒ Yes
☐ No

If no, please explain in the space provided below.

Comments

Scope:
The scope of the proposed standard is appropriate. However, the reliability requirements would be better addressed by a comprehensive review that considers the adequacy of existing reliability standards.

Applicability:
The applicability of the proposed standard is understood to be Reliability Authorities, Balancing Authorities, and Generator Operators. However, substantial questions remain as to how the responsibilities implied in the proposed standard will be equitably distributed.

Question 3: Do you believe these standards are more appropriately additions to existing standards as opposed to creating new standards?

☒ Yes

☐ No

If yes, please identify the location you believe would be the most appropriate for the proposed standard.

The reliability requirements provided in the proposed standard would be better addressed by a comprehensive review that considers the adequacy of the existing reliability standards (i.e., 300 - Balance Resources and Demand)

Comments

Question 4: Do you have any additional comments regarding the SAR that you believe should be addressed?

☐ Yes

☒ No

If yes, please share those comments in the space provided below.

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Do not submit a response in an unprotected copy of this form.

Individual Commenter Information **(Complete this page for comments from one organization or individual.)**		
Name:	Les Pereira	
Organization:	Northern California Power Agency	
Telephone:	916-781-4218	
Email:	les@ncpa.com	
NERC Region		**Registered Ballot Body Segment**
☐ ERCOT ☐ ECAR ☐ FRCC ☐ MAAC ☐ MAIN ☐ MAPP ☐ NPCC ☐ SERC ☐ SPP x☐ WECC ☐ NA - Not Applicable	☐	1 - Transmission Owners
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x☐ Yes

☐ No

If no, please explain in the space provided below.

Comments

Question 2: Do you agree with the scope and applicability of the proposed standard?

☐ Yes

x☐ No

If no, please explain in the space provided below.

The scope needs to be expanded – see detailed comments in a following section – based on extensive modeling and validation work in WECC.

Comments

Question 3: Do you believe these standards are more appropriately additions to existing standards as opposed to creating new standards?

☐ Yes

x☐ No

If yes, please identify the location you believe would be the most appropriate for the proposed standard.

Comments

A new SAR will be more prescriptive, however there is also need for other related sections in NERC Operating Policy and Planning that need to be modified – see other comments below.

Question 4: Do you have any additional comments regarding the SAR that you believe should be addressed?

x☐ Yes

☐ No

If yes, please share those comments in the space provided below.

Two statements are made in the SAR:

1. The purpose of the proposed SAR is to ensure that frequency of the Interconnection remains above underfrequency load shedding setpoints during the transient period following the sudden loss of generation on the Interconnection.
2. Furthermore, it is stated that " In regard to frequency response, one shortcoming of the recommendations in policy today is that there is no guidance regarding how much governor response (in MW) is required at the 5% droop rate."

The first is a calculated number and depends not only on the amount of generation tripped, but also the total generation in the Whole Interconnection at the time of trip. Obviously two very different answers will be obtained : one with the Interconnection intact (normal operation) and the second when islanded. Both affect reliability.

The second issue has been thoroughly investigated in the WECC and a new Thermal Governor modeling approach has been implemented in the WECC after system tests, an exhaustive modeling validation effort and obtaining data from the generator owners. This has been documented in two IEEE Transaction papers described below. These papers present the development of a new turbine-governor modeling approach in WECC that correctly represents thermal units that have demonstrated unresponsive characteristics such as "base loaded" units operated with limiters, or partially responsive units with MW-load-controllers. The May 18th 2001 system trip test for 1250 MW performed with all AGCs off indicated that only about 40% of the governors effectively responded in the real system. If all the governors were responsive the calculated generation pickup for governors with a 5% droop for a 0.1 Hz frequency deviation would be 3185 MW instead of 1250 MW. The new modeling approach has been extensively validated against recordings from three WECC system tests and several large disturbances, and has been approved for use in all operation and planning studies in the WECC. The second paper describes the steps being taken to obtain validated data for the new governor models.

The work done by WECC indicate clearly that we do not get the required 5% droop from all units as required by NERC. The modeling approach taken was to model the governors in planning and operating studies exactly as they are being actually operated. Enforcement/compliance of the 5% droop is a separate issue and must be addressed by operating policies.

Obviously, the SAR touches upon only part of the problem, but it is a good start and should be expanded. It also needs to be cross-referenced with other areas such as the 5% droop requirement, an effective spinning reserves policy that actually works (see the

papers), and the effect on 'governor' powerflow and voltage stability analysis as a result of "unresponsive" governors.

The white paper referred by the SAR only touches upon the WECC effort and seems to miss the whole point of the modeling and validation work by the Governor Modeling Task Force in WECC - and what we have achieved in WECC to address realistic modeling of unresponsive governors in the real system.

1. "A New Thermal Governor Modeling Approach in the WECC"
by L. Pereira, J. Undrill, D. Kosterev, D. Davies, S. Patterson, *IEEE Trans. Power Systems*, vol. 18, Issue.2, pp. 819-829, May 2003. (*IEEE 2004 prize paper). Presented at Toronto IEEE PES, July 2003.*

2. "New Thermal Governor Model Selection and Validation in the WECC"
by Les Pereira, Dmitry Kosterev, Donald Davies, and Shawn Patterson - IEEE TPWRS – Vol.19, No.1, pp 517-523, February 2004. *Presented at Denver IEEE PES, July 2004.*

COMMENT FORM
Proposed Frequency Response Standard

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Individual Commenter Information **(Complete this page for comments from one organization or individual.)**		
Name:	Mike Calimano	
Organization:	New York Independent System Operator	
Telephone:	518-356-6129	
Email:	mcalimano@nyiso.com	
NERC Region		**Registered Ballot Body Segment**
☐ ERCOT	☐	1 - Transmission Owners
☐ ECAR	☒	2 - RTOs, ISOs, Regional Reliability Councils
☐ FRCC	☐	3 - Load-serving Entities
☐ MAAC	☐	4 - Transmission-dependent Utilities
☐ MAIN	☐	5 - Electric Generators
☐ MAPP	☐	6 - Electricity Brokers, Aggregators, and Marketers
☒ NPCC	☐	7 - Large Electricity End Users
☐ SERC	☐	8 - Small Electricity End Users
☐ SPP	☐	9 - Federal, State, Provincial Regulatory or other Government Entities
☐ WECC		
☐ NA - Not Applicable		

Comment Form – Proposed Frequency Response Standard

Group Comments (Complete this page if comments are from a group.)

Group Name: **New York Independent System Operator**

Lead Contact: **Mike Calimano**

Contact Organization: **NYISO**

Contact Segment: **2**

Contact Telephone: **518-356-6129**

Contact Email: **mcalimano@nyiso.com**

Additional Member Name	Additional Member Organization	Region*	Segment*

* If more than one Region or Segment applies, indicate the best fit for the purpose of these comments. Regional acronyms and segment numbers are shown on prior page.

Background Information:

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Question 1: Do you agree there is a reliability need for a specifying the quality and quantity of frequency response?

☒ Yes

☐ No

If no, please explain in the space provided below.

Comments

We agree in general that there is a reliability need to have frequency response, particularly during disturbances, islanding and restoration. The standard should provide the process for a technically sound calculation of frequency response and bias (both fixed and variable).

Any new standards on frequency response need not and should not be onerous by finding BAs noncompliant with response less than average or below some un-validated norms. There may be valid reasons why a BA is below observed norms in response. For example, the BA may meet most of its obligations with schedules or its native load may be non-responsive.

If performance is significantly less than an Interconnection norm, the standard should not trigger an automatic non-compliance. In these situations the BA should perform an internal review/assessment that ensures governors are working as designed, that the BA knows which resources are frequency responsive (so the information can be included in restoration plans), whether governors can be put in more responsive modes during disturbances, etc.

When required, the validation of governor performance could be achieved either through online monitoring in an EMS or periodic testing (both methods should be explained in a reference document to support the standard).

The standard should acknowledge that some units might not provide response under normal operations (e.g. nuclear units operating at full load) and that response is highly variable event-to-event based on simultaneous load changes. The standard should acknowledge the differing Interconnection requirements (smaller Interconnections need greater response).

The standard should also track Interconnection response over time (years) and be reevaluated as performance changes.

Question 2: Do you agree with the scope and applicability of the proposed standard?

☐ Yes

☒ No

If no, please explain in the space provided below.

There is a general need for a standard, but the outcomes and expectations should address the comments raised in question 1.

While we agree that the standard should not preclude market solutions (e.g. allow purchasing of response as long as deliverability and restoration criteria can be met), we have concerns with the statement: *There must be a means for sale/purchase of frequency response as for any other quantity.*

It is not clear what is meant by *A method of allocation must be developed"*. Is this an allocation of Interconnection response to BAs, BA allocation to generators or something different?

.

Comments

Question 3: Do you believe these standards are more appropriately additions to existing standards as opposed to creating new standards?

☐ Yes

☒ No

If yes, please identify the location you believe would be the most appropriate for the proposed standard.

Comments

Question 4: Do you have any additional comments regarding the SAR that you believe should be addressed?

☒ Yes

☐ No

If yes, please share those comments in the space provided below.

We appreciate the opportunity to comment and believe there is a need for such a standard. Published studies show frequency response is declining when it should be increasing with load. The main concerns with this decreasing performance are:

There may be areas unable to withstand severe disturbances.

Following a grid separation or collapse, control areas may be unable to fulfill their blackstart and restoration responsibilities, thereby becoming a burden to neighbors.

Because engineering models use theoretical frequency response, they are likely overoptimistic and may misstate grid stability limits.

This standard would allow the industry to determine whether the decline is local or global.

Rather than implementing a complicated infrastructure or process, we would suggest that NERC automate the calculation of frequency response by either:

Asking BAs to save their CPS-source data in a common format so a common tool can be used (MAPP BAs and some others use a common tool that can calculate frequency response with CPS-source data).

Embed the calculation in the NERC ACE-monitoring application.

Refer to our earlier comments the structure of the standard (where lower amounts of BA response trigger an internal assessment rather than automatic assignment of non-compliance). BAs (and ultimately generators) would only be initially non-compliant if their response was low AND the BA failed to perform a reliability assessment in conjunction with its TOP. This default assessment would be at the BA level, but could be on an area basis (likely islanding area or where a TSP has responsibility for frequency responsive and black start ancillary services).

The standard should employ a methodology that not only captures initial response (first few seconds after the event) but also the sustained response until AGC action takes over

Each Interconnection should have the ability to add and further define the standard to meet its needs.

Providing visibility on where and when performance is substandard will likely initiate sufficient action to arrest the decline in performance. Minimum performance standards could be

implemented after the industry has identified what is reasonably achievable and technically justified.

CHANGE
This SAR is proposed to develop a standard to measure sub-minute responses to changes in frequency and to set minimum acceptable responses to system these events.
TO
This SAR is proposed to develop a standard to measure sub-minute responses to changes in frequency and to set minimum acceptable responses to these system events.

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Individual Commenter Information **(Complete this page for comments from one organization or individual.)**		
Name:	James Stanton	
Organization:	Calpine	
Telephone:	832-476-4453	
Email:	jstanton@calpine.com	
NERC Region		**Registered Ballot Body Segment**
☒ ERCOT ☒ ECAR ☒ FRCC ☒ MAAC ☒ MAIN ☒ MAPP ☒ NPCC ☒ SERC ☒ SPP ☒ WECC ☐ NA - Not Applicable	☐	1 - Transmission Owners
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Comment Form – Proposed Frequency Response Standard

Group Comments (Complete this page if comments are from a group.)

Group Name:

Lead Contact:

Contact Organization:

Contact Segment:

Contact Telephone:

Contact Email:

Additional Member Name	Additional Member Organization	Region*	Segment*

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Comment Form – Proposed Frequency Response Standard

Question 1: Do you agree there is a reliability need for a specifying the quality and quantity of frequency response?

☒ Yes

☐ No

If no, please explain in the space provided below.

Comments

Question 2: Do you agree with the scope and applicability of the proposed standard?

☒ Yes
☐ No

If no, please explain in the space provided below.

Comments

Question 3: Do you believe these standards are more appropriately additions to existing standards as opposed to creating new standards?

☐ Yes

☒ No

If yes, please identify the location you believe would be the most appropriate for the proposed standard.

Comments

Question 4: Do you have any additional comments regarding the SAR that you believe should be addressed?

☒ Yes

☐ No

If yes, please share those comments in the space provided below.

Given the language in the accompanying White Paper: The standard should not preclude market solutions (e.g. allow purchasing of response as long as deliverability and restoration criteria can be met).There must be a means for sale/purchase of frequency response as for any other quantity. – I believe this Standard should be developed in conjunction with NAESB. The definition, attributes and procurement metrics of the frequency response product will be a critical component of this Standard. Some guidance in defining and developing this service to the bulk interconnected system can be found in the NERC IOS Reference Document. The Standard should build on this previous IOS work.

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Group Comments (Complete this page if comments are from a group.)

Group Name: **Operating Reliability Working Group (ORWG)**

Lead Contact: **Robert Rhodes**

Contact Organization: **Southwest Power Pool**

Contact Segment: **1, 2**

Contact Telephone: **501-614-3241**

Contact Email: **rrhodes@spp.org**

Additional Member Name	Additional Member Organization	Region*	Segment*
Ron Ciesiel	Southwest Power Pool	SPP	2
Bob Cochran	SPS	SPP	1
Mike Gammon	KCPL	SPP	1
Steve Hillman	WPEK	SPP	1
Allen Klassen	Westar	SPP	1
Bill Nolte	SECI	SPP	1
Robert Rhodes	Southwest Power Pool	SPP	2
Mike Stafford	GRDA	SPP	1

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Question 1: Do you agree there is a reliability need for a specifying the quality and quantity of frequency response?

☒ Yes

☐ No

If no, please explain in the space provided below.

Comments

A frequency response standard is needed but only within the scope and range of the previously provided guides in Policy 1 such as a design criteria of 5% droop, a 36 mHz deadband with exclusions for nuclear, combined cycle and small generating units.

Question 2: Do you agree with the scope and applicability of the proposed standard?

☒ Yes
☐ No

If no, please explain in the space provided below.

Comments

Question 3: Do you believe these standards are more appropriately additions to existing standards as opposed to creating new standards?

☒ Yes

☐ No

If yes, please identify the location you believe would be the most appropriate for the proposed standard.

We would recommend that this standard be incorporated into the Balance Resource and Demand Standard (Standard 300) or the Version 0 BAL Standard.

Comments

Question 4: Do you have any additional comments regarding the SAR that you believe should be addressed?

☐ Yes

☒ No

If yes, please share those comments in the space provided below.

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Comment Form – Proposed Frequency Response Standard

Group Comments (Complete this page if comments are from a group.)

Group Name: California ISO

Lead Contact: **Ed Riley**

Contact Organization: **California ISO**

Contact Segment: **2**

Contact Telephone: **916 351 4463**

Contact Email: **eriley@caiso.com**

Additional Member Name	Additional Member Organization	Region*	Segment*
Yuri Makarov	**California ISO**	**WECC**	**2**
Steve McCoy	**California ISO**	**WECC**	**2**

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X Yes

☐ No

If no, please explain in the space provided below.

Comments

Frequency response provided by speed governors and loads helps to prevent load shedding and generator trips at significant frequency excursions caused by sudden active power mismatches in the systems. Without a sufficient frequency response emerging during the first seconds after a frequency disturbance, there is a danger of further cascading development or frequency instability and system collapse cased by underfrequency generator trips. It has been already noted that insufficient frequency response in some parts of an Interconnection may cause certain temporary redistribution of power flows and reduce stability margins after frequency disturbances that may limit the OTC on critical paths within the Interconnection. It has been also observed that insufficient frequency response may cause a weaker frequency recovery that bears a greater risk of system collapse at subsequent frequency disturbances. Therefore, frequency response is definitely a reliability issue that needs to be addressed by a NERC standard.

Question 2: Do you agree with the scope and applicability of the proposed standard?

X Yes

☐ No

If no, please explain in the space provided below.

Comments

Generally, our answer is yes, but the matter of applicability needs a very careful consideration. The question is whether the proposed standard should be applied to only the reliability and balancing authorities and plant operators, or also to the resource and system planning authorities and generator owners. For example, wind generators do not provide a frequency response, whereas the response from the Combined Cycle units is limited. This is a matter of design as well as the matter of controllability of the primary energy source. If the generation portfolio contains a lot of wind and CC generators, the balancing authority cannot do much to improve its summary frequency response in general terms. Also, if frequency responsive generators in a CA are heavily loaded, would the new standard force the balancing authorities to re-dispatch generation in favor of non-responsive generation and commit more responsive generation ahead of the non-responsive generation? Another issue is whether the standard should specify the required response in the area or individual responses from generators. Perhaps, NERC should work with NASB to find the right answers before establishing the standard. One possible solution is to establish penalties for non-compliance that would stimulate generator owners to invest in frequency responsive generation. Another possible recommendation could be establishing a market for frequency response. Without resolving these difficult issues, this standard cannot be accepted.

Question 3: Do you believe these standards are more appropriately additions to existing standards as opposed to creating new standards?

☐ Yes

X No

If yes, please identify the location you believe would be the most appropriate for the proposed standard.

Comments

The new standard should a stand-alone standard because of its potential implications for control areas and the necessity to stage the implementation of the standard in coordination with resolution of the issues discussed above.

Question 4: Do you have any additional comments regarding the SAR that you believe should be addressed?

☐ Yes

X No

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Individual Commenter Information **(Complete this page for comments from one organization or individual.)**		
Name:	Travis Besier or Ellis Rankin	
Organization:	TXU Electric Delivery Company	
Telephone:	214-812-4917 or 214-743-6825	
Email:	tbesier1@txued.com or erankin@txued.com	
NERC Region		**Registered Ballot Body Segment**
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Lead Contact:

Contact Organization:

Contact Segment:

Contact Telephone:

Contact Email:

Additional Member Name	Additional Member Organization	Region*	Segment*

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☒ Yes

☐ No

If no, please explain in the space provided below.

Comments

TXU Electric Delivery proposes that Frequency Response Guidelines at the NERC level should only be in general terms and require that each Reliability Authority establish a specific Frequency Response Standard with detailed specifications as appropriate for its region.

Question 2: Do you agree with the scope and applicability of the proposed standard?

☒ Yes
☐ No

If no, please explain in the space provided below.

Comments

Question 3: Do you believe these standards are more appropriately additions to existing standards as opposed to creating new standards?

☐ Yes

☒ No

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Comments

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Comment Form – Proposed Frequency Response Standard

Group Comments (Complete this page if comments are from a group.)

Group Name: RTO/ISO Standards Review Committee

Lead Contact: **Karl Tammar**

Contact Organization: **NYISO**

Contact Segment: 2

Contact Telephone: **518-356-6205**

Contact Email: **ktammar@nyiso.com**

Additional Member Name	Additional Member Organization	Region*	Segment*
Dale McMaster	**AESO**	**WECC**	**2**
Ed Riley	**CAISO**	**WECC**	**2**
Sam Jones	**ERCOT**	**ERCOT**	**2**
Peter Henderson	**IESO**	**NPCC**	**2**
Peter Brandien	**ISO-NE**	**NPCC**	**2**
Bill Phillips	**MISO**		**2**
Karl Tammar	**NYISO**	**NPCC**	**2**
Bruce Balmat	**PJM**	**MAAC**	**2**
Charles Yeung	**SPP**	**SPP**	**2**

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We agree in general that there is a reliability need to have frequency response, particularly during disturbances, islanding and restoration. The standard should provide the process for a technically sound calculation of frequency response and bias (both fixed and variable).

Any new standards on frequency response need not and should not be onerous by finding BAs noncompliant with response less than average or below some un-validated norms.

If performance is significantly less than an Interconnection norm, the standard should not trigger an automatic non-compliance. In these situations the BA should perform an internal review/assessment that ensures governors are working as designed, that the BA knows which resources are frequency responsive (so the information can be included in restoration plans), whether governors can be triggered to be more responsive during disturbances, etc and satisfy the Interconnection requirement. If the Interconnection requirement is not met within a reasonable timeframe then the BA should be deemed as non-compliant.

When required, the validation of governor performance could be achieved either through online monitoring in an EMS or periodic testing (both methods should be explained in a reference document to support the standard).

The standard should acknowledge that some units might not provide response under normal operations (e.g. nuclear units operating at full load) and that response is highly variable event-to-event based on simultaneous load changes.

The standard should acknowledge the differing Interconnection requirements (smaller Interconnections need greater response).

The standard should also track Interconnection and BA areas response over time (years) and be reevaluated as performance changes.

Question 2: Do you agree with the scope and applicability of the proposed standard?

☐ Yes

☒ No

If no, please explain in the space provided below.

There is a general need for a standard, but the outcomes and expectations should address the comments raised in question 1.

While we agree that the standard should not preclude market solutions (e.g. allow purchasing of response as long as deliverability and restoration criteria can be met), we have concerns with the statement *There must be a means for sale/purchase of frequency response as for any other quantity.*

It is not clear what is meant by *A method of allocation must be developed"* Is this an allocation of Interconnection response to BAs, BA allocation to generators or something different?

Comments

Question 3: Do you believe these standards are more appropriately additions to existing standards as opposed to creating new standards?

☐ Yes

☒ No

If yes, please identify the location you believe would be the most appropriate for the proposed standard.

Comments

Unless the Version 0 (BAL-003-0 — Frequency Response and Bias) can be clarified and brought in line with this proposed standard, it should be stand-alone.

Question 4: Do you have any additional comments regarding the SAR that you believe should be addressed?

☒ Yes

☐ No

If yes, please share those comments in the space provided below.

We appreciate the opportunity to comment and believe there is a need for such a standard.

It needs to be recognized that there are two objectives for governor response, namely, to provide response on an interconnection wide basis to maintain an acceptable frequency and secondly to control frequency in island situations. The former may allow for averaging over an area of the response requirement but the latter may limit the extent of averaging.

Published studies show frequency response is declining when it should be increasing with load. The main concerns with this decreasing performance are:

There may be areas unable to withstand severe disturbances.

Following a grid separation or collapse, control areas may be unable to fulfill their blackstart and restoration responsibilities, thereby becoming a burden to neighbors.

Because engineering models use theoretical frequency response, they are likely over optimistic and may misstate grid stability limits.

This standard would allow the industry to determine whether the decline is local or global.

Rather than implementing a complicated infrastructure or process, we would suggest that NERC automate the calculation of frequency response by either:

Asking BAs to save their CPS-source data in a common format so a common tool can be used (MAPP BAs and some others use a common tool that can calculate frequency response with CPS-source data).

Embed the calculation in the NERC ACE-monitoring application.

Refer to our earlier comments the structure of the standard (where lower amounts of BA response trigger an internal assessment rather than automatic assignment of non-compliance). BAs (and ultimately generators) would only be initially non-compliant if their response was low AND the BA failed to perform a reliability assessment in conjunction with its TOP. Non compliance should be assessed if the BA does not alleviate the deficiency within a reasonable timeframe. This default assessment would be at the BA level, but could be on an area basis (likely islanding area or where a TSP has responsibility for frequency responsive and black start ancillary services).

The standard should employ a methodology that not only captures initial response (first few seconds after the event) but also the sustained response until AGC action takes over

Each Interconnection should have the ability to add and further define the standard to meet its needs.

Providing visibility on where and when performance is substandard will likely initiate sufficient action to arrest the decline in performance. Minimum performance standards could be implemented after the industry has identified what is reasonably achievable and technically justified.

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Individual Commenter Information **(Complete this page for comments from one organization or individual.)**		
Name:		
Organization: Bonneville Power Administration		
Telephone:		
Email:		
NERC Region		**Registered Ballot Body Segment**
☐ ERCOT ☐ ECAR ☐ FRCC ☐ MAAC ☐ MAIN ☐ MAPP ☐ NPCC ☐ SERC ☐ SPP ☒ WECC ☐ NA - Not Applicable	☒	1 - Transmission Owners
	☐	2 - RTOs, ISOs, Regional Reliability Councils
	☐	3 - Load-serving Entities
	☐	4 - Transmission-dependent Utilities
	☐	5 - Electric Generators
	☐	6 - Electricity Brokers, Aggregators, and Marketers
	☐	7 - Large Electricity End Users
	☐	8 - Small Electricity End Users
	☐	9 - Federal, State, Provincial Regulatory or other Government Entities

Comment Form – Proposed Frequency Response Standard

Group Comments (Complete this page if comments are from a group.)

Group Name: Bonneville Power Administration

Lead Contact: **Bart McManus**

Contact Organization:

Contact Segment:

Contact Telephone: **(360)418-2309**

Contact Email: **bamcmanus@bpa.gov**

Additional Member Name	Additional Member Organization	Region*	Segment*
Brian Tuck	**BPA**		
James Randall	**BPA**		
Francis Halpin	**BPA**		
Bill Mittlestat	**BPA**		
James Murphy	**BPA**		

* If more than one Region or Segment applies, indicate the best fit for the purpose of these comments. Regional acronyms and segment numbers are shown on prior page.

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Question 1: Do you agree there is a reliability need for a specifying the quality and quantity of frequency response?

☐ Yes

☒ No

If no, please explain in the space provided below.

NERC should not involve itself in the development of these standards and should allow individual interconnections to address frequency response issues independently. For example, the WECC is currently working on standards that will address this concern. They will be tailored to the specific requirements of this interconnection and will provide the best possible solution to the problem. There may be a need to specify frequency response requirements within some interconnections; however, it is not necessary, or most effective for them to be defined at the NERC level.

Comments

Question 2: Do you agree with the scope and applicability of the proposed standard?

☐ Yes

☒ No

If no, please explain in the space provided below.

The main theme that there needs to be a relationship between response and frequency decline is the right approach but requirements would be different from region to region. Standards to manage frequency response should be developed by individual interconnections; not NERC. The scope and applicability should be defined by the needs of the interconnection to provide the most benefit to system wide reliability.

Comments

Question 3: Do you believe these standards are more appropriately additions to existing standards as opposed to creating new standards?

☐ Yes

☒ No

If yes, please identify the location you believe would be the most appropriate for the proposed standard.

WECC has been working on frequency response standards for a few years and is close to finalizing standards specifically for the WECC interconnection. We do think there is a need for standardization of frequency response (clearly we do since WECC is doing it) BUT this standard should be developed at the Regional Council or Interconnection level and then adopted by NERC as a "Standard" with regional differences. Any new standards concerning frequency response should be developed by the individual interconnections.

Comments

Question 4: Do you have any additional comments regarding the SAR that you believe should be addressed?

☒ Yes

☐ No

If yes, please share those comments in the space provided below.

Frequency response requirements are likely different for each of the three interconnected regions and a generalized approach will likely not meet WECC needs. The danger here is that a NERC-wide approach may not be compatible with the needs of a regional approach. Standards are currently being developed within WECC to address the frequency response concerns of this interconnection. We feel that if the Eastern Interconnection needs a Frequency Response Standard, they should utilize the NERC Frequency Response Standard Whitepaper to draft an Eastern Interconnection-specific Frequency Response Standard.

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Individual Commenter Information **(Complete this page for comments from one organization or individual.)**		
Name: Richard P. Schulz		
Organization: Richard Schulz LLC		
Telephone: 614.899.9184		
Email: r.p.schulz@ieee.org		
NERC Region		**Registered Ballot Body Segment**
☐ ERCOT ☐ ECAR ☐ FRCC ☐ MAAC ☐ MAIN ☐ MAPP ☐ NPCC ☐ SERC ☐ SPP ☐ WECC ☒ NA - Not Applicable	☐	1 - Transmission Owners
	☐	2 - RTOs, ISOs, Regional Reliability Councils
	☐	3 - Load-serving Entities
	☐	4 - Transmission-dependent Utilities
	☐	5 - Electric Generators
	☐	6 - Electricity Brokers, Aggregators, and Marketers
	☐	7 - Large Electricity End Users
	☐	8 - Small Electricity End Users
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Comment Form – Proposed Frequency Response Standard

Group Comments (Complete this page if comments are from a group.)

Group Name:

Lead Contact:

Contact Organization:

Contact Segment:

Contact Telephone:

Contact Email:

Additional Member Name	Additional Member Organization	Region*	Segment*

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Question 1: Do you agree there is a reliability need for a specifying the quality and quantity of frequency response?

☒ Yes

☐ No

If no, please explain in the space provided below.

Comments

Question 2: Do you agree with the scope and applicability of the proposed standard?

☒ Yes

☐ No

If no, please explain in the space provided below.

Comments

The proposed scope and applicability, to the extent that they are in the given in the SAR, are good.

Question 3: Do you believe these standards are more appropriately additions to existing standards as opposed to creating new standards?

☐ Yes

☐ No

If yes, please identify the location you believe would be the most appropriate for the proposed standard.

Comments

Question 4: Do you have any additional comments regarding the SAR that you believe should be addressed?

☒ Yes

☐ No

If yes, please share those comments in the space provided below.

Please see the attachment <SAR_Comments_RPSchulz.doc>

Comments on SAR Frequency Response

First, I make these comments based on work that I've done principally at American Electric Power Service Corp, before my retirement from there in November 2000, and as founding Chair of the IEEE Task Force on Large Interconnected Power System Response to Generation Governing. These comments are entirely mine, and reflect no views of either body.

Second. It appears that the final standard will differ from any single person's opinions. Thus the specific comments below may not prevail.

Specific Comment 1:

The comment on page 4 of the SAR, "The standard should not preclude market solutions (e.g. allow purchasing of response as long as deliverability and restoration criteria can be met).There must be a means for sale/purchase of frequency response as for any other quantity." is workable only in near-normal operating conditions. But it will fail miserably when there is any islanding condition. An analogy:

> Several skydivers agree that reserve parachutes are a very good idea, but don't want to invest in 1 reserve each. So they agree that they'll buy one to share among them, so each will be saved by that spare. This means that they will hold hands until they pull their ripcords.
>
> Sounded good, until they tried it, and the first guy to pull his cord came unhitched, had a failed main 'chute, and the spare was on someone else.

Specific Comment 2:

The comment on page 4 of the SAR, "The measurement selected must be accurate and, to the extent practical, easy to implement.' may be met in the Eastern Interconnection by the underway DOE "Eastern Interconnection Phasor Project ' and by the similar WECC measurement systems, commonly called "WAMS". Les Peieira's paper, cited in the White Paper, used the WAMS measurements.

Dick Schulz
Chair, IEEE Task Force on Large Interconnected Power System Response to Generation Governing
433 S. Spring Rd.
Westerville, Ohio 43081-2732
(614) 899-9184 home
(614) 306-8233 cell
r.p.schulz@ieee.org or schulzes@copper.net

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Individual Commenter Information **(Complete this page for comments from one organization or individual.)**		
Name:	Roy Boyer	
Organization:	TXU Electric Delivery	
Telephone:	214-743-6682	
Email:	rboyer@txued.com	
NERC Region		**Registered Ballot Body Segment**
x **ERCOT**	☐	1 - Transmission Owners
☐ **ECAR**	☐	2 - RTOs, ISOs, Regional Reliability Councils
☐ **FRCC**	☐	3 - Load-serving Entities
☐ **MAAC**	☐	4 - Transmission-dependent Utilities
☐ **MAIN**	☐	5 - Electric Generators
☐ **MAPP**	☐	6 - Electricity Brokers, Aggregators, and Marketers
☐ **NPCC**	☐	7 - Large Electricity End Users
☐ **SERC**	☐	8 - Small Electricity End Users
☐ **SPP**	☐	9 - Federal, State, Provincial Regulatory or other Government Entities
☐ **WECC**		
☐ **NA - Not Applicable**		

Comment Form – Proposed Frequency Response Standard

Group Comments (Complete this page if comments are from a group.)

Group Name:

Lead Contact:

Contact Organization:

Contact Segment:

Contact Telephone:

Contact Email:

Additional Member Name	Additional Member Organization	Region*	Segment*

* If more than one Region or Segment applies, indicate the best fit for the purpose of these comments. Regional acronyms and segment numbers are shown on prior page.

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Comment Form – Proposed Frequency Response Standard

Question 1: Do you agree there is a reliability need for a specifying the quality and quantity of frequency response?

☐ xYes

☐ No

If no, please explain in the space provided below.

Comments

Yes, I agree there is a reliability need for specifying the quality and quantity of frequency response. There is ample evidence that specifying a droop value or that specifying governors must be in operation will not necessarily result in any useful governor response to a sudden large drop in system frequency. So yes, I think a SAR team should look into this matter. I would suggest the part load can play in arresting frequency decline be included in the scope. I would also suggest that the frequency response needs of the regions will likely vary, so final specific requirements should probably be made at the region level.

Question 2: Do you agree with the scope and applicability of the proposed standard?

☐x Yes

☐ No

If no, please explain in the space provided below.

Comments
Yes, I agree.

Question 3: Do you believe these standards are more appropriately additions to existing standards as opposed to creating new standards?

☐ Yes

☐ No

If yes, please identify the location you believe would be the most appropriate for the proposed standard.

Comments
No opinion.

Question 4: Do you have any additional comments regarding the SAR that you believe should be addressed?

☐ Yes

☐ xNo

If yes, please share those comments in the space provided below.

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Individual Commenter Information **(Complete this page for comments from one organization or individual.)**		
Name:	Linda Campbell	
Organization:	FRCC	
Telephone:	813-289-5644	
Email:	lcampbell@frcc.com	
NERC Region		**Registered Ballot Body Segment**
☐ ERCOT ☐ ECAR ☒ FRCC ☐ MAAC ☐ MAIN ☐ MAPP ☐ NPCC ☐ SERC ☐ SPP ☐ WECC ☐ NA - Not Applicable	☐	1 - Transmission Owners
	☒	2 - RTOs, ISOs, Regional Reliability Councils
	☐	3 - Load-serving Entities
	☐	4 - Transmission-dependent Utilities
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Comment Form – Proposed Frequency Response Standard

Group Comments (Complete this page if comments are from a group.)

Group Name: FRCC Region

Lead Contact: **Eric Senkowicz**

Contact Organization:

Contact Segment: **2**

Contact Telephone: **813-289-5646**

Contact Email: **erics@frcc.com**

Additional Member Name	Additional Member Organization	Region*	Segment*
Ron Donahey	TEC	FRCC	1
Mark Bennett	GRU	FRCC	3
Steve Wallace	SEC	FRCC	5
Steve McElhaney	FMPA	FRCC	5
Ted Hobson	JEA	FRCC	1

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Question 1: Do you agree there is a reliability need for a specifying the quality and quantity of frequency response?

☐ Yes

☒ No

If no, please explain in the space provided below.

Comments

The FRCC does not support the development of a Frequency Response Standard at this time. A standard for each Interconnection, although informative would be unenforceable as far as identifying short term, frequency response deficient, entities or areas. As such measurability and compliance by the relevant entities would be all but impossible. As far as an Interconnection allocation program for frequency response, we feel that the "apparent" decline in response is not significant enough to warrant a standard at this time and we would require additional details of how such a plan would be implemented and the potential economic impacts on the Regions that would be associated with that plan.

Question 2: Do you agree with the scope and applicability of the proposed standard?

☐ Yes

☒ No

If no, please explain in the space provided below.

Comments

The SAR indicates a measure of frequency response for the Interconnection, as a measure of performance. This would be very difficult to translate to individual entity compliance and thus render the standard applicable to no entities.

Question 3: Do you believe these standards are more appropriately additions to existing standards as opposed to creating new standards?

☐ Yes

☒ No

If yes, please identify the location you believe would be the most appropriate for the proposed standard.

Comments

Question 4: Do you have any additional comments regarding the SAR that you believe should be addressed?

☒ Yes

☐ No

If yes, please share those comments in the space provided below.

At this time the FRCC has the highest frequency settings for load shedding in the Eastern Interconnection (southern part of the Region). Being a peninsula and out of necessity, the Region has developed a well coordinated, under-frequency program for extreme frequency excursions. Ambiguity of the requirements, uncertainty of measurement and the lack of benefit to the Region require that the FRCC to oppose this Standard Authorization Request at this time.

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Individual Commenter Information **(Complete this page for comments from one organization or individual.)**		
Name:	Gerald Rheault	
Organization:	Manitoba Hydro	
Telephone:	204-487-5423	
Email:	gnrheault@hydro.mb.ca	
NERC Region		**Registered Ballot Body Segment**
☐ ERCOT ☐ ECAR ☐ FRCC ☐ MAAC ☐ MAIN ☒ MAPP ☐ NPCC ☐ SERC ☐ SPP ☐ WECC ☐ NA - Not Applicable	■	1 - Transmission Owners
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Comment Form – Proposed Frequency Response Standard

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Group Name:

Lead Contact:

Contact Organization:

Contact Segment:

Contact Telephone:

Contact Email:

Additional Member Name	Additional Member Organization	Region*	Segment*

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Question 1: Do you agree there is a reliability need for a specifying the quality and quantity of frequency response?

■ Yes

☐ No

If no, please explain in the space provided below.

Comments

Manitoba Hydro , from a reliability perspective, supports the idea of specifying the quantity and quality of frequency response and incorporating these elements in a Standard. However, the development of this standard should not be rushed since the evidence provided in the Standard Authorization Request form and in the Frequency Response Standard White paper shows that current frequency response and projected frequency response trends do not pose a significant potential for compromising system reliability and for major under-frequency load shedding to occur in the near term.

Also in the section of the white paper which examines “frequency response standard considerations”, a broad scope and outline is given, more detail is required especially regarding methods of ensuring compliance.

In paragraph 2, page 9 of the white paper where the current frequency response of the Eastern Interconnection is stated as 3100 MW/0.1 Hz with a standard deviation of 1870 MW/0.1 Hz and the statement is made that “the fact that an under-frequency event has not happened yet is only coincidence” requires much more detailed information regarding the origin and calculations of these numbers before these assumptions can be made. Could it be that instead of a frequency response closer to 1230MW/ 0.1 Hz it is actually practically closer to 3100 MW/ 0.1 Hz or even 4970 MW/ 0.1 Hz most of the time?

One understandable major concern addressed in the white paper is the response of combined-cycle units to frequency decline and the fact that due to a drop in combustion air volume their output may actually decrease with a drop in frequency or even result in unit tripping. Also there was concern with the possibility that larger amounts of these types of units will be installed on the system thereby potentially increasing the decline in frequency response rate from 70 MW/ 0.1 Hz /Year (Eastern Interconnection) .

It is also mentioned (on page 10) that with proper tuning combined cycle units can provide correct frequency response. Maybe part of the focus should be on finding ways of enforcing the Current Requirements (Page 14) and including specific frequency response requirements for combined-cycle units.

Question 2: Do you agree with the scope and applicability of the proposed standard?

■ Yes
☐ No

If no, please explain in the space provided below.

Comments

Question 3: Do you believe these standards are more appropriately additions to existing standards as opposed to creating new standards?

☐ Yes

■ No

If yes, please identify the location you believe would be the most appropriate for the proposed standard.

Comments

Question 4: Do you have any additional comments regarding the SAR that you believe should be addressed?

■ Yes

☐ No

If yes, please share those comments in the space provided below.

Below are a few general comments on the SAR:

There is general agreement with the statement “reliance on load as the sole support to arrest the frequency can lead to a decline in the reliability of the grid” in paragraph 3, page 4 of the white paper. However enough information is not provided to substantiate statements earlier in the paragraph such as, “the turn around in frequency from points C to B attributable to unit governor response has markedly declined and at times is non-existent in the eastern interconnection” and “the line from points C to D is shifting down and becoming horizontal”.

In areas where governor response is limited it may be necessary to explore the necessity of earmarking “high-set” blocks of load , as is practiced in ERCOT, to act as a supplementary to governor response. Although it is anticipated that this approach would probably be much more difficult and challenging to co-ordinate in larger areas.

There should be careful thought put into the system/interconnection performance targets for frequency response. Perhaps the bar should be higher than preventing UFLS for credible generation loss events, i.e., provide a margin above this level. At the same time the standard should not impose unreasonable costs on entities to demonstrate compliance. The performance target should address both total interconnection response and also area or system response (potential islanding) and be very clear how generator operators (or load) obligations are allocated to achieve the performance targets.

NERC should investigate a process to monitor interconnection frequency response to be able to measure performance.

COMMENT FORM
Proposed Frequency Response Standard

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Individual Commenter Information (Complete this page for comments from one organization or individual.)	
Name:	P.D. Henderson
Organization:	Independent Electricity System Operator
Telephone:	905 855-6258
Email:	peter.henderson@ieso.ca

NERC Region		Registered Ballot Body Segment
☐ ERCOT ☐ ECAR ☐ FRCC ☐ MAAC ☐ MAIN ☐ MAPP ☒ NPCC ☐ SERC ☐ SPP ☐ WECC ☐ NA - Not Applicable	☐	1 - Transmission Owners
	☒	2 - RTOs, ISOs, Regional Reliability Councils
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	☐	7 - Large Electricity End Users
	☐	8 - Small Electricity End Users
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Comment Form – Proposed Frequency Response Standard

Group Comments (Complete this page if comments are from a group.)

Group Name:

Lead Contact:

Contact Organization:

Contact Segment:

Contact Telephone:

Contact Email:

Additional Member Name	Additional Member Organization	Region*	Segment*

* If more than one Region or Segment applies, indicate the best fit for the purpose of these comments. Regional acronyms and segment numbers are shown on prior page.

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Question 1: Do you agree there is a reliability need for a specifying the quality and quantity of frequency response?

☒ Yes

☐ No

If no, please explain in the space provided below.

Comments

We agree in general that there is a reliability need to have frequency response, in order to maintain interconnection frequency and particularly during disturbances, islanding and restoration. The standard need to address both the system needs as well as island requirements for frequency response.

The standard should provide the process for a technically sound calculation of frequency response and bias.

The standard should acknowledge that some units might not provide response under normal operations (e.g. nuclear units operating at full load) and that load response is highly variable event based on time of day or year.

The standard should acknowledge smaller areas need greater response.

Where BA areas are deficient in meeting the interconnection requirement , they should be allowed a reasonable period of time to take appropriate steps to make corrections before being assessed as non compliant.

The standard should also track area response over time (years) and be reevaluated as performance changes.

Quality should be defined. For generators it should include dead-band, droop characteristics, etc.

Question 2: Do you agree with the scope and applicability of the proposed standard?

☐ Yes

☒ No

If no, please explain in the space provided below.

While we agree that the standard should not preclude market solutions (e.g. allow purchasing of response as long as deliverability and restoration criteria can be met), we have concerns with the statement *There must be a means for sale/purchase of frequency response as for any other quantity.* The scope should exclude any reference to a means for sale/purchase of frequency response as it should only address reliability requirements.

It is not clear what is meant by *A method of allocation must be developed.* Is this an allocation of Interconnection response to BAs, BA allocation to generators or something different?

The requirements should recognize the capabilities and limitations of generators (e.g. nuclear units operating at full load).

Comments

Question 3: Do you believe these standards are more appropriately additions to existing standards as opposed to creating new standards?

☐ Yes

☒ No

If yes, please identify the location you believe would be the most appropriate for the proposed standard.

Comments

If the existing Frequency Response and Bias Standard Version 0 (Bal-003-0) can not be clarified and brought in line with this proposed standard, it should be standalone .

Question 4: Do you have any additional comments regarding the SAR that you believe should be addressed?

☒ Yes

☐ No

If yes, please share those comments in the space provided below.

We appreciate the opportunity to comment and believe there is a need for such a standard.

It needs to be recognized that there are two objectives for governor response, namely, to provide response on an interconnection wide basis to maintain an acceptable frequency and secondly to control frequency in island situations. The former may allow for averaging over an area of the response requirement but the latter may limit the extent of averaging.

Published studies show frequency response is declining when it should be increasing with load. The main concerns with this decreasing performance are:

There may be areas unable to withstand severe disturbances.

Following a grid separation or collapse, control areas may be unable to fulfill their blackstart and restoration responsibilities, thereby becoming a burden to neighbors.

Because engineering models use theoretical frequency response, they are likely over optimistic and may misstate grid stability limits.

This standard would allow the industry to determine whether the decline is local or global.

Rather than implementing a complicated infrastructure or process, we would suggest that NERC automate the calculation of frequency response by either:

Asking BAs to save their CPS-source data in a common format so a common tool can be used (MAPP BAs and some others use a common tool that can calculate frequency response with CPS-source data).

Embed the calculation in the NERC ACE-monitoring application.

The standard should employ a methodology that not only captures initial response (first few seconds after the event) but also the sustained response until AGC action takes over

Providing visibility on where and when performance is substandard will likely initiate sufficient action to arrest the decline in performance. Minimum performance standards could be implemented after the industry has identified what is reasonably achievable and technically justified.

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Individual Commenter Information **(Complete this page for comments from one organization or individual.)**		
Name:	Kenneth A. Goldsmith	
Organization:	Alliant Energy	
Telephone:	319-786-4167	
Email:	kengoldsmith@alliantenergy.com	
NERC Region		**Registered Ballot Body Segment**
☐ ERCOT ☐ ECAR ☐ FRCC ☐ MAAC ☒ MAIN ☐ MAPP ☐ NPCC ☐ SERC ☐ SPP ☐ WECC ☐ NA - Not Applicable	☒	1 - Transmission Owners
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Comment Form – Proposed Frequency Response Standard

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Lead Contact:

Contact Organization:

Contact Segment:

Contact Telephone:

Contact Email:

Additional Member Name	Additional Member Organization	Region*	Segment*

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☒ Yes

☐ No

If no, please explain in the space provided below.

Comments

Question 2: Do you agree with the scope and applicability of the proposed standard?

☒ Yes
☐ No

If no, please explain in the space provided below.

Comments

Question 3: Do you believe these standards are more appropriately additions to existing standards as opposed to creating new standards?

☒ Yes

☐ No

If yes, please identify the location you believe would be the most appropriate for the proposed standard.

Version 0 of BAL-003-0, Frequency Response and Bias; or its successor

Comments

Question 4: Do you have any additional comments regarding the SAR that you believe should be addressed?

☐ Yes

☒ No

If yes, please share those comments in the space provided below.

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Name:		
Organization:		
Telephone:		
Email:		
NERC Region		**Registered Ballot Body Segment**
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Comment Form – Proposed Frequency Response Standard

Group Comments (Complete this page if comments are from a group.)

Group Name: **MAAC Staff**

Lead Contact: **Albert DiCaprio**

Contact Organization: **PJM**

Contact Segment: **2**

Contact Telephone: **610-666-8854**

Contact Email: **dicapram@pjm.com**

Additional Member Name	Additional Member Organization	Region*	Segment*
Bruce M. Balmat	**PJM**	**MAAC**	**2**
Joseph D. Willson	**PJM**	**MAAC**	**2**
Mark Kuras	**PJM**	**MAAC**	**2**

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Question 1: Do you agree there is a reliability need for a specifying the quality and quantity of frequency response?

☐ Yes

☒ No

If no, please explain in the space provided below.

There is a need for governors but not for frequency response.

Governors are needed to resynchronize during restoration. But the need for a short-term frequency response characteristic has been obviated by the pending Version1 Balancing Standard. That standard is designed to ensure that interconnection frequency is never at such a level that the loss of the largest contingency will cause instability or cascading outages. If the system is always in such a state why would the instantaneous response to the loss of a single contingency add to the system reliability?

The SAR has not provided any definitive need.

The SAR has not provided sufficient focus vis-à-vis who is responsible to meet the standard (the generator, the BA, the Load, the RA)

This proposal has not provided any additional information concerning the need for this proposed Standard since the last time (during the Balancing Resources and Demand consensus) that a similar Frequency Response Requirement was overwhelming rejected by those who commented to that proposal.

Transient frequency response has not been the target of any major public concern. The current Version 1 Control Standard proposal provides limits on the frequency excursions that can be controlled by system-operators and their control systems. Relays and other Protection Devices serve to protect those time frames too short for an operator to respond to. What does this standard add?

Comments

This SAR is not clear as to what it really is intended to mandate. Does the requestor want to create a standard for Generator Owners to install governors? Or a standard on Generator Operators for individuals unit governor response? Or a standard for Balancing Authorities for Area response? Or for Reliability Authorities for Regional response? All of these are different requirements and have different effects.

The requestor must be clear as to what is intended. To ensure that frequency doesn't hit a relay limit (as in the Balancing standard?) or is it to address the need for governors when synchronizing?

When does the standard apply? All times (which means that NERC can go to a unit, BA or RA to check that some finite response is available?) Just at times when large events occur (the problem is of course whether or not the outage is near or far from the entity being checked)? Only during test conditions (since a unit under stress – 'valves wide open' has not governor response at that time – even though it may have the greatest of responses at other times).

The requestor's intent may be laudable but the description is no where near ready to be considered as 'standard material'.

Question 2: Do you agree with the scope and applicability of the proposed standard?

☐ Yes

☒ No

If no, please explain in the space provided below.

Frequency Response characteristics should be dictated by the Reliability entities as part of their respective control services to meet the regional synchronizing requirements as well as the longer duration control standards and of the needs of the interconnection in which they operate.

Comments

Question 3: Do you believe these standards are more appropriately additions to existing standards as opposed to creating new standards?

☐ Yes

☒ No

If yes, please identify the location you believe would be the most appropriate for the proposed standard.

Comments

Question 4: Do you have any additional comments regarding the SAR that you believe should be addressed?

☒ Yes

☐ No

If yes, please share those comments in the space provided below.

The SAR requestor has not provided any indication of a reliability problem. Decreasing frequency response is in and of itself not a reliability problem - more evidence is required as to the magnitude of the threat.

Any standard that is proposed, regarding frequency response, should consider both generator and load response. If Load response does provide a significant portion of the frequency response (as some people contend) then that resource must be considered in the proposal. In short the standard must make clear whether it is for interconnection response or for balancing area response or for individual generator response and individual load response.

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Individual Commenter Information **(Complete this page for comments from one organization or individual.)**		
Name:	Theodore Pappas	
Organization:	New York State Reliability Council	
Telephone:	516-545-4011	
Email:	tpappas@service.lipower.org	
NERC Region		**Registered Ballot Body Segment**
☐ ERCOT ☐ ECAR ☐ FRCC ☐ MAAC ☐ MAIN ☐ MAPP X NPCC ☐ SERC ☐ SPP ☐ WECC ☐ NA - Not Applicable	☐	1 - Transmission Owners
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Comment Form – Proposed Frequency Response Standard

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Lead Contact:

Contact Organization:

Contact Segment:

Contact Telephone:

Contact Email:

Additional Member Name	Additional Member Organization	Region*	Segment*

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X Yes

☐ No

If no, please explain in the space provided below.

Comments

Question 2: Do you agree with the scope and applicability of the proposed standard?

X Yes

☐ No

If no, please explain in the space provided below.

Comments

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☐ Yes

X No

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Comments

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X Yes

☐ No

If yes, please share those comments in the space provided below.

The Standard should define the term “event” in terms of time and frequency deviation. The frequency deviation the event must fall outside the droop deadband.

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Individual Commenter Information **(Complete this page for comments from one organization or individual.)**		
Name:	Howard Rulf	
Organization:	We Energies	
Telephone:	262-574-6046	
Email:	Howard.Rulf@we-energies.com	
NERC Region		**Registered Ballot Body Segment**
☐ ERCOT ☐ ECAR ☐ FRCC ☐ MAAC ☐ MAIN ☐ MAPP ☐ NPCC ☐ SERC ☐ SPP ☐ WECC ☐ NA - Not Applicable	☐	1 - Transmission Owners
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Comments

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☐ Yes

☒ No

If yes, please identify the location you believe would be the most appropriate for the proposed standard.

Comments

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☐ Yes

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Individual Commenter Information **(Complete this page for comments from one organization or individual.)**		
Name:	Raymond L. Vice	
Organization:	Chairman of NERC Frequency Taskforce	
Telephone:	(205) 257-6209	
Email:	rlvice@southernco.com	
NERC Region		**Registered Ballot Body Segment**
☐ ERCOT ☐ ECAR ☐ FRCC ☐ MAAC ☐ MAIN ☐ MAPP ☐ NPCC ☐ SERC ☐ SPP ☐ WECC ☒ NA - Not Applicable	☐	1 - Transmission Owners
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☒ Yes

☐ No

If no, please explain in the space provided below.

Comments

Trends in Eastern and Western Interconnection Turbine Governor Response and primary frequency response over the past two decades (as documented by EPRI Project RP2473-53 and Decline of Eastern Interconnection Frequency Response by Ingleson and Nagle) as well as trends in frequency error magnitude and variance over the past five years (as documented by the NERC Resources Subcommittee at URL http://www.nerc.com/~filez/rs.html) indicate that significant frequency response degradation is occurring, particularly in the Eastern Interconnection. While not yet a crisis, these trends are indicative of significant changes in design and operational practices on the interconnected electrical systems of North America which, if not managed intelligently, can cause significant degradation in reliability. I strongly urge the industry to support this SAR and begin the process of controlled management before the processes behind these trends reach crisis proportion.

Question 2: Do you agree with the scope and applicability of the proposed standard?

☒ Yes
☐ No

If no, please explain in the space provided below.

Comments

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☒ Yes

☐ No

If yes, please identify the location you believe would be the most appropriate for the proposed standard.

The Frequency Response Standard could be included as part of the Balance Resources and Demand Standard.

Comments

Since both the Frequency Response Standard and the Balance Resources and Demand Standard address frequency, they obviously must work together closely. If they are crafted, as originally intended by the Frequency Taskforce, to utilize the same CPS database, there may be savings in administrative overhead in putting them both in the same standard.

Question 4: Do you have any additional comments regarding the SAR that you believe should be addressed?

☒ Yes

☐ No

If yes, please share those comments in the space provided below.

I personally believe that the industry will be exposing the interconnected electrical systems of North America to a significant degree of reliability risk if a Frequency Response Standard similar to the one proposed by this SAR is not adopted. This risk can be mitigated somewhat by the turbine governor requirements of Standard MOD-014-1 from the Phase III/IV Standards SAR, if passed. However, the risk can be managed properly (and in the most economical manner) only on an interconnection/balancing authority basis, not on an individual generator basis as required by Standard MOD-014-1.

What is important is that the interconnections maintain sufficient frequency responsive resources to ensure the stability of interconnection frequency under first contingency conditions. The Frequency Response Standard, as proposed, sets requirements for the management and deployment of frequency responsive resources that achieve this goal without unduly interfering with the on going operation of the interconnection. I strongly urge the industry to support this SAR.

RLV

COMMENT FORM
Proposed Frequency Response Standard

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Individual Commenter Information **(Complete this page for comments from one organization or individual.)**		
Name:		
Organization:		
Telephone:		
Email:		
NERC Region		**Registered Ballot Body Segment**
☐ ERCOT ☐ ECAR ☐ FRCC ☐ MAAC ☐ MAIN ☐ MAPP ☐ NPCC ☐ SERC ☐ SPP ☐ WECC ☐ NA - Not Applicable	☐	1 - Transmission Owners
	☐	2 - RTOs, ISOs, Regional Reliability Councils
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	☐	4 - Transmission-dependent Utilities
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	☐	6 - Electricity Brokers, Aggregators, and Marketers
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	☐	8 - Small Electricity End Users
	☐	9 - Federal, State, Provincial Regulatory or other Government Entities

Comment Form – Proposed Frequency Response Standard

Group Comments (Complete this page if comments are from a group.)

Group Name: Southern Company Transmission, Operations, Planning and EMS divisions

Lead Contact: **Marc Butts**

Contact Organization: **Southern Company**

Contact Segment: **1**

Contact Telephone: **205-257-4839**

Contact Email: **mmbutts@southernco.com**

Additional Member Name	Additional Member Organization	Region*	Segment*
Raymond Vice	Southern Company Services	SERC	1
Steve Corbin	Southern Company Services	SERC	1
Jim Viikinsalo	Southern Company Services	SERC	1
Jim Griffith	Southern Company Services	SERC	1
Doug McLaughlin	Southern Company Services	SERC	1
Monroe Landrum	Southern Company Services	SERC	1

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Comment Form – Proposed Frequency Response Standard

Question 1: Do you agree there is a reliability need for a specifying the quality and quantity of frequency response?

☒ Yes

☐ No

If no, please explain in the space provided below.

Comments

Trends in Eastern and Western Interconnection Turbine Governor Response and primary frequency response over the past two decades (as documented by EPRI Project RP2473-53 and Decline of Eastern Interconnection Frequency Response by Ingleson and Nagle) as well as trends in frequency error magnitude and variance over the past five years (as documented by the NERC Resources Subcommittee at URL http://www.nerc.com/~filez/rs.html) indicate that significant frequency response degradation is occurring, particularly in the Eastern Interconnection. While not yet a crisis, these trends are indicative of significant changes in design and operational practices on the interconnected electrical systems of North America which, if not managed intelligently, can cause significant degradation in reliability. We strongly urge the industry to support this SAR and begin the process of controlled management before the processes behind these trends reach crisis proportion.

Question 2: Do you agree with the scope and applicability of the proposed standard?

☒ Yes
☐ No

If no, please explain in the space provided below.

Comments

Question 3: Do you believe these standards are more appropriately additions to existing standards as opposed to creating new standards?

☒ Yes

☐ No

If yes, please identify the location you believe would be the most appropriate for the proposed standard.

The Frequency Response Standard could be included as part of the Balance Resources and Demand Standard.

Comments

Since both the Frequency Response Standard and the Balance Resources and Demand Standard address frequency, they obviously must work together closely. If they are crafted, as originally intended by the Frequency Taskforce, to utilize the same CPS database, there may be savings in administrative overhead in putting them both in the same standard.

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We believe that the industry will be exposing the interconnected electrical systems of North America to a significant degree of reliability risk if a Frequency Response Standard similar to the one proposed by this SAR is not adopted. This risk can be mitigated somewhat by the turbine governor requirements of Standard MOD-014-1 from the Phase III/IV Standards SAR, if passed. However, the risk can be managed properly (and in the most economical manner) only on an interconnection/balancing authority basis, not on an individual generator basis as required by Standard MOD-014-1.

What is important is that the interconnections maintain sufficient frequency responsive resources to ensure the stability of interconnection frequency under first contingency conditions. The Frequency Response Standard, as proposed, sets requirements for the management and deployment of frequency responsive resources that achieve this goal without unduly interfering with the on going operation of the interconnection. We strongly urge the industry to support this SAR.

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Comment Form – Proposed Frequency Response Standard

Group Comments (Complete this page if comments are from a group.)

Group Name: Midwest Reliability Organization

Lead Contact: Lawrence R Larson, P E

Contact Organization: Otter Tail Power Company

Contact Segment: 2

Contact Telephone: 218/739-8572

Contact Email: llarson@otpco.com

Additional Member Name	Additional Member Organization	Region*	Segment*
Lawrence R Larson, P E	Otter Tail Power Company	MRO	2
Al Boesch	Nebraska Public Power District	MRO	2
Terry Bilke	Midwest ISO	MRO	2
Robert Coish	Manitoba Hydro	MRO	2
Dennis Florom	Lincoln Electric System	MRO	2
Ken Goldsmith	Alliant Energy	MRO	2
Todd Gosnell	Omaha Public Power District	MRO	2
Wayne Guttormson	Saskatchewan Power Corporation	MRO	2
Jim Maenner	WPS Resources	MRO	2
Tom Mielnik	MidAmerican Energy	MRO	2
Darrick Moe	Western Area Power Administration	MRO	2
Joe Knight	Midwest Reliability Organization	MRO	2

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Question 1: Do you agree there is a reliability need for a specifying the quality and quantity of frequency response?

☒ Yes

☐ No

If no, please explain in the space provided below.

Comments

We agree (with qualifications). Any new standards on frequency response need not and should not be onerous (identifying BAs noncompliant with less than average response or some un-validated norms).

The standard should provide the process for a sound calculation of frequency response and bias (both fixed and variable).

There may be valid reasons why a BA is below observed norms in response. It may meet most of its obligations with schedules.

Rather than generate an automatic non-compliance when response is below some benchmark, the standard should require an internal review that ensures governors are working as designed, that the BA knows which resources are frequency responsive (so the information can be included in restoration plans), whether governors can be put in more responsive modes during disturbances, etc.

The standard should have some requirements on generators if the BA is not providing the response outlined in the standard (governors should be working as designed).

The standard should also track Interconnection response over time and identify a target response (different for each Interconnection). NERC or NAESB will want to look at how this is allocated to BAs and generators.

Question 2: Do you agree with the scope and applicability of the proposed standard?

☒ Yes
☐ No

If no, please explain in the space provided below.

Comments

Question 3: Do you believe these standards are more appropriately additions to existing standards as opposed to creating new standards?

☒ Yes

☐ No

If yes, please identify the location you believe would be the most appropriate for the proposed standard.

Version 0 (BAL-003-0 — Frequency Response and Bias) or its successor is a logical place. Depending on the outcome of the V1 Balance Resource and Demand standard, it could reside there.

Comments

Question 4: Do you have any additional comments regarding the SAR that you believe should be addressed?

☒ Yes

☐ No

If yes, please share those comments in the space provided below.

We appreciate the opportunity to comment and believe there is a need for such a standard. Published studies show frequency response is declining when it should be increasing with load.

Because there is no process in place to track BA or Interconnection response, we don't know whether the decline is local or global. Primary concerns with this decreasing performance in primary control:

1. There may be areas unable to withstand severe disturbances.
2. Following a grid separation or collapse, control areas may be unable to fulfill their blackstart and restoration responsibilities, thereby becoming a burden to neighbors.
3. Because engineering models use theoretical frequency response, they are likely overoptimistic and may misstate grid stability limits.

Rather than putting in a complicated infrastructure or process, we would suggest that NERC automate the calculation of frequency response by either:

- Asking BAs to save their CPS-source data in a common format so a common tool can be used (MAPP BAs and some others use a common tool that can calculate frequency response with CPS-source data).
- Embed the calculation in the NERC ACE-monitoring application.

The standard will need to acknowledge the large variability in individual responses at each BA due to coincident load changes and amount and mix of generation. In addition, smaller Interconnections likely need greater response.

Refer to our earlier comments the structure of the standard (where lower amounts of response trigger an internal assessment rather than assessment non-compliance). BAs (and ultimately generators) would only be initially non-compliant if their response was low AND they failed to perform the reliability assessment.

Providing visibility on where and when performance is substandard will likely initiate sufficient action to arrest the decline in performance. Minimum performance standards could be implemented after the industry has identified what is reasonably achievable and technically justified.

The standard should not preclude market solutions to providing frequency response, but such arrangements would need to be looked at closely to be sure they fulfill reliability needs.

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Individual Commenter Information **(Complete this page for comments from one organization or individual.)**	
Name:	Peter Burke [on behalf of ATC's John Ratajczyk (jratajczyk@atcllc.com, 262-506-6769)]
Organization:	American Transmission Company
Telephone:	262-506-6863
Email:	PBurke@atcllc.com

NERC Region		Registered Ballot Body Segment
☐ ERCOT	☒	1 - Transmission Owners
☐ ECAR	☐	2 - RTOs, ISOs, Regional Reliability Councils
☐ FRCC	☐	3 - Load-serving Entities
☐ MAAC	☐	4 - Transmission-dependent Utilities
☒ MAIN	☐	5 - Electric Generators
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☐ NPCC	☐	7 - Large Electricity End Users
☐ SERC	☐	8 - Small Electricity End Users
☐ SPP	☐	9 - Federal, State, Provincial Regulatory or other Government Entities
☐ WECC		
☐ NA - Not Applicable		

Comment Form – Proposed Frequency Response Standard

Group Comments (Complete this page if comments are from a group.)

Group Name:

Lead Contact:

Contact Organization:

Contact Segment:

Contact Telephone:

Contact Email:

Additional Member Name	Additional Member Organization	Region*	Segment*

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Question 1: Do you agree there is a reliability need for a specifying the quality and quantity of frequency response?

☒ Yes

☐ No

If no, please explain in the space provided below.

Comments

Based on the NERC white paper **Frequency Response Standard Whitepaper** dated April 6, 2004 that was prepared by the Frequency task Force of the NERC Resources Subcommittee, it would appear that the decline in frequency response of both the Eastern and Western Interconnections is a reliability concern. As a transmission provider, however, there is probably little that can be done other than make sure that governor response and load modeling can be made as accurate as reasonably possible in conducting dynamic simulations and be aware of this issue in studying existing as well as new generating facilities. The control area, generation operators and turbine-generator manufacturers need guidance provided as to their responsibilities and obligations regarding frequency response. Changes in the load characteristics (e.g. fewer large motors, variable speed drives, etc) over time, plus changes in reserve sharing practices brought on by deregulation and competition are and will affect load response to frequency excursions. The type of generation (e.g. combustion turbine units, combined-cycle units) being interconnected to the system as well as the operation of the governors (e.g. blocked or improper settings) and turbines (e.g. sliding pressure, boiler-follower, etc.) of existing generators have a significant effect on the system frequency response.

Question 2: Do you agree with the scope and applicability of the proposed standard?

☒ Yes

☐ No

If no, please explain in the space provided below.

Comments

The Frequency control standard needs to address levels required for reliability, be consistent and verifiable, and be simple to monitor for compliance purposes.

Question 3: Do you believe these standards are more appropriately additions to existing standards as opposed to creating new standards?

☒ Yes

☐ No

If yes, please identify the location you believe would be the most appropriate for the proposed standard.

II.B.S1M5, Test results of speed/load governor controls.

Comments

It may be appropriate to include this standard in the Phase III/IV standards that address speed/load governor controls (II.B.S1M5, Test results of speed/load governor controls). The three following customer demand related standards would be helpful in defining load response to frequency excursions:

II.E.S1.M1, Plans for the evaluation and reporting of voltage & Frequency characteristics of customer demands.

IIE.S1.M2 Documentation or requirements for determining dynamic characteristics of customer demands.

II.E.S1.M3, Customer (dynamic) demand data.

Question 4: Do you have any additional comments regarding the SAR that you believe should be addressed?

☐ Yes

☒ No

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Comment Form – Proposed Frequency Response Standard

Group Comments (Complete this page if comments are from a group.)

Group Name: Southern Co. Generation

Lead Contact: **Roman Carter**

Contact Organization: **Southern Co. Generation**

Contact Segment: **6**

Contact Telephone: **205.257.6027**

Contact Email: **jrcarter@southernco.com**

Additional Member Name	Additional Member Organization	Region*	Segment*
Roman Carter	Southern Generation	SERC	6
Tony Reed	Southern Generation	SERC	6
Joel Dison	Southern Generation	SERC	6
Lucius Burris	Southern Generation	SERC	6
Lloyd Barnes	Southern Generation	SERC	6
Clifford Shepard	Southern Generation	SERC	6
Terry Crawley	Southern Generation	SERC	5
Roger Green	Southern Generation	SERC	5
Tom Higgins	Southern Generation	SERC	5

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Comments

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Question 2: Do you agree with the scope and applicability of the proposed standard?

☒ Yes
☐ No

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Comments

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The Frequency Response Standard could be included as part of the Balance Resources and Demand Standard.

Comments

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The governor response in MW for generators is not just dependent on the governor droop and dead-band settings, but on the design of the plant control system (sliding pressure boiler, nuclear pressurized water reactor, etc.). For example, nuclear plant operators must control reactivity changes in the core and generally cannot allow external controls to increase or decrease power levels on demand. This standard should take such factors into account and address frequency & MW response at the Balancing Authority level, not at the individual generator level**.**

What is important is that the interconnections maintain sufficient frequency responsive resources to ensure the stability of interconnection frequency under first contingency conditions. The Frequency Response Standard, as proposed, sets requirements for the management and deployment of frequency responsive resources that achieve this goal without unduly interfering with the on going operation of the interconnection. We support this SAR.

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Comment Form – Proposed Frequency Response Standard

Group Comments (Complete this page if comments are from a group.)

Group Name: NPCC CP9, Reliability Standards Working Group

Lead Contact: **Guy V. Zito**

Contact Organization: **Northeast Power Coordinating Council**

Contact Segment: **2**

Contact Telephone: **212-840-1070**

Contact Email: **gzito@npcc.org**

Additional Member Name	Additional Member Organization	Region*	Segment*
Ralph Rufrano	New York Power Authority	NPCC	1
Kathleen Goodman	ISO-New England	NPCC	2
Al Adamson	New York State Reliability Council	NPCC	2
Bob Pelligrini	United Illuminating	NPCC	1
David Kiguel	Hydro One Networks, (Ontario)	NPCC	1
Peter Lebro	US National Grid	NPCC	1
Roger Champagne	TransEnergie, (Quebec)	NPCC	1
Brian Hogue	NPCC	NPCC	2
Guy Zito	NPCC	NPCC	2
Khaqan Khan	The IESO, (Ontario)	NPCC	2
Michael Potisnak	ISO-NewEngland	NPCC	2
Greg Campoli	New York ISO	NPCC	2

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☒ Yes

☐ No

If no, please explain in the space provided below.

Comments

Question 2: Do you agree with the scope and applicability of the proposed standard?

☐ Yes
☒ No

If no, please explain in the space provided below.

The applicability of this Standard to the LSE should be considered.

Comments

Question 3: Do you believe these standards are more appropriately additions to existing standards as opposed to creating new standards?

☐ Yes

☒ No

If yes, please identify the location you believe would be the most appropriate for the proposed standard.

Comments

Question 4: Do you have any additional comments regarding the SAR that you believe should be addressed?

☒ Yes

☐ No

If yes, please share those comments in the space provided below.

CHANGE
This SAR is proposed to develop a standard to measure sub-minute responses to changes in frequency and to set minimum acceptable responses to system these events.
TO
This SAR is proposed to develop a standard to measure sub-minute responses to changes in frequency and to set minimum acceptable responses to these system events.

COMMENT FORM
Proposed Frequency Response Standard

This form is to be used to submit comments on the proposed Frequency Response Standard Authorization Request. Comments must be submitted by **February 17, 2005**. You may submit the completed form by emailing it to: sarcomm@nerc.com with the words "Frequency Response SAR Comments" in the subject line. If you have questions please contact Mark Ladrow at mark.ladrow@nerc.net or by telephone at 609-452-8060.

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Do not use numbering or bullets in any data field.
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Do not submit a response in an unprotected copy of this form.

Individual Commenter Information **(Complete this page for comments from one organization or individual.)**		
Name:	Howard F. Illian	
Organization:	Energy Mark, Inc.	
Telephone:	847-910-9510	
Email:	howard.illian@energymark.com	
NERC Region		**Registered Ballot Body Segment**
☐ ERCOT	☐	1 - Transmission Owners
☐ ECAR	☐	2 - RTOs, ISOs, Regional Reliability Councils
☐ FRCC	☐	3 - Load-serving Entities
☐ MAAC	☐	4 - Transmission-dependent Utilities
☐ MAIN	☐	5 - Electric Generators
☐ MAPP	☐	6 - Electricity Brokers, Aggregators, and Marketers
☐ NPCC	☐	7 - Large Electricity End Users
☐ SERC	☒	8 - Small Electricity End Users
☐ SPP	☐	9 - Federal, State, Provincial Regulatory or other Government Entities
☐ WECC		
☒ NA - Not Applicable		

Comment Form – Proposed Frequency Response Standard

Group Comments (Complete this page if comments are from a group.)

Group Name:

Lead Contact:

Contact Organization:

Contact Segment:

Contact Telephone:

Contact Email:

Additional Member Name	Additional Member Organization	Region*	Segment*

* If more than one Region or Segment applies, indicate the best fit for the purpose of these comments. Regional acronyms and segment numbers are shown on prior page.

Background Information:

Posted for comments is the first posting of the Frequency Response SAR. The Frequency Task Force of the NERC Resources Subcommittee has identified the transient frequency response characteristics as degrading over time and potentially threatening the reliability of the bulk electric system. This Standard Authorization Request was initiated to address this concern by developing a standard to specify a measuring convention for frequency response and by specifying a minimum required response to system disturbances based on the convention.

The requestor would like to receive industry comments on this SAR and to obtain the input of the industry prior to determining the final scope and requirements of the SAR. Accordingly, we request your comments included on this form, emailed with the subject "Frequency Response SAR Comments" by February 17, 2005.

Question 1: Do you agree there is a reliability need for a specifying the quality and quantity of frequency response?

☒ Yes

☐ No

If no, please explain in the space provided below.

Comments

There is a reliability need but it is not an immediate reliability need for all of the interconnections. The amount of Frequency Response on the Texas Interconnection is close to the minimum acceptable amount, and therefore, there is an immediate need for a FRS on the Texas Interconnection. On the Western Interconnection, the WECC keeps close tabs on Frequency Response and takes immediate action when a problem arises with frequency response on that interconnection. Although there is no immediate need for a Frequency Response Standard on the Western Interconnection at this time, the observed reductions in Frequency Response on that interconnection make this issue an ongoing concern. Finally, there is no current need for a Frequency Response Standard on the Eastern Interconnection because current Frequency Response is adequate. However, it takes significant time to develop an effective standard and put it in place. The Balancing Resources and Demand Standard is entering its fourth year of development with expectations of at least another year before implementation. A Frequency Response Standard would be expected to take a similar period to develop. That means that it will be at least 2010 before a new FRS would be put in place. There is no question that adequate Frequency Response is required for reliability. There is no question that Frequency Response on the Eastern Interconnection is declining. There are two paths of action available; 1) Wait until adequate Frequency Response causes reliability problems and then begin the five year process to develop a standard; 2) Begin development of a FRS and determine the final need for implementation during the five year development process. I would rather have a standard that requires measurement that does not result in enforcement action, and therefore, has no effect on operations, than not have a standard when there are definite reliability problems. It will be much easier to implement a standard for Frequency Response before reliability problems occur than to implement a standard after reliability problems occur. NERC should develop a Frequency Response Standard and continue to investigate the need for the standard during its development.

Question 2: Do you agree with the scope and applicability of the proposed standard?

☒ Yes

☐ No

If no, please explain in the space provided below.

Comments

Planning standards are not enough by themselves. Without continuous measurement, there can be no assurance that those responsible for meeting the reliability need for Frequency Response are fulfilling those responsibilities. Only a Frequency Response Standard that continuously measures response can insure that the response is available when required.

Question 3: Do you believe these standards are more appropriately additions to existing standards as opposed to creating new standards?

☒ Yes

☐ No

If yes, please identify the location you believe would be the most appropriate for the proposed standard.

Frequency Response is closely related to the Frequency Bias used in the Balancing Resources and Demand Standard and therefore this standard should be included as an addition to that standard. If it is not included in the BRD Standard, a separate standard would require coordination between the two standards. This would make the process of updating the standards more complex.

Comments

Question 4: Do you have any additional comments regarding the SAR that you believe should be addressed?

☒ Yes

☐ No

If yes, please share those comments in the space provided below.

NERC has the responsibility of maintaining reliability on the North American Interconnections. NERC cannot perform that function effectively if it waits for reliability problems to become apparent in system operations before it takes actions to address those problems. NERC must be a forward looking organization that anticipates future reliability problems and takes actions to resolve those problems before they affect interconnection reliability.

COMMENT FORM
Proposed Frequency Response Standard

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Individual Commenter Information **(Complete this page for comments from one organization or individual.)**		
Name:	Terry Bilke	
Organization:	Midwest ISO	
Telephone:	317-249-5463	
Email:	tbilke@midwestiso.org	
NERC Region		**Registered Ballot Body Segment**
☐ ERCOT ☐ ECAR ☐ FRCC ☐ MAAC ☐ MAIN ☐ MAPP ☐ NPCC ☐ SERC ☐ SPP ☐ WECC ☒ NA - Not Applicable	☐	1 - Transmission Owners
	☐	2 - RTOs, ISOs, Regional Reliability Councils
	☐	3 - Load-serving Entities
	☐	4 - Transmission-dependent Utilities
	☐	5 - Electric Generators
	☐	6 - Electricity Brokers, Aggregators, and Marketers
	☐	7 - Large Electricity End Users
	☐	8 - Small Electricity End Users
	☐	9 - Federal, State, Provincial Regulatory or other Government Entities

Comment Form – Proposed Frequency Response Standard

Group Comments (Complete this page if comments are from a group.)

Group Name:

Lead Contact:

Contact Organization:

Contact Segment:

Contact Telephone:

Contact Email:

Additional Member Name	Additional Member Organization	Region*	Segment*

* If more than one Region or Segment applies, indicate the best fit for the purpose of these comments. Regional acronyms and segment numbers are shown on prior page.

Background Information:

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The requestor would like to receive industry comments on this SAR and to obtain the input of the industry prior to determining the final scope and requirements of the SAR. Accordingly, we request your comments included on this form, emailed with the subject "Frequency Response SAR Comments" by February 17, 2005.

Question 1: Do you agree there is a reliability need for a specifying the quality and quantity of frequency response?

☒ Yes

☐ No

If no, please explain in the space provided below.

Comments

These are my individual comments as a member of the NERC Resources subcommittee and not those of representing any organization.

There is a reliability need for a light-handed standard that allows us to do a better job of ensuring response is available when required. As some entities might comment, there is adequate response in all interconnections during "system normal" conditions. The problem is what occurs during major disturbances and restoration.

A primary reason the industry needs to do a better job of tracking frequency response is the fact that response is declining when it should actually be increasing with load and generation growth.

The standard should not be structured such that it finds BAs noncompliant if response is below average or if response is low for a given event. Frequency response at the BA level is extremely variable as the measure is mingled with load fluctuation.

The standard should guide a technically sound calculation of response at the BA level and track interconnection performance over time to enable informed decisions.

If a BA performs significantly below an Interconnection norm, the standard should require the BA do an internal assessment of its key generation to verify governors are working as designed and that there will be frequency responsive resources for disturbances and restoration.

If Interconnection response significantly changes over time, the standard should be reevaluated.

Question 2: Do you agree with the scope and applicability of the proposed standard?

☒ Yes

☐ No

If no, please explain in the space provided below.

I agree, with some qualification. While the standard shouldn't preclude market solutions, I don't think it must enable a market as the scope implies. A little more clarity on the goals of the standard is needed.

Comments

Question 3: Do you believe these standards are more appropriately additions to existing standards as opposed to creating new standards?

☒ Yes

☐ No

If yes, please identify the location you believe would be the most appropriate for the proposed standard.

Comments

It's not a major issue. It appears it should be include in the Version 0 (BAL-003-0 — Frequency Response and Bias).

Question 4: Do you have any additional comments regarding the SAR that you believe should be addressed?

☒ Yes

☐ No

If yes, please share those comments in the space provided below.

Thanks for the opportunity to comment. I hope the SAC puts all comments in perspective. We are in a period where the industry is reluctant to adopt new standards that generate extra work and compliance exposure. The reliability of the Interconnections can benefit with minimal impact to most BAs with a light-handed standard.

Rather than implementing a complicated process, why not embed most of the effort in the NERC ACE-monitoring application? Only those BAs with unusually low response would need to drill down and do an internal assessment to determine their ability to withstand disturbances and whether they have responsive resources for blackstart.

Knowing where and when performance is substandard will likely arrest the decline in performance. Minimum performance standards could be implemented once the industry has identified what is reasonably achievable and technically justified.

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Do not use quotation marks in any data field.
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Individual Commenter Information **(Complete this page for comments from one organization or individual.)**		
Name:	John Horakh – 02-15-2005	
Organization:	MAAC	
Telephone:	609-625-6014	
Email:	john.horakh@conectiv.com	
NERC Region		**Registered Ballot Body Segment**
☐ ERCOT ☐ ECAR ☐ FRCC X☐ MAAC ☐ MAIN ☐ MAPP ☐ NPCC ☐ SERC ☐ SPP ☐ WECC ☐ NA - Not Applicable	☐	1 - Transmission Owners
	X ☐	2 - RTOs, ISOs, Regional Reliability Councils
	☐	3 - Load-serving Entities
	☐	4 - Transmission-dependent Utilities
	☐	5 - Electric Generators
	☐	6 - Electricity Brokers, Aggregators, and Marketers
	☐	7 - Large Electricity End Users
	☐	8 - Small Electricity End Users
	☐	9 - Federal, State, Provincial Regulatory or other Government Entities

Comment Form – Proposed Frequency Response Standard

Group Comments (Complete this page if comments are from a group.)

Group Name:

Lead Contact:

Contact Organization:

Contact Segment:

Contact Telephone:

Contact Email:

Additional Member Name	Additional Member Organization	Region*	Segment*

* If more than one Region or Segment applies, indicate the best fit for the purpose of these comments. Regional acronyms and segment numbers are shown on prior page.

Background Information:

Posted for comments is the first posting of the Frequency Response SAR. The Frequency Task Force of the NERC Resources Subcommittee has identified the transient frequency response characteristics as degrading over time and potentially threatening the reliability of the bulk electric system. This Standard Authorization Request was initiated to address this concern by developing a standard to specify a measuring convention for frequency response and by specifying a minimum required response to system disturbances based on the convention.

The requestor would like to receive industry comments on this SAR and to obtain the input of the industry prior to determining the final scope and requirements of the SAR. Accordingly, we request your comments included on this form, emailed with the subject "Frequency Response SAR Comments" by February 17, 2005.

Question 1: Do you agree there is a reliability need for a specifying the quality and quantity of frequency response?

X☐ Yes

☐ No

If no, please explain in the space provided below.

Comments

There may be a reliability need in the near future. The Whitepaper does an excellent job of making that case. For the purpose of commenting on a SAR that has not yet produced a proposed Standard, I can give it the benefit of the doubt and say yes, there is reliability need.

Question 2: Do you agree with the scope and applicability of the proposed standard?

☐ Yes

X☐ No

If no, please explain in the space provided below.

Quoted from the SAR (with corrections): This SAR is proposed to develop a standard to measure sub-minute responses to changes in frequency and to set minimum acceptable responses of the system to these events. Also quoted: The measurement selected must be accurate and, to the extent practical, easy to implement. This seems more like a research project than a request for a standard. There is no mention of any possible measurements that might be in the standard. I'm afraid that proceeding with such a vague idea of a measurement will lead the SAR or later Standard to become bogged down with research and field testing even more so than the Balance Load and Demand Standard. And Balance Load and Demand did have definite measurements in mind, thereby not requiring much research, mainly field testing. Come back with a SAR after the research is done, or at least started.

Comments

Question 3: Do you believe these standards are more appropriately additions to existing standards as opposed to creating new standards?

☐ Yes

X☐ No

If yes, please identify the location you believe would be the most appropriate for the proposed standard.

Comments

Adding this requirement to another standard would only slow down the progress of both.

Question 4: Do you have any additional comments regarding the SAR that you believe should be addressed?

X☐ Yes

☐ No

If yes, please share those comments in the space provided below.

It appears Frequency Response is an accepted term used for this requirement, and therefore might be difficult to change. However, Frequency Response is not a very good description of the requirement. A term such as Transient Generator and Load Response would be more descriptive.

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Individual Commenter Information **(Complete this page for comments from one organization or individual.)**		
Name:	Kathy Davis	
Organization:	Tennessee Valley Authority	
Telephone:	423-751-6172	
Email:	kadavis@tva.gov	
NERC Region		**Registered Ballot Body Segment**
☐ ERCOT ☐ ECAR ☐ FRCC ☐ MAAC ☐ MAIN ☐ MAPP ☐ NPCC x SERC ☐ SPP ☐ WECC ☐ NA - Not Applicable	x	1 - Transmission Owners
	☐	2 - RTOs, ISOs, Regional Reliability Councils
	☐	3 - Load-serving Entities
	☐	4 - Transmission-dependent Utilities
	☐	5 - Electric Generators
	☐	6 - Electricity Brokers, Aggregators, and Marketers
	☐	7 - Large Electricity End Users
	☐	8 - Small Electricity End Users
	☐	9 - Federal, State, Provincial Regulatory or other Government Entities

Comment Form – Proposed Frequency Response Standard

Group Comments (Complete this page if comments are from a group.)

Group Name: Electric System Operations

Lead Contact:

Contact Organization:

Contact Segment:

Contact Telephone:

Contact Email:

Additional Member Name	Additional Member Organization	Region*	Segment*
Larry Akens	**TVA**	**SERC**	**1**
Mitch Needham	**TVA**	**SERC**	**1**
Chuck Feagans	**TVA**	**SERC**	**1**
Edd Forsythe	**TVA**	**SERC**	**1**

* If more than one Region or Segment applies, indicate the best fit for the purpose of these comments. Regional acronyms and segment numbers are shown on prior page.

Background Information:

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Question 1: Do you agree there is a reliability need for a specifying the quality and quantity of frequency response?

x Yes

No

If no, please explain in the space provided below.

Comments

Question 2: Do you agree with the scope and applicability of the proposed standard?

☐ Yes

x No

If no, please explain in the space provided below.

If the purpose is to purchase frequency response, then the Market Operator needs to be includes. Will this be considered an Ancillary Service?

Others that may need to be involved are Transmission Service Provider, Generator Owner, Planning Authority and Resource Planner.

Applicability should include #2

Comments

Question 3: Do you believe these standards are more appropriately additions to existing standards as opposed to creating new standards?

☐ Yes

x No

If yes, please identify the location you believe would be the most appropriate for the proposed standard.

Comments

Question 4: Do you have any additional comments regarding the SAR that you believe should be addressed?

☐ Yes

x No

If yes, please share those comments in the space provided below.

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Individual Commenter Information (Complete this page for comments from one organization or individual.)		
Name:	Robert Blohm	
Organization:		
Telephone:	609 585 5451	
Email:	rb112@columbia.edu	
NERC Region		**Registered Ballot Body Segment**
☐ ERCOT ☐ ECAR ☐ FRCC ☒ MAAC ☐ MAIN ☐ MAPP ☒ NPCC ☐ SERC ☐ SPP ☐ WECC ☐ NA - Not Applicable	☐	1 - Transmission Owners
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Contact Organization:

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The requestor would like to receive industry comments on this SAR and to obtain the input of the industry prior to determining the final scope and requirements of the SAR. Accordingly, we request your comments included on this form, emailed with the subject "Frequency Response SAR Comments" by February 17, 2005.

Question 1: Do you agree there is a reliability need for a specifying the quality and quantity of frequency response?

☒ Yes

☐ No

If no, please explain in the space provided below.

Comments

The CPS1 equation is a single equation in two variables, primary (governor) response and secondary response. Two variables require two equations in order to have a unique solution. That second equation does not currently exist and must be the proposed Frequency Response standard that pins down the value of primary (governor) response. Currently, the single CPS1 equation allows any Balancing Authority an infinity of solutions for any given CPS1 value. Accordingly, Balancing Authorities have been tending to reduce expensive primary response and increase cheaper secondary response (AGC, regulation, load following) to achieve a given CPS1 score, which is an average over time. The result has been a halving of system bias in the Eastern Interconnection and the rest of the case made for the standard in the supporting White Paper.

Question 2: Do you agree with the scope and applicability of the proposed standard?

☒ Yes
☐ No

If no, please explain in the space provided below.

Comments

Question 3: Do you believe these standards are more appropriately additions to existing standards as opposed to creating new standards?

☐ Yes

☒ No

If yes, please identify the location you believe would be the most appropriate for the proposed standard.

Comments

The SAR acknowledges that the proposed Standard not only is complementary to the Balancing Resources and Demand Standard, but also must be coordinated with that Standard. The two standards could be combined. But that is insufficient reason to oppose development of a separate Frequency Response Standard. Moreover, combining the standards would reverse the great progress made in consensus on the Balancing Resources and Demand Standard.

Question 4: Do you have any additional comments regarding the SAR that you believe should be addressed?

☐ Yes

☒ No

If yes, please share those comments in the space provided below.

Background:

The Frequency Response SAR drafting team thanks all commenters who submitted comments on the first draft of the Frequency Response SAR. The SAR was posted for comment from January 17 – February 17, 2005. The SAR drafting team asked stakeholders to provide feedback on the SAR through a special SAR Comment Form. There were 30 sets of comments.

Based on the comments received, the drafting team has revised the SAR and is reposting it for an additional 30-day comment period

In this 'Consideration of Comments' document, stakeholder comments have been organized so that it is easier to see the summary of changes being requested of the SAR. All comments received on the first draft of the Frequency Response SAR can be viewed in their original format at:

ftp://www.nerc.com/pub/sys/all_updl/standards/sar/Frequency_Response_SAR_Comments_02_17_05.pdf

If you feel that your comment has been overlooked, please let us know immediately. Our goal is to give every comment serious consideration in this process! If you feel there has been an error or omission, you can contact the Vice President and Director of Standards, Gerry Cauley at 609-452-8060 or at gerry.cauley@nerc.net. In addition, there is a NERC Reliability Standards Appeals Process.[1]

[1] The appeals process is in the Reliability Standards Process Manual: http://www.nerc.com/standards/newstandardsprocess.html.

Index to Questions, Comments and Responses:

1. Do you agree there is a reliability need for specifying the quality and quantity of frequency response?

Summary Consideration: Most commenters agreed that there is a reliability need to specify the quality and quantity of frequency response.

Commenter	Yes	No	Comment
MAAC Staff (2) Al DiCaprio – MAAC (2) Joe Willson – MAAC (2) Mark Kuras – MAAC (2)		✓	There is a need for governors but not for frequency response. Governors are needed to resynchronize during restoration. But the need for a short-term frequency response characteristic has been obviated by the pending Version1 Balancing Standard. That standard is designed to ensure that interconnection frequency is never at such a level that the loss of the largest contingency will cause instability or cascading outages. If the system is always in such a state why would the instantaneous response to the loss of a single contingency add to the system reliability? The SAR has not provided any definitive need. The SAR has not provided sufficient focus vis-à-vis who is responsible to meet the standard (the generator, the BA, the Load, the RA) This proposal has not provided any additional information concerning the need for this proposed Standard since the last time (during the Balancing Resources and Demand consensus) that a similar Frequency Response Requirement was overwhelming rejected by those who commented to that proposal. Transient frequency response has not been the target of any major public concern. The current Version 1 Control Standard proposal provides limits on the frequency excursions that can be controlled by system-operators and their control systems. Relays and other Protection Devices serve to protect those time frames too short for an operator to respond to. What does this standard add? **Comments** This SAR is not clear as to what it really is intended to mandate. Does the requestor want to create a standard for Generator Owners to install governors? Or a standard on Generator Operators for individuals unit governor response? Or a standard for Balancing Authorities for Area response? Or for Reliability Authorities for Regional response? All of these are different requirements and have different effects. The requestor must be clear as to what is intended. To ensure that frequency doesn't hit a relay limit (as in the Balancing standard?) or is it to address the need for governors when synchronizing? When does the standard apply? All times (which means that NERC can go to a unit, BA or RA to check that some finite response is available?) Just at times when large events occur (the problem is of course whether or not the outage is near or far from the entity being checked)? Only during test conditions (since a unit under stress – 'valves wide open' has not governor response at that time – even though it may have the greatest of

Commenter	Yes	No	Comment
			responses at other times). The requestor's intent may be laudable but the description is no where near ready to be considered as 'standard material'.
Response: The drafting team (Resources Subcommittee Frequency Task Force) attempted to answer many of the questions raised by the commenters in the Frequency Response Standard Whitepaper. We agree that the standard needs to be clear to who and when it would apply and this is addressed in the revised SAR. While the Interconnections may have sufficient frequency response for normal operations, we don't know how this response is dispersed and at what point it will pose a reliability risk. A primary purpose of this standard is to collect information so informed decisions can be made before there is a problem. We disagree that the Balance Resources and Demand (BRD) standard is sufficient for all operating states. The BRD addresses steady state and fully interconnected conditions. Refer to "A New Thermal Governor Modeling Approach in the WECC" by Les Pereira, John Undrill, Dmitry Kosterev, Donald Davies, and Shawn Patterson. Also, keep in mind that response has continued to decline since the last published study, even though it should be increasing with load growth. As you request, the draft standard addresses who is required to meet the standard (BA). The standard will be designed such that a BA can mirror the metrics within its boundaries (evaluate generators and LSEs) if they so choose. The standard is not intended to establish a large set of arbitrary requirements, but will establish the framework to collect the information to make informed engineering decisions. The revised SAR clarifies what is expected.			
BPA Bart McManus Brian Tuck James Randall Francis Halpin Bill Mittlestat James Murphy		✓	NERC should not involve itself in the development of these standards and should allow individual interconnections to address frequency response issues independently. For example, the WECC is currently working on standards that will address this concern. They will be tailored to the specific requirements of this interconnection and will provide the best possible solution to the problem. There may be a need to specify frequency response requirements within some interconnections; however, it is not necessary, or most effective for them to be defined at the NERC level.
Response: The Resources Subcommittee Frequency Task Force agrees that frequency response is primarily an Interconnection issue and, as envisioned, the proposed standard would accommodate Interconnection differences both in amounts of response and methodology in calculating response. The standard would identify technical and engineering principles that should be met to calculate and evaluate the amount and distribution of frequency response within each Interconnection. The drafting team believes that stakeholders would prefer the assurance of knowing that NERC is providing oversight to ensure that all Interconnections have a technically sound basis for the development of respective frequency response requirements.			
FRCC (2) Linda Campbell Ron Donahey – TEC (1) Mark Bennett – GRU (3) Steve Wallace – SEC (5) S. McElhaney – FMPA (5) Ted Hobson – JEA (1)		✓	The FRCC does not support the development of a Frequency Response Standard at this time. A standard for each Interconnection, although informative would be unenforceable as far as identifying short term, frequency response deficient, entities or areas. As such measurability and compliance by the relevant entities would be all but impossible. As far as an Interconnection allocation program for frequency response, we feel that the "apparent" decline in response is not significant enough to warrant a standard at this time and we would require additional details of how such a plan would be implemented and the potential economic impacts on the Regions that would be

Commenter	Yes	No	Comment
			associated with that plan.
Response: The standard as envisioned does not mandate a specific amount of frequency response. With regard to the "apparent" decline in frequency response, the most widely published report (Ingleson and Nagle, 1999) documented a change in Eastern Interconnection response from 3750MW/0.1Hz in 1994 to 3390MW/0.1Hz in 1998. The Resources Subcommittee evaluation of 44 events in 2005 showed an average frequency response well below 3000MW/0.1Hz. Theoretically, response should be increasing over time with increasing load and generation in an Interconnection. One of the primary reasons for the standard is to enable a better analysis of response and also enable informed decisions. As envisioned, the standard will provide a fairly simple methodology to verify compliance.			
ISO/RTO Standards Review Committee (2) K. Tammar – NYISO (2) D. McMaster – AESO (2) Ed Riley – CAISO (2) Sam Jones – ERCOT (2) P. Henderson – IESO (2) P. Brandien – ISO-NE (2) B. Phillips – MISO (2) B. Balmat – PJM (2) C. Yeung – SPP (2)	✓	✓	We agree in general that there is a reliability need to have frequency response, particularly during disturbances, islanding and restoration. The standard should provide the process for a technically sound calculation of frequency response and bias (both fixed and variable). Any new standards on frequency response need not and should not be onerous by finding BAs noncompliant with response less than average or below some un-validated norms. If performance is significantly less than an Interconnection norm, the standard should not trigger an automatic non-compliance. In these situations the BA should perform an internal review/assessment that ensures governors are working as designed, that the BA knows which resources are frequency responsive (so the information can be included in restoration plans), whether governors can be triggered to be more responsive during disturbances, etc and satisfy the Interconnection requirement. If the Interconnection requirement is not met within a reasonable timeframe then the BA should be deemed as non-compliant. When required, the validation of governor performance could be achieved either through online monitoring in an EMS or periodic testing (both methods should be explained in a reference document to support the standard). The standard should acknowledge that some units might not provide response under normal operations (e.g. nuclear units operating at full load) and that response is highly variable event-to-event based on simultaneous load changes. The standard should acknowledge the differing Interconnection requirements (smaller Interconnections need greater response). The standard should also track Interconnection and BA areas response over time (years) and be reevaluated as performance changes.
Response: The Resources Subcommittee Frequency Task Force agrees with these comments as a whole. As envisioned, the standard would not mandate a given amount of response, but would require			

Commenter	Yes	No	Comment
an analysis if response were measurably below the norm (this detail has been added to the detailed description in the SAR). There is another standard under development, (Phase III & IV MOD-027 - Verification and Status of Generator Frequency Response) that requires Generator Owners to verify that their governors are working as designed. The standard would accommodate the simplification ideas you propose, and in fact, if data is saved in a common format, the Resources Subcommittee Frequency Task Force has a tool that could calculate the BA's performance to the standard. The SAR was also changed to reflect the suggestions to accommodate: • Both fixed and variable bias. • Cases where a specific unit (e.g. nuclear) is prohibited from providing frequency response. • Differing Interconnection needs.			
CAISO (2) Ed Riley Yuri Makarov Steve McCoy	✓		Frequency response provided by speed governors and loads helps to prevent load shedding and generator trips at significant frequency excursions caused by sudden active power mismatches in the systems. Without a sufficient frequency response emerging during the first seconds after a frequency disturbance, there is a danger of further cascading development or frequency instability and system collapse cased by underfrequency generator trips. It has been already noted that insufficient frequency response in some parts of an Interconnection may cause certain temporary redistribution of power flows and reduce stability margins after frequency disturbances that may limit the OTC on critical paths within the Interconnection. It has been also observed that insufficient frequency response may cause a weaker frequency recovery that bears a greater risk of system collapse at subsequent frequency disturbances. Therefore, frequency response is definitely a reliability issue that needs to be addressed by a NERC standard.
Response: The Resources Subcommittee Frequency Task Force agrees that there are several issues that must be addressed in the standard or in supporting business practices. As envisioned, the proposed standard would not be prescriptive with regard to "how much" and "where" the response is carried.			
Manitoba Hydro (1, 3, 5, 6) Gerald Rheault	✓		Manitoba Hydro , from a reliability perspective, supports the idea of specifying the quantity and quality of frequency response and incorporating these elements in a Standard. However, the development of this standard should not be rushed since the evidence provided in the Standard Authorization Request form and in the Frequency Response Standard White paper shows that current frequency response and projected frequency response trends do not pose a significant potential for compromising system reliability and for major under-frequency load shedding to occur in the near term. Also in the section of the white paper which examines "frequency response standard considerations", a broad scope and outline is given, more detail is required especially regarding methods of ensuring compliance. In paragraph 2, page 9 of the white paper where the current frequency response of the Eastern Interconnection is stated as 3100 MW/0.1 Hz with a standard deviation of 1870 MW/0.1 Hz and the statement is made that "the fact that an under-frequency

Commenter	Yes	No	Comment
			event has not happened yet is only coincidence" requires much more detailed information regarding the origin and calculations of these numbers before these assumptions can be made. Could it be that instead of a frequency response closer to 1230MW/ 0.1 Hz it is actually practically closer to 3100 MW/ 0.1 Hz or even 4970 MW/ 0.1 Hz most of the time? One understandable major concern addressed in the white paper is the response of combined-cycle units to frequency decline and the fact that due to a drop in combustion air volume their output may actually decrease with a drop in frequency or even result in unit tripping. Also there was concern with the possibility that larger amounts of these types of units will be installed on the system thereby potentially increasing the decline in frequency response rate from 70 MW/ 0.1 Hz /Year (Eastern Interconnection) . It is also mentioned (on page 10) that with proper tuning combined cycle units can provide correct frequency response. Maybe part of the focus should be on finding ways of enforcing the Current Requirements (Page 14) and including specific frequency response requirements for combined-cycle units.
Response: The Resources Subcommittee Frequency Task Force agrees that the standard should not rush to a decision on the amount and location of frequency response, but should set the framework for making informed decisions. Frequency response is needed for more than protection against UFLS. Response is also needed during disturbances and restoration. With regard to "current requirements", the Whitepaper listed what existed in NERC Policy, mostly as guides. There is very little in the V0 Standards regarding governors or frequency response. We agree that the standard should not impose unreasonable costs to demonstrate compliance. We agree that frequency response should be monitored both at the BA and Interconnection level. Characterizing how frequency response changes under varying interconnection load and unit commitment conditions will be addressed by a sampling methodology. The drafting team is pursuing the addition of functionality in the "NERC –ACE monitoring application" that will identify generator trips and automate the calculation of Interconnection frequency response. Evidence to date indicates that frequency response declines significantly during light load periods, even though the exact mechanism for this is not well defined. Most of the major frequency excursions experienced in the Eastern Interconnection have occurred during the shoulder period of the year during either the early morning or late evening periods. Regarding the last comment, there currently are no governor or frequency response requirements for generators.			
Energy Mark, Inc. (8) Howard Illian	✓		There is a reliability need but it is not an immediate reliability need for all of the interconnections. The amount of Frequency Response on the Texas Interconnection is close to the minimum acceptable amount, and therefore, there is an immediate need for a FRS on the Texas Interconnection. On the Western Interconnection, the WECC keeps close tabs on Frequency Response and takes immediate action when a problem arises with frequency response on that interconnection. Although there is no immediate need for a Frequency Response Standard on the Western Interconnection at this time, the observed reductions in Frequency Response on that interconnection make this issue an ongoing concern. Finally, there is no current need for a Frequency Response Standard on the Eastern Interconnection because current Frequency Response is adequate. However, it

Commenter	Yes	No	Comment
			takes significant time to develop an effective standard and put it in place. The Balancing Resources and Demand Standard is entering its fourth year of development with expectations of at least another year before implementation. A Frequency Response Standard would be expected to take a similar period to develop. That means that it will be at least 2010 before a new FRS would be put in place. There is no question that adequate Frequency Response is required for reliability. There is no question that Frequency Response on the Eastern Interconnection is declining. There are two paths of action available; 1) Wait until adequate Frequency Response causes reliability problems and then begin the five year process to develop a standard; 2) Begin development of a FRS and determine the final need for implementation during the five year development process. I would rather have a standard that requires measurement that does not result in enforcement action, and therefore, has no effect on operations, than not have a standard when there are definite reliability problems. It will be much easier to implement a standard for Frequency Response before reliability problems occur than to implement a standard after reliability problems occur. NERC should develop a Frequency Response Standard and continue to investigate the need for the standard during its development.
Response: The Resources Subcommittee Frequency Task Force agrees with the comments that the standard should initially focus on measuring the amount of response and not impose restrictions on current operations. As envisioned, the proposed standard would identify a consistent, objective calculation of frequency response The standard would require regional and local analyses when BAs have low response. This way, informed technical decisions can be made prior to reaching a point where reliability is truly threatened.			
MAAC (2) John Horakh	✓		There may be a reliability need in the near future. The white paper does an excellent job of making that case. For the purpose of commenting on a SAR that has not yet produced a proposed Standard, I can give it the benefit of the doubt and say yes, there is reliability need.
Response: The Resources Subcommittee Frequency Task Force appreciates your support and agrees that there is a reliability need for this proposed standard.			
MRO (2) Larry Larson – OTTP Al Boesch – NPPD Terry Bilke – MISO R. Coish – MH Dennis Florom – LES K. Goldsmith – Alliant Todd Gosnell – OPPD W. Guttormson – SaskPwr Jim Maenner – WPS Tom Mielnik –	✓		We agree (with qualifications). Any new standards on frequency response need not and should not be onerous (identifying BAs noncompliant with less than average response or some un-validated norms). The standard should provide the process for a sound calculation of frequency response and bias (both fixed and variable). There may be valid reasons why a BA is below observed norms in response. It may meet most of its obligations with schedules. Rather than generate an automatic non-compliance when response is below some benchmark, the standard should require

Commenter	Yes	No	Comment
MidAmerican Darrick Moe – WAPA Joe Knight – MRO			an internal review that ensures governors are working as designed, that the BA knows which resources are frequency responsive (so the information can be included in restoration plans), whether governors can be put in more responsive modes during disturbances, etc. The standard should have some requirements on generators if the BA is not providing the response outlined in the standard (governors should be working as designed). The standard should also track Interconnection response over time and identify a target response (different for each Interconnection). NERC or NAESB will want to look at how this is allocated to BAs and generators.
Response: The Resources Subcommittee Frequency Task Force agrees with these comments as a whole. As envisioned the proposed standard would not mandate a given amount of response, but would require an analysis if response is measurably below the norm. As envisioned the proposed standard is would acknowledge the variability inherent in measuring frequency response and would provide two methods of capturing sufficient samples to make an objective measurement. The standard would not preclude market solutions. The SAR detailed description has been expanded to state that the standard will include a sound calculation for measuring frequency response with consideration of interconnection specifics. Another detail added to the SAR requires generator units with nameplate ratings of 10 MW or greater to be equipped with governors. There is another standard under development, (Phase III & IV MOD-027 - Verification and Status of Generator Frequency Response) that requires Generator Owners to verify that their governors are working as designed. Finally, the SAR was modified to accommodate both fixed and variable bias.			
Southern Company Transmission, Operations, Planning and EMS Divisions (1) Marc Butts Steve Corbin Jim Viikinsalo Jim Griffith Doug McLaughlin Monroe Landrum	✓		Trends in Eastern and Western Interconnection Turbine Governor Response and primary frequency response over the past two decades (as documented by EPRI Project RP2473-53 and Decline of Eastern Interconnection Frequency Response by Ingleson and Nagle) as well as trends in frequency error magnitude and variance over the past five years (as documented by the NERC Resources Subcommittee at URL http://www.nerc.com/~filez/rs.html) indicate that significant frequency response degradation is occurring, particularly in the Eastern Interconnection. While not yet a crisis, these trends are indicative of significant changes in design and operational practices on the interconnected electrical systems of North America which, if not managed intelligently, can cause significant degradation in reliability. We strongly urge the industry to support this SAR and begin the process of controlled management before the processes behind these trends reach crisis proportion.
Response: The Resources Subcommittee Frequency Task Force agrees with these comments.			
New York ISO (2) Mike Calimano	✓		We agree in general that there is a reliability need to have frequency response, particularly during disturbances, islanding and restoration. The standard should provide the process for a technically sound calculation of frequency response and bias (both fixed and variable). Any new standards on frequency response need not and should

Commenter	Yes	No	Comment
			not be onerous by finding BAs noncompliant with response less than average or below some un-validated norms. There may be valid reasons why a BA is below observed norms in response. For example, the BA may meet most of its obligations with schedules or its native load may be non-responsive. If performance is significantly less than an Interconnection norm, the standard should not trigger an automatic non-compliance. In these situations the BA should perform an internal review/assessment that ensures governors are working as designed, that the BA knows which resources are frequency responsive (so the information can be included in restoration plans), whether governors can be put in more responsive modes during disturbances, etc. When required, the validation of governor performance could be achieved either through online monitoring in an EMS or periodic testing (both methods should be explained in a reference document to support the standard). The standard should acknowledge that some units might not provide response under normal operations (e.g. nuclear units operating at full load) and that response is highly variable event-to-event based on simultaneous load changes. The standard should acknowledge the differing Interconnection requirements (smaller Interconnections need greater response). The standard should also track Interconnection response over time (years) and be reevaluated as performance changes.
Response: The Resources Subcommittee Frequency Task Force agrees with these comments as a whole. As envisioned, the standard would not mandate a given amount of response, but would require an analysis if response were measurably below the norm (this detail has been added to the detailed description in the SAR). There is another standard under development, (Phase III & IV MOD-027 - Verification and Status of Generator Frequency Response) that requires Generator Owners to verify that their governors are working as designed. The standard would accommodate the simplification ideas you propose, and in fact, if data is saved in a common format, the Resources Subcommittee Frequency Task Force has a tool that could calculate the BA's performance to the standard. The SAR was also changed to reflect the suggestions to accommodate: • Cases where a specific unit (e.g. nuclear) is prohibited from providing frequency response. • Differing Interconnection needs.			
IESO (2) Pete Henderson	✓		We agree in general that there is a reliability need to have frequency response, in order to maintain interconnection frequency and particularly during disturbances, islanding and restoration. The standard need to address both the system needs as well as island requirements for frequency response. The standard should provide the process for a technically sound

Commenter	Yes	No	Comment
			calculation of frequency response and bias. The standard should acknowledge that some units might not provide response under normal operations (e.g. nuclear units operating at full load) and that load response is highly variable event based on time of day or year. The standard should acknowledge smaller areas need greater response. Where BA areas are deficient in meeting the interconnection requirement , they should be allowed a reasonable period of time to take appropriate steps to make corrections before being assessed as non compliant. The standard should also track area response over time (years) and be reevaluated as performance changes. Quality should be defined. For generators it should include dead-band, droop characteristics, etc.
Response: The Resources Subcommittee Frequency Task Force agrees with these comments as a whole. As envisioned, the standard would not mandate a given amount of response, but would require an analysis if response were measurably below the norm (this detail has been added to the detailed description). The standard accommodates the simplification ideas you propose, and in fact, if data is saved in a common format, the Resources Subcommittee Frequency Task Force has a tool that will calculate the BA's performance to the standard. The Resources Subcommittee Frequency Task Force agrees with your "governor quality" comment and has added governor installation and operation details to the SAR's detailed description. As envisioned, the standard will provide the Balancing Authority with sub-par frequency response time to analyze their situation and make necessary changes and corrections.			
ATC (1) Peter Burke	✓		Based on the NERC white paper Frequency Response Standard Whitepaper dated April 6, 2004 that was prepared by the Frequency task Force of the NERC Resources Subcommittee, it would appear that the decline in frequency response of both the Eastern and Western Interconnections is a reliability concern. As a transmission provider, however, there is probably little that can be done other than make sure that governor response and load modeling can be made as accurate as reasonably possible in conducting dynamic simulations and be aware of this issue in studying existing as well as new generating facilities. The control area, generation operators and turbine-generator manufacturers need guidance provided as to their responsibilities and obligations regarding frequency response. Changes in the load characteristics (e.g. fewer large motors, variable speed drives, etc) over time, plus changes in reserve sharing practices brought on by deregulation and competition are and will affect load response to frequency excursions. The type of generation (e.g. combustion turbine units, combined-cycle units) being interconnected to the system as well as the operation of the

Commenter	Yes	No	Comment
			governors (e.g. blocked or improper settings) and turbines (e.g. sliding pressure, boiler-follower, etc.) of existing generators have a significant effect on the system frequency response.
Response: The Resources Subcommittee Frequency Task Force agrees with your technical comments in support of this standard. The team also supports the development of the planning "MOD" standards that address frequency response at the generator level.			
NERC Frequency Task Force Raymond L. Vice, Chairman	✓		Trends in Eastern and Western Interconnection Turbine Governor Response and primary frequency response over the past two decades (as documented by EPRI Project RP2473-53 and Decline of Eastern Interconnection Frequency Response by Ingleson and Nagle) as well as trends in frequency error magnitude and variance over the past five years (as documented by the NERC Resources Subcommittee at URL http://www.nerc.com/~filez/rs.html) indicate that significant frequency response degradation is occurring, particularly in the Eastern Interconnection. While not yet a crisis, these trends are indicative of significant changes in design and operational practices on the interconnected electrical systems of North America which, if not managed intelligently, can cause significant degradation in reliability. I strongly urge the industry to support this SAR and begin the process of controlled management before the processes behind these trends reach crisis proportion.
Response: The Resources Subcommittee Frequency Task Force agrees with these comments.			
Robert Blohm	✓		The CPS1 equation is a single equation in two variables, primary (governor) response and secondary response. Two variables require two equations in order to have a unique solution. That second equation does not currently exist and must be the proposed Frequency Response standard that pins down the value of primary (governor) response. Currently, the single CPS1 equation allows any Balancing Authority an infinity of solutions for any given CPS1 value. Accordingly, Balancing Authorities have been tending to reduce expensive primary response and increase cheaper secondary response (AGC, regulation, load following) to achieve a given CPS1 score, which is an average over time. The result has been a halving of system bias in the Eastern
Response: The Resources Subcommittee Frequency Task Force appreciates your comment and your support for the frequency response standard.			
SPP Operating Reliability Working Group Robert Rhodes –SPP (2) Ron Ciesiel – SPP (2) Bob Cochran – SPS (1) Mike Gammon – KCPL (1) Steve Hillman – WPEK (1) Allen Klassen – Westar	✓		A frequency response standard is needed but only within the scope and range of the previously provided guides in Policy 1 such as a design criteria of 5% droop, a 36 mHz deadband with exclusions for nuclear, combined cycle and small generating units.

Commenter	Yes	No	Comment
(1) Bill Nolte – SECI (1) Mike Stafford – GRDA (1)			
Response: The Resources Subcommittee Frequency Task Force agrees with the comments and has added statements to the detailed description to reflect the comments. However, the SAR is intended to capture the scope of the standard and the specific parameters will be determined by the standard drafting team.			
Southern Co. Generation (6) Roman Carter Tony Reed Joel Dison Lucius Burris Lloyd Barnes Clifford Shepard Terry Crawley Roger Green Tom Higgins	✓		Trends in Eastern and Western Interconnection Turbine Governor Response and primary frequency response over the past two decades (as documented by EPRI Project RP2473-53 and Decline of Eastern Interconnection Frequency Response by Ingleson and Nagle) as well as trends in frequency error magnitude and variance over the past five years (as documented by the NERC Resources Subcommittee at URL http://www.nerc.com/~filez/rs.html) indicate that frequency response degradation is occurring, particularly in the Eastern Interconnection. While not yet a crisis, these trends are indicative of significant changes in design and operational practices on the interconnected electrical systems of North America which, if not managed intelligently, can cause degradation in reliability. We support this SAR in an effort to begin the process of controlled management before the processes behind these trends reach crisis proportion.
Response: The Resources Subcommittee Frequency Task Force agrees with these comments.			
TXU Energy Delivery Roy Boyer	✓		Yes, I agree there is a reliability need for specifying the quality and quantity of frequency response. There is ample evidence that specifying a droop value or that specifying governors must be in operation will not necessarily result in any useful governor response to a sudden large drop in system frequency. So yes, I think a SAR team should look into this matter. I would suggest the part load can play in arresting frequency decline be included in the scope. I would also suggest that the frequency response needs of the regions will likely vary, so final specific requirements should probably be made at the region level.
Response: The Resources Subcommittee Frequency Task Force agrees that load can provide frequency response and load contribution is, by default, included in the balancing authority's performance. The standard is indifferent to whether response is provided by load or generation. The proposed standard recognizes the role and importance of both the Interconnection and the Regional Reliability Organization in the establishment of requirements. In general, it is expected there is a "base" Interconnection target response that will be addressed in this standard. Each Interconnection would have a different target, based on its size and historic response. There are areas (e.g. Maritimes) that require additional response. It is expected these unique situations will be primarily addressed in the "MOD" standards. This standard would enable improved data for the MOD standards.			
MISO Terry Bilke	✓		These are my individual comments as a member of the NERC Resources subcommittee and not those of representing any organization. There is a reliability need for a light-handed standard that allows us to do a better job of ensuring response is available when

Commenter	Yes	No	Comment
			required. As some entities might comment, there is adequate response in all interconnections during "system normal" conditions. The problem is what occurs during major disturbances and restoration. A primary reason the industry needs to do a better job of tracking frequency response is the fact that response is declining when it should actually be increasing with load and generation growth. The standard should not be structured such that it finds BAs noncompliant if response is below average or if response is low for a given event. Frequency response at the BA level is extremely variable as the measure is mingled with load fluctuation. The standard should guide a technically sound calculation of response at the BA level and track interconnection performance over time to enable informed decisions. If a BA performs significantly below an Interconnection norm, the standard should require the BA do an internal assessment of its key generation to verify governors are working as designed and that there will be frequency responsive resources for disturbances and restoration. If Interconnection response significantly changes over time, the standard should be reevaluated.
Response: The Resources Subcommittee Frequency Task Force agrees with these comments.			
TXU Electric Delivery (1) Travis Besier or Ellis Rankin	✓		TXU Electric Delivery proposes that Frequency Response Guidelines at the NERC level should only be in general terms and require that each Reliability Authority establish a specific Frequency Response Standard with detailed specifications as appropriate for its region.
Response: The Resources Subcommittee Frequency Task Force intent was not to mandate a specific amount of frequency response, but to require a consistent, objective calculation of frequency response. The balancing authority and the Regional Reliability Organization must do an assessment of adequacy if response is measurably below the norm. The proposed standard recognizes the role and importance of the Interconnection and the Regional Reliability Organization in the establishment of requirements. In general, it is expected there is a "base" Interconnection target response that will be addressed in this standard. Each Interconnection would have a different target, based on its size and historic response. There are areas (e.g. Maritimes) that require additional response. It is expected these unique situations will be primarily addressed in the "MOD" standards. This standard would enable improved data for the MOD standards.			
TVA (1) Kathie Davis Larry Akens Mitch Needham Chuck Feagans	✓		

Commenter	Yes	No	Comment
Ed Forsythe			
Alliant Energy (1) Kenneth A. Goldsmith	✓		
Progress Energy – Carolinas (1, 3, 5, 6) Phil Creech	✓		
Dick Schulz Chair, IEEE Task Force on Large Interconnected Power System Response to Generation Governing	✓		
NCPA (4) Les Pereira	✓		
NPCC CP9, Reliability Standards Working Group Guy V. Zito – NPCC (2) Ralph Rufrano – NYPA (1) K. Goodman – ISONE (2) Al Adamson – NYSRC (2) Bob Pelligrini – UI (1) D. Kiguel – Hydro One (1) P. Lebro – Nat'l Grid (1) R. Champagne – TE (1) B. Hogue – NPCC (2) K. Khan – IESO (2) M. Potishnak – ISONE (2) G. Campoli – NYISO (2)	✓		
New York State Reliability Council (2) Theodore Pappas	✓		
We Energies (3, 4, 5) Howard Rulf	✓		
Calpine (6) James Stanton	✓		

2. Do you agree with the scope and applicability of the proposed standard?

Summary Consideration: Most commenters agreed that the proposed standard should apply to the Reliability Authority (or Reliability Coordinator), Balancing Authority and Generator Operator. With the revisions to the SAR, there are requirements for the Generator Owner to ensure that certain governors meet a minimum set of criteria

There was no consensus amongst commenters on the scope of the proposed standard. The drafting team made extensive changes to try to better define the scope.

Commenter	Yes	No	Comment
MAAC Staff (2) Al DiCaprio – MAAC (2) Joe Willson – MAAC (2) Mark Kuras – MAAC (2)		✓	Frequency Response characteristics should be dictated by the Reliability entities as part of their respective control services to meet the regional synchronizing requirements as well as the longer duration control standards and of the needs of the interconnection in which they operate.
Response: The Resources Subcommittee Frequency Task Force's intent is that the standard be designed such that a BA can mirror the metrics within its boundaries (evaluate generators and LSEs) if it so chooses.			
BPA Bart McManus Brian Tuck James Randall Francis Halpin Bill Mittlestat James Murphy		✓	The main theme that there needs to be a relationship between response and frequency decline is the right approach but requirements would be different from region to region. Standards to manage frequency response should be developed by individual interconnections; not NERC. The scope and applicability should be defined by the needs of the interconnection to provide the most benefit to system wide reliability.
Response: The Resources Subcommittee Frequency Task Force agrees that frequency response is primarily an Interconnection issue and, as envisioned, the Standard would accommodate Interconnection differences both in amounts of response and methodology in calculating response. The drafting team believes that stakeholders would prefer the assurance of knowing that NERC is providing oversight to ensure that all Interconnections have a technically sound basis for the development of respective frequency response requirements.			
NPCC CP9, Reliability Standards Working Group Guy V. Zito – NPCC (2) Ralph Rufrano – NYPA (1) K. Goodman – ISONE (2) Al Adamson – NYSRC (2) Bob Pelligrini – UI (1) D. Kiguel – Hydro One (1) P. Lebro – Nat'l Grid (1) R. Champagne – TE (1) B. Hogue – NPCC (2) K. Khan – IESO (2) M. Potishnak – ISONE (2)		✓	The applicability of this Standard to the LSE should be considered.

Commenter	Yes	No	Comment
G. Campoli – NYISO (2)			
Response: The Resources Subcommittee Frequency Task Force will add LSE to the standard's applicability list.			
MAAC (2) John Horakh		✓	Quoted from the SAR (with corrections): This SAR is proposed to develop a standard to measure sub-minute responses to changes in frequency and to set minimum acceptable responses of the system to these events. Also quoted: The measurement selected must be accurate and, to the extent practical, easy to implement. This seems more like a research project than a request for a standard. There is no mention of any possible measurements that might be in the standard. I'm afraid that proceeding with such a vague idea of a measurement will lead the SAR or later Standard to become bogged down with research and field testing even more so than the Balance Load and Demand Standard. And Balance Load and Demand did have definite measurements in mind, thereby not requiring much research, mainly field testing. Come back with a SAR after the research is done, or at least started.
Response: The Resources Subcommittee Frequency Task Force agrees that the whitepaper bears some resemblance to the description for a research project. Many in the industry are concerned with the decline in Frequency Response, while at the same time some are asking how much of a problem is the decline in response. The drafting team's goal is to put the infrastructure and process in place to make informed decisions in the future and to allow the Regions to evaluate the distribution and adequacy of response and take mitigating action if there are areas found to be deficient. The Resources Subcommittee Frequency Task Force disagrees with delaying the standard development. The SAR will define the scope of the standard. The specific detailed requirements and measures will be developed by the standard drafting team.			
TVA (1) Kathie Davis Larry Akens Mitch Needham Chuck Feagans Ed Forsythe		✓	If the purpose is to purchase frequency response, then the Market Operator needs to be includes. Will this be considered an Ancillary Service? Others that may need to be involved are Transmission Service Provider, Generator Owner, Planning Authority and Resource Planner. Applicability should include #2
Response: The Resources Subcommittee Frequency Task Force agrees that others have roles in providing Frequency Response, but have focused on the higher level calculation of response at the balancing authority and Interconnection level. The primary reason for this is that there are about 150 balancing authorities. Only those balancing authorities with sub-normal response need to investigate to the generator level. The NERC 2002 Generating Unit Statistical Brochure identifies 3694 generators of 1 MW or greater. It would be difficult (and unnecessary if the BA has good response) to monitor thousands of generators with this standard. The standard doesn't preclude market solutions, which NAESB may adopt. The Resources Subcommittee Frequency Task Force agrees with the comment to include #2 in the SAR.			
ISO/RTO Standards Review Committee (2) K. Tammar – NYISO (2) D. McMaster – AESO (2) Ed Riley – CAISO (2) Sam Jones – ERCOT (2)		✓	There is a general need for a standard, but the outcomes and expectations should address the comments raised in question 1. While we agree that the standard should not preclude market solutions (e.g. allow purchasing of response as long as deliverability and restoration criteria can be met), we have concerns with the statement *There must be a means for sale/purchase of frequency response as for any other quantity.*

Commenter	Yes	No	Comment
P. Henderson – IESO (2) P. Brandien – ISO-NE (2) B. Phillips – MISO (2) B. Balmat – PJM (2) C. Yeung – SPP (2) New York ISO (2) Mike Calimano			It is not clear what is meant by *A method of allocation must be developed."* Is this an allocation of Interconnection response to BAs, BA allocation to generators or something different?
Response: The Resources Subcommittee Frequency Task Force agrees with these comments, and has revised the SAR to omit the italicized statements. As envisioned, the proposed standard would not mandate a given amount of frequency response, but would require an analysis if response were measurably below the norm. The standard doesn't preclude market solutions, which NAESB may adopt.			
NCPA (4) Les Pereira		✓	The scope needs to be expanded – see detailed comments in a following section – based on extensive modeling and validation work in WECC.
Response: The Resources Subcommittee Frequency Task Force appreciates the significant work that has been done in this area by the WECC and has referenced some of this research in the Whitepaper. We believe the Planning Standards under development (MOD-13 and MOD-27) deal with the governor issues that you outline. As envisioned, this standard will provide improved data into the modeling process.			
FRCC (2) Linda Campbell Ron Donahey – TEC (1) Mark Bennett – GRU (3) Steve Wallace – SEC (5) S. McElhaney – FMPA (5) Ted Hobson – JEA (1)		✓	The SAR indicates a measure of frequency response for the Interconnection, as a measure of performance. This would be very difficult to translate to individual entity compliance and thus render the standard applicable to no entities.
Response: The interconnection measure of response is intended as a benchmark and as a validation of the balancing authority's reported performance. The revised SAR indicates that if frequency response is outside the norm for the BA, based on its size, BAs and Regions would be required to conduct analyses to determine the reason for the performance.			
IESO (2) Pete Henderson		✓	The Frequency control standard needs to address levels required for reliability, be consistent and verifiable, and be simple to monitor for compliance purposes.
Response: This is the intent.			
Progress Energy – Carolinas (1, 3, 5, 6) Phil Creech	✓		Scope: The scope of the proposed standard is appropriate. However, the reliability requirements would be better addressed by a comprehensive review that considers the adequacy of existing reliability standards. Applicability: The applicability of the proposed standard is understood to be Reliability Authorities, Balancing Authorities, and Generator

Commenter	Yes	No	Comment
			Operators. However, substantial questions remain as to how the responsibilities implied in the proposed standard will be equitably distributed.
Response: The Resources Subcommittee Frequency Task Force appreciates your comment. The new standard for verifying generator governor controls will be under field test through part of 2007 and then will be finalized, balloted and then implemented. The implementation plan for MOD-027 includes additional time for entities to become compliant with the requirements. This would mean that any work on this standard could be delayed for several years. With the decline in Eastern Interconnection frequency response, the drafting team thinks it would be unwise to wait for the new standards to be developed and reviewed before developing this standard. Your questions regarding the applicability of the responsibilities will be better defined during the standard drafting phase of this standard.			
CAISO (2) Ed Riley Yuri Makarov Steve McCoy	✓		Generally, our answer is yes, but the matter of applicability needs a very careful consideration. The question is whether the proposed standard should be applied to only the reliability and balancing authorities and plant operators, or also to the resource and system planning authorities and generator owners. For example, wind generators do not provide a frequency response, whereas the response from the Combined Cycle units is limited. This is a matter of design as well as the matter of controllability of the primary energy source. If the generation portfolio contains a lot of wind and CC generators, the balancing authority cannot do much to improve its summary frequency response in general terms. Also, if frequency responsive generators in a CA are heavily loaded, would the new standard force the balancing authorities to re-dispatch generation in favor of non-responsive generation and commit more responsive generation ahead of the non-responsive generation? Another issue is whether the standard should specify the required response in the area or individual responses from generators. Perhaps, NERC should work with NASB to find the right answers before establishing the standard. One possible solution is to establish penalties for non-compliance that would stimulate generator owners to invest in frequency responsive generation. Another possible recommendation could be establishing a market for frequency response. Without resolving these difficult issues, this standard cannot be accepted.
Response: The Resources Subcommittee Frequency Task Force agrees that there are several issues that must be addressed in the standard or in supporting business practices. As envisioned, the draft standard would not be prescriptive with regard to “how much” and “where” the response is carried. The standard would allow balancing authorities, reliability coordinators, load-serving entities and Regional Reliability Organizations to make informed decisions based on their unique situation.			
Energy Mark, Inc. (8) Howard Illian	✓		Planning standards are not enough by themselves. Without continuous measurement, there can be no assurance that those responsible for meeting the reliability need for Frequency Response are fulfilling those responsibilities. Only a Frequency Response Standard that continuously measures response can insure that the response is available when required.
Response: The Resources Subcommittee Frequency Task Force agrees with your comment. The SAR drafting team will follow the Planning Standards under development (MOD-13 and MOD-27) that deal with governors and frequency response to be sure there are no conflicts.			

Commenter	Yes	No	Comment
TXU Energy Delivery Roy Boyer	✓		Yes, I agree.
Response: The Resources Subcommittee Frequency Task Force agrees with this comment.			
MISO Terry Bilke	✓		I agree, with some qualification. While the standard shouldn't preclude market solutions, I don't think it must enable a market as the scope implies. A little more clarity on the goals of the standard is needed.
Response: The Resources Subcommittee Frequency Task Force agrees with these comments and has removed the reference in the original SAR to market solutions.			
Dick Schulz Chair, IEEE Task Force on Large Interconnected Power System Response to Generation Governing	✓		The proposed scope and applicability, to the extent that they are in the given in the SAR, are good.
Response: The Resources Subcommittee Frequency Task Force agrees with this comment.			
We Energies (3, 4, 5) Howard Rulf	✓		
Manitoba Hydro (1, 3, 5, 6) Gerald Rheault	✓		
Calpine (6) James Stanton	✓		
Alliant Energy (1) Kenneth A. Goldsmith	✓		
MRO (2) Larry Larson – OTTP Al Boesch – NPPD Terry Bilke – MISO R. Coish – MH Dennis Florom – LES K. Goldsmith – Alliant Todd Gosnell – OPPD W. Guttormson – SaskPwr Jim Maenner – WPS Tom Mielnik – MidAmerican Darrick Moe – WAPA Joe Knight – MRO	✓		
Southern Company Transmission, Operations, Planning and	✓		

Commenter	Yes	No	Comment
EMS Divisions (1) Marc Butts Steve Corbin Jim Viikinsalo Jim Griffith Doug McLaughlin Monroe Landrum			
NERC Frequency Task Force Raymond L. Vice, Chairman	✓		
Robert Blohm	✓		
SPP Operating Reliability Working Group Robert Rhodes –SPP (2) Ron Ciesiel – SPP (2) Bob Cochran – SPS (1) Mike Gammon – KCPL (1) Steve Hillman – WPEK (1) Allen Klassen – Westar (1) Bill Nolte – SECI (1) Mike Stafford – GRDA (1)	✓		
Southern Co. Generation (6) Roman Carter Tony Reed Joel Dison Lucius Burris Lloyd Barnes Clifford Shepard Terry Crawley Roger Green Tom Higgins	✓		
New York State Reliability Council (2) Theodore Pappas	✓		
TXU Electric Delivery (1) Travis Besier or Ellis Rankin	✓		

3. Do you believe these standards are more appropriately additions to existing standards as opposed to creating new standards?

Summary Consideration: There was no consensus amongst commenters on this issue. Refinement of this SAR was delayed for a year. During that time other related standards have undergone considerable development, and are on a schedule that would not be improved by the addition of the requirements envisioned with the Frequency Response standard. For these reasons, the drafting team is recommending that the new requirements for Frequency Response be in a new, stand-alone standard.

Commenter	Yes	No	Comment
BPA Bart McManus Brian Tuck James Randall Francis Halpin Bill Mittlestat James Murphy		✓	WECC has been working on frequency response standards for a few years and is close to finalizing standards specifically for the WECC interconnection. We do think there is a need for standardization of frequency response (clearly we do since WECC is doing it) BUT this standard should be developed at the Regional Council or Interconnection level and then adopted by NERC as a "Standard" with regional differences. Any new standards concerning frequency response should be developed by the individual interconnections.
Response: The Resources Subcommittee Frequency Task Force agrees that frequency response is primarily an Interconnection issue and the proposed standard accommodates Interconnection differences both in amounts of response and methodology in calculating response. The SAR's detailed description has been expanded to include broader parameters, including frequency response calculations that are Interconnection-specific. The drafting team believes that stakeholders would prefer the assurance of knowing that NERC is providing oversight to ensure that all Interconnections have a technically sound basis for the development of respective frequency response requirements.			
CAISO (2) Ed Riley Yuri Makarov Steve McCoy		✓	The new standard should a stand-alone standard because of its potential implications for control areas and the necessity to stage the implementation of the standard in coordination with resolution of the issues discussed above.
Response: The Resources Subcommittee Frequency Task Force agrees with this comment.			
Robert Blohm		✓	The SAR acknowledges that the proposed Standard not only is complementary to the Balancing Resources and Demand Standard, but also must be coordinated with that Standard. The two standards could be combined. But that is insufficient reason to oppose development of a separate Frequency Response Standard. Moreover, combining the standards would reverse the great progress made in consensus on the Balancing Resources and Demand Standard.
Response: The Resources Subcommittee Frequency Task Force agrees with this comment.			
MAAC (2) John Horakh		✓	Adding this requirement to another standard would only slow down the progress of both.
Response: The Resources Subcommittee Frequency Task Force agrees with this comment.			
ISO/RTO Standards Review		✓	Unless the Version 0 (BAL-003-0 — Frequency

Commenter	Yes	No	Comment
Committee (2) K. Tammar – NYISO (2) D. McMaster – AESO (2) Ed Riley – CAISO (2) Sam Jones – ERCOT (2) P. Henderson – IESO (2) P. Brandien – ISO-NE (2) B. Phillips – MISO (2) B. Balmat – PJM (2) C. Yeung – SPP (2)			Response and Bias) can be clarified and brought in line with this proposed standard, it should be stand-alone.
Response: The Resources Subcommittee Frequency Task Force agrees with this comment.			
NCPA (4) Les Pereira		✓	A new SAR will be more prescriptive, however there is also need for other related sections in NERC Operating Policy and Planning that need to be modified – see other comments below.
Response: The Resources Subcommittee Frequency Task Force agrees with this comment.			
IESO (2) Pete Henderson		✓	If the existing Frequency Response and Bias Standard Version 0 (Bal-003-0) can not be clarified and brought in line with this proposed standard, it should be standalone.
Response: The Resources Subcommittee Frequency Task Force agrees with this comment.			
MAAC Staff (2) Al DiCaprio – MAAC (2) Joe Willson – MAAC (2) Mark Kuras – MAAC (2)		✓	
Manitoba Hydro (1, 3, 5, 6) Gerald Rheault		✓	
We Energies (3, 4, 5) Howard Rulf		✓	
Calpine (6) James Stanton		✓	
TVA (1) Kathie Davis Larry Akens Mitch Needham Chuck Feagans Ed Forsythe		✓	
FRCC (2) Linda Campbell Ron Donahey – TEC (1) Mark Bennett – GRU (3)		✓	

Commenter	Yes	No	Comment
Steve Wallace – SEC (5) S. McElhaney – FMPA (5) Ted Hobson – JEA (1)			
New York ISO (2) Mike Calimano		✓	
New York State Reliability Council (2) Theodore Pappas		✓	
TXU Electric Delivery (1) Travis Besier or Ellis Rankin		✓	
NPCC CP9, Reliability Standards Working Group Guy V. Zito – NPCC (2) Ralph Rufrano – NYPA (1) K. Goodman – ISONE (2) Al Adamson – NYSRC (2) Bob Pelligrini – UI (1) D. Kiguel – Hydro One (1) P. Lebro – Nat'l Grid (1) R. Champagne – TE (1) B. Hogue – NPCC (2) K. Khan – IESO (2) M. Potishnak – ISONE (2) G. Campoli – NYISO (2)		✓	
Progress Energy – Carolinas (1, 3, 5, 6) Phil Creech	✓		The reliability requirements provided in the proposed standard would be better addressed by a comprehensive review that considers the adequacy of the existing reliability standards (i.e., 300 - Balance Resources and Demand)
Response: Frequency Response was consciously left out of the Balance Resources and Demand (BR&D) standard. We agree that the Frequency Response standard should complement the BR&D standard and believe it does.			
Energy Mark, Inc. (8) Howard Illian	✓		Frequency Response is closely related to the Frequency Bias used in the Balancing Resources and Demand Standard and therefore this standard should be included as an addition to that standard. If it is not included in the BRD Standard, a separate standard would require coordination between the two standards. This would make the process of updating the standards more complex.
Response: The Resources Subcommittee Frequency Task Force acknowledges that if the frequency response requirements and measures were to be included in another standard that the Balance Resources and Demand standards would be the most likely standard(s). The Resources Subcommittee Frequency Task Force is working with the Balance Resources and Demand standard drafting team to ensure that the efforts of both teams are coordinated.			

Commenter	Yes	No	Comment
Alliant Energy (1) Kenneth A. Goldsmith	✓		Version 0 of BAL-003-0, Frequency Response and Bias; or its successor.
Response: The Balance Resources and Demand standard drafting team has a successor version of Frequency Bias posted for review. The Resources Subcommittee Frequency Task Force is working with the Balance Resources and Demand standard drafting team to ensure that the efforts of both teams are coordinated.			
MRO (2) Larry Larson – OTTP Al Boesch – NPPD Terry Bilke – MISO R. Coish – MH Dennis Florom – LES K. Goldsmith – Alliant Todd Gosnell – OPPD W. Guttormson – SaskPwr Jim Maenner – WPS Tom Mielnik – MidAmerican Darrick Moe – WAPA Joe Knight – MRO	✓		Version 0 (BAL-003-0 — Frequency Response and Bias) or its successor is a logical place. Depending on the outcome of the V1 Balance Resource and Demand standard, it could reside there.
Response: : The Balance Resources and Demand standard drafting team has a successor version of Frequency Bias posted for review. The Resources Subcommittee Frequency Task Force is working with the Balance Resources and Demand standard drafting team to ensure that the efforts of both teams are coordinated.			
Southern Company Transmission, Operations, Planning and EMS Divisions (1) Marc Butts Steve Corbin Jim Viikinsalo Jim Griffith Doug McLaughlin Monroe Landrum	✓		The Frequency Response Standard could be included as part of the Balance Resources and Demand Standard. **Comments** Since both the Frequency Response Standard and the Balance Resources and Demand Standard address frequency, they obviously must work together closely. If they are crafted, as originally intended by the Frequency Taskforce, to utilize the same CPS database, there may be savings in administrative overhead in putting them both in the same standard.
Response: The intent is for the Frequency Response Standard to complement the Balance Resources and Demand standards. The Resources Subcommittee Frequency Task Force is working with the Balance Resources and Demand standard drafting team to ensure that the efforts of both teams are coordinated. The 'new' Balance Resources and Demand standards are close to completion and cover related but different topics from those in the proposed Frequency Response SAR. There doesn't seem to be any benefit in stalling the implementation of the new Balance Resources and Demand standards while the technical details of the new Frequency Response standard are developed, tested and then implemented.			
ATC (1) Peter Burke	✓		II.B.S1M5, Test results of speed/load governor controls.

Commenter	Yes	No	Comment
			Comments It may be appropriate to include this standard in the Phase III/IV standards that address speed/load governor controls (II.B.S1M5, Test results of speed/load governor controls). The three following customer demand related standards would be helpful in defining load response to frequency excursions: II.E.S1.M1, Plans for the evaluation and reporting of voltage & Frequency characteristics of customer demands. IIE.S1.M2 Documentation or requirements for determining dynamic characteristics of customer demands. II.E.S1.M3, Customer (dynamic) demand data.
Response: The drafting team will follow the development of the Phase III/IV planning standards under development (MOD-13 and MOD-27) that deal with governors and frequency response to be sure there are no conflicts. The Resources Subcommittee Frequency Task Force believes that a Frequency Response standard could simplify what is proposed in the planning standards if it allowed an on-line calculation of generator response.			
NERC Frequency Task Force Raymond L. Vice, Chairman	✓		The Frequency Response Standard could be included as part of the Balance Resources and Demand Standard. **Comments** Since both the Frequency Response Standard and the Balance Resources and Demand Standard address frequency, they obviously must work together closely. If they are crafted, as originally intended by the Frequency Taskforce, to utilize the same CPS database, there may be savings in administrative overhead in putting them both in the same standard.
Response: The Resources Subcommittee Frequency Task Force's intent is for the Frequency Response Standard to complement the Balance Resources and Demand standards. The 'new' Balance Resources and Demand standards are close to completion and cover related but different topics from those in the proposed Frequency Response SAR. There doesn't seem to be any benefit in stalling the implementation of the new Balance Resources and Demand standards while the technical details of the new Frequency Response standard are developed, tested and then implemented.			
SPP Operating Reliability Working Group Robert Rhodes –SPP (2) Ron Ciesiel – SPP (2) Bob Cochran – SPS (1) Mike Gammon – KCPL (1) Steve Hillman – WPEK (1) Allen Klassen – Westar (1)	✓		We would recommend that this standard be incorporated into the Balance Resource and Demand Standard (Standard 300) or the Version 0 BAL Standard.

Commenter	Yes	No	Comment
Bill Nolte – SECI (1) Mike Stafford – GRDA (1)			
Response: The Resources Subcommittee Frequency Task Force's intent is for the Frequency Response Standard to complement the Balance Resources and Demand standards. The 'new' Balance Resources and Demand standards are close to completion and cover related but different topics from those in the proposed Frequency Response SAR. There doesn't seem to be any benefit in stalling the implementation of the new Balance Resources and Demand standards while the technical details of the new Frequency Response standard are developed, tested and then implemented.			
Southern Co. Generation (6) Roman Carter Tony Reed Joel Dison Lucius Burris Lloyd Barnes Clifford Shepard Terry Crawley Roger Green Tom Higgins	✓		The Frequency Response Standard could be included as part of the Balance Resources and Demand Standard. **Comments** Since both the Frequency Response Standard and the Balance Resources and Demand Standard address frequency, they obviously must work together closely. If they are crafted, as originally intended by the Frequency Taskforce, to utilize the same CPS database, there may be savings in administrative overhead in putting them both in the same standard.
Response: The Resources Subcommittee Frequency Task Force's intent is for the Frequency Response Standard to complement the Balance Resources and Demand standards. The 'new' Balance Resources and Demand standards are close to completion and cover related but different topics from those in the proposed Frequency Response SAR. There doesn't seem to be any benefit in stalling the implementation of the new Balance Resources and Demand standards while the technical details of the new Frequency Response standard are developed, tested and then implemented.			
MISO Terry Bilke	✓		It's not a major issue. It appears it should be include in the Version 0 (BAL-003-0 — Frequency Response and Bias).
Response: The Resources Subcommittee Frequency Task Force's intent is for the Frequency Response Standard to complement the Balance Resources and Demand standards. The 'new' Balance Resources and Demand standards are close to completion and cover related but different topics from those in the proposed Frequency Response SAR. There doesn't seem to be any benefit in stalling the implementation of the new Balance Resources and Demand standards while the technical details of the new Frequency Response standard are developed, tested and then implemented.			
Dick Schulz Chair, IEEE Task Force on Large Interconnected Power System Response to Generation Governing			No comment.
TXU Energy Delivery Roy Boyer			No opinion.

4. Do you have any additional comments regarding the SAR that you believe should be addressed?

Commenter	Yes	No	Comment
MAAC Staff (2) Al DiCaprio – MAAC (2) Joe Willson – MAAC (2) Mark Kuras – MAAC (2)	✓		The SAR requestor has not provided any indication of a reliability problem. Decreasing frequency response is in and of itself not a reliability problem - more evidence is required as to the magnitude of the threat. Any standard that is proposed, regarding frequency response, should consider both generator and load response. If Load response does provide a significant portion of the frequency response (as some people contend) then that resource must be considered in the proposal. In short the standard must make clear whether it is for interconnection response or for balancing area response or for individual generator response and individual load response.
Response: Most commenters indicated that they feel that there is a reliability-related need for a standard to address Frequency Response. The standard is not intended to establish a large set of arbitrary requirements, but will establish the framework to collect the information to make informed engineering decisions. Additional detail has been added to the SAR's Purpose/Industry Need and the Detailed Description. The revised SAR does not specifically consider load response but does state that the proposed standard will include requirements for the Interconnection response, for the installation of governors and for BAs to operate their automatic generation control function on tie-line frequency bias and for BAs to respond to requests for information on frequency response. The revised SAR does not include requirements for generators to provide response and does not address load response.			
BPA Bart McManus Brian Tuck James Randall Francis Halpin Bill Mittlestat James Murphy	✓		Frequency response requirements are likely different for each of the three interconnected regions and a generalized approach will likely not meet WECC needs. The danger here is that a NERC-wide approach may not be compatible with the needs of a regional approach. Standards are currently being developed within WECC to address the frequency response concerns of this interconnection. We feel that if the Eastern Interconnection needs a Frequency Response Standard, they should utilize the NERC Frequency Response Standard Whitepaper to draft an Eastern Interconnection-specific Frequency Response Standard.
Response: The Resources Subcommittee Frequency Task Force agrees that frequency response is primarily an Interconnection issue and the proposed standard accommodates Interconnection differences both in amounts of response and methodology in calculating response. As noted in and earlier response, we would expect some general technical and engineering principles that should be met in order to calculate and evaluate the amount and distribution of frequency response. Additional SAR Detailed Description details have been added. The drafting team believes that stakeholders would prefer the assurance of knowing that NERC is providing oversight to ensure that all Interconnections have a technically sound basis for the development of respective frequency response requirements.			
Manitoba Hydro (1, 3, 5, 6) Gerald Rheault	✓		Below are a few general comments on the SAR: There is general agreement with the statement "reliance on load as the sole support to arrest the frequency can lead to a decline in the reliability of the grid" in paragraph 3, page 4 of the white paper. However enough information is not provided to

Commenter	Yes	No	Comment
			substantiate statements earlier in the paragraph such as, “the turn around in frequency from points C to B attributable to unit governor response has markedly declined and at times is non-existent in the eastern interconnection” and “the line from points C to D is shifting down and becoming horizontal”. In areas where governor response is limited it may be necessary to explore the necessity of earmarking “high-set” blocks of load , as is practiced in ERCOT, to act as a supplementary to governor response. Although it is anticipated that this approach would probably be much more difficult and challenging to co-ordinate in larger areas. There should be careful thought put into the system/interconnection performance targets for frequency response. Perhaps the bar should be higher than preventing UFLS for credible generation loss events, i.e., provide a margin above this level. At the same time the standard should not impose unreasonable costs on entities to demonstrate compliance. The performance target should address both total interconnection response and also area or system response (potential islanding) and be very clear how generator operators (or load) obligations are allocated to achieve the performance targets. NERC should investigate a process to monitor interconnection frequency response to be able to measure performance.
Response: As envisioned, the standard will accommodate special needs of each Interconnection. It will not preclude load from being part of the solution. While not part of the standard, the Resources Subcommittee is pursuing the addition of functionality in the “NERC ACE-Frequency monitoring application” that will identify generator trips and automate the calculation of Interconnection frequency response. Evidence to date indicates that frequency response declines significantly during light load periods, even though the exact mechanism for this is not well defined. Most of the major frequency excursions experienced in the Eastern Interconnection have occurred during the shoulder period of the year during either the early morning or late evening periods.			
NPCC CP9, Reliability Standards Working Group Guy V. Zito – NPCC (2) Ralph Rufrano – NYPA (1) K. Goodman – ISONE (2) Al Adamson – NYSRC (2) Bob Pelligrini – UI (1) D. Kiguel – Hydro One (1) P. Lebro – Nat’l Grid (1) R. Champagne – TE (1) B. Hogue – NPCC (2) K. Khan – IESO (2) M. Potishnak – ISONE	✓		CHANGE This SAR is proposed to develop a standard to measure sub-minute responses to changes in frequency and to set minimum acceptable responses to system these events. TO This SAR is proposed to develop a standard to measure sub-minute responses to changes in frequency and to set minimum acceptable responses to these system events.

Commenter	Yes	No	Comment
(2) G. Campoli – NYISO (2)			
Response: The SAR has been revised and no longer includes this phrase.			
Energy Mark, Inc. (8) Howard Illian	✓		NERC has the responsibility of maintaining reliability on the North American Interconnections. NERC cannot perform that function effectively if it waits for reliability problems to become apparent in system operations before it takes actions to address those problems. NERC must be a forward looking organization that anticipates future reliability problems and takes actions to resolve those problems before they affect interconnection reliability.
Response: The Resources Subcommittee Frequency Task Force agrees with the comments and has made substantial changes to the SAR's Purpose/Industry Needs and the Detailed Description reflecting the industry comments.			
Calpine (6) James Stanton	✓		Given the language in the accompanying White Paper: The standard should not preclude market solutions (e.g. allow purchasing of response as long as deliverability and restoration criteria can be met).There must be a means for sale/purchase of frequency response as for any other quantity. – I believe this Standard should be developed in conjunction with NAESB. The definition, attributes and procurement metrics of the frequency response product will be a critical component of this Standard. Some guidance in defining and developing this service to the bulk interconnected system can be found in the NERC IOS Reference Document. The Standard should build on this previous IOS work.
Response: The Resources Subcommittee Frequency Task Force intent for this proposed standard does not preclude market solutions. Language in the original SAR that referenced markets has been removed and is not in the revised SAR. We hope that the previous IOS work and the related MOD standards will provide balancing authorities a means to obtain frequency response where needed. It is quite possible that NAESB will pick up where the IOS left off.			
MAAC (2) John Horakh	✓		It appears Frequency Response is an accepted term used for this requirement, and therefore might be difficult to change. However, Frequency Response is not a very good description of the requirement. A term such as Transient Generator and Load Response would be more descriptive.
Response: Transient Generator and Load Response probably is a more descriptive than Frequency Response. Note that the focus of the proposed standard would be on generator response, not on load response. . The Resources Subcommittee Frequency Task Force agrees that changing the name from Frequency Response would likely encounter resistance.			
ISO/RTO Standards Review Committee (2) K. Tammar – NYISO (2) D. McMaster – AESO (2) Ed Riley – CAISO (2) Sam Jones – ERCOT (2) P. Henderson – IESO (2)	✓		We appreciate the opportunity to comment and believe there is a need for such a standard. It needs to be recognized that there are two objectives for governor response, namely, to provide response on an interconnection wide basis to maintain an acceptable frequency and secondly to control frequency in island situations. The former may allow for averaging over an area of the response

Commenter	Yes	No	Comment
P. Brandien – ISO-NE (2) B. Phillips – MISO (2) B. Balmat – PJM (2) C. Yeung – SPP (2)			requirement but the latter may limit the extent of averaging. Published studies show frequency response is declining when it should be increasing with load. The main concerns with this decreasing performance are: There may be areas unable to withstand severe disturbances. Following a grid separation or collapse, control areas may be unable to fulfill their blackstart and restoration responsibilities, thereby becoming a burden to neighbors. Because engineering models use theoretical frequency response, they are likely over optimistic and may misstate grid stability limits. This standard would allow the industry to determine whether the decline is local or global. Rather than implementing a complicated infrastructure or process, we would suggest that NERC automate the calculation of frequency response by either: Asking BAs to save their CPS-source data in a common format so a common tool can be used (MAPP BAs and some others use a common tool that can calculate frequency response with CPS-source data). Embed the calculation in the NERC ACE-monitoring application. Refer to our earlier comments the structure of the standard (where lower amounts of BA response trigger an internal assessment rather than automatic assignment of non-compliance). BAs (and ultimately generators) would only be initially non-compliant if their response was low AND the BA failed to perform a reliability assessment in conjunction with its TOP. Non compliance should be assessed if the BA does not alleviate the deficiency within a reasonable timeframe. This default assessment would be at the BA level, but could be on an area basis (likely islanding area or where a TSP has responsibility for frequency responsive and black start ancillary services). The standard should employ a methodology that not only captures initial response (first few seconds after the event) but also the sustained response until AGC action takes over Each Interconnection should have the ability to add and further define the standard to meet its needs.

Commenter	Yes	No	Comment
			Providing visibility on where and when performance is substandard will likely initiate sufficient action to arrest the decline in performance. Minimum performance standards could be implemented after the industry has identified what is reasonably achievable and technically justified.
Response: The Resources Subcommittee Frequency Task Force agrees with these comments as a whole. A envisioned, the standard will measure response for perhaps a minute to ensure response is not withdrawn immediately after it is provided. The proposed standard would not mandate a given amount of response, but would requires an analysis if response were measurably below the norm. The proposed standard would accommodate the simplification ideas you propose, and in fact, if data is saved in a common format, the Resources Subcommittee has a tool that could calculate the BA's performance to the standard. The drafting team agrees that performance requirements must be validated by the industry. As you suggested, a long field test may be needed before justifiable minimum performance standards can be identified.			
MRO (2) Larry Larson – OTTP Al Boesch – NPPD Terry Bilke – MISO R. Coish – MH Dennis Florom – LES K. Goldsmith – Alliant Todd Gosnell – OPPD W. Guttormson – SaskPwr Jim Maenner – WPS Tom Mielnik – MidAmerican Darrick Moe – WAPA Joe Knight – MRO	✓		We appreciate the opportunity to comment and believe there is a need for such a standard. Published studies show frequency response is declining when it should be increasing with load. Because there is no process in place to track BA or Interconnection response, we don't know whether the decline is local or global. Primary concerns with this decreasing performance in primary control: 1. There may be areas unable to withstand severe disturbances. 2. Following a grid separation or collapse, control areas may be unable to fulfill their blackstart and restoration responsibilities, thereby becoming a burden to neighbors. 3. Because engineering models use theoretical frequency response, they are likely overoptimistic and may misstate grid stability limits. Rather than putting in a complicated infrastructure or process, we would suggest that NERC automate the calculation of frequency response by either: • Asking BAs to save their CPS-source data in a common format so a common tool can be used (MAPP BAs and some others use a common tool that can calculate frequency response with CPS-source data). • Embed the calculation in the NERC ACE-monitoring application. The standard will need to acknowledge the large variability in individual responses at each BA due to coincident load changes and amount and mix of generation. In addition, smaller Interconnections likely need greater response. Refer to our earlier comments the structure of the standard

Commenter	Yes	No	Comment
			(where lower amounts of response trigger an internal assessment rather than assessment non-compliance). BAs (and ultimately generators) would only be initially non-compliant if their response was low AND they failed to perform the reliability assessment. Providing visibility on where and when performance is substandard will likely initiate sufficient action to arrest the decline in performance. Minimum performance standards could be implemented after the industry has identified what is reasonably achievable and technically justified. The standard should not preclude market solutions to providing frequency response, but such arrangements would need to be looked at closely to be sure they fulfill reliability needs.
Response: The Resources Subcommittee Frequency Task Force agrees with these comments as a whole. As envisioned, the proposed standard would not mandate a given amount of response, but would require an analysis if response were measurably below the norm. The proposed standard would accommodate the simplification ideas you propose, and in fact, if data is saved in a common format, the Resources Subcommittee has a tool that could calculate the BA's performance to the standard. The Resources Subcommittee Frequency Task Force acknowledges the variability inherent in measuring frequency response. The standard will require capturing sufficient samples to make an objective measurement. The proposed standard does not preclude market solutions. The new requirements may need to be field tested for a long duration before compliance with the requirements is mandatory. As envisioned, the standard does not mandate a specific amount of response, but requires analysis if response is markedly below the norm. Analysis may identify the need for corrective measures and the standard will accommodate the necessary time to make corrections. The references to market solutions that were contained in the original SAR have been removed. NAESB may choose to develop associated business practices.			
NCPA (4) Les Pereira	✓		Two statements are made in the SAR: 1. The purpose of the proposed SAR is to ensure that frequency of the Interconnection remains above underfrequency load shedding setpoints during the transient period following the sudden loss of generation on the Interconnection. 2. Furthermore, it is stated that " In regard to frequency response, one shortcoming of the recommendations in policy today is that there is no guidance regarding how much governor response (in MW) is required at the 5% droop rate." The first is a calculated number and depends not only on the amount of generation tripped, but also the total generation in the Whole Interconnection at the time of trip. Obviously two very different answers will be obtained : one with the Interconnection intact (normal operation) and the second when islanded. Both affect reliability. The second issue has been thoroughly investigated in the WECC and a new Thermal Governor modeling approach has

Commenter	Yes	No	Comment
			been implemented in the WECC after system tests, an exhaustive modeling validation effort and obtaining data from the generator owners. This has been documented in two IEEE Transaction papers described below. These papers present the development of a new turbine-governor modeling approach in WECC that correctly represents thermal units that have demonstrated unresponsive characteristics such as "base loaded" units operated with limiters, or partially responsive units with MW-load-controllers. The May 18th 2001 system trip test for 1250 MW performed with all AGCs off indicated that only about 40% of the governors effectively responded in the real system. If all the governors were responsive the calculated generation pickup for governors with a 5% droop for a 0.1 Hz frequency deviation would be 3185 MW instead of 1250 MW. The new modeling approach has been extensively validated against recordings from three WECC system tests and several large disturbances, and has been approved for use in all operation and planning studies in the WECC. The second paper describes the steps being taken to obtain validated data for the new governor models. The work done by WECC indicate clearly that we do not get the required 5% droop from all units as required by NERC. The modeling approach taken was to model the governors in planning and operating studies exactly as they are being actually operated. Enforcement/compliance of the 5% droop is a separate issue and must be addressed by operating policies. Obviously, the SAR touches upon only part of the problem, but it is a good start and should be expanded. It also needs to be cross-referenced with other areas such as the 5% droop requirement, an effective spinning reserves policy that actually works (see the papers), and the effect on 'governor' powerflow and voltage stability analysis as a result of "unresponsive" governors. The white paper referred by the SAR only touches upon the WECC effort and seems to miss the whole point of the modeling and validation work by the Governor Modeling Task Force in WECC - and what we have achieved in WECC to address realistic modeling of unresponsive governors in the real system. 1. "A New Thermal Governor Modeling Approach in the WECC" by L. Pereira, J. Undrill, D. Kosterev, D. Davies, S. Patterson, *IEEE Trans. Power Systems*, vol. 18, Issue.2, pp. 819-829, May 2003. (*IEEE 2004 prize paper). Presented at Toronto IEEE PES, July 2003.* 2. "New Thermal Governor Model Selection and Validation in the WECC" by Les Pereira, Dmitry

Commenter	Yes	No	Comment
			Kosterev, Donald Davies, and Shawn Patterson - IEEE TPWRS – Vol.19, No.1, pp 517-523, February 2004. *Presented at Denver IEEE PES, July 2004.*
Response: The Resources Subcommittee Frequency Task Force appreciates the significant work that has been done in this area by the WECC and has referenced some of this research in the Whitepaper. We believe the Planning Standards under development (MOD-13 and MOD-27) deal with the detailed governor issues that you have outlined. The Resources Subcommittee Frequency Task Force appreciates the importance of the modeling effort you mention. This standard is not intended to address the modeling issues, but provides the framework and data needed to support the modeling. The SAR was modified to include basic governor requirements.			
FRCC (2) Linda Campbell Ron Donahey – TEC (1) Mark Bennett – GRU (3) Steve Wallace – SEC (5) S. McElhaney – FMPA (5) Ted Hobson – JEA (1)	✓		At this time the FRCC has the highest frequency settings for load shedding in the Eastern Interconnection (southern part of the Region). Being a peninsula and out of necessity, the Region has developed a well coordinated, under-frequency program for extreme frequency excursions. Ambiguity of the requirements, uncertainty of measurement and the lack of benefit to the Region require that the FRCC to oppose this Standard Authorization Request at this time.
Response: The interconnection measure of response is intended as a benchmark and as a validation of BAs' reported performance.			
Southern Company Transmission, Operations, Planning and EMS Divisions (1) Marc Butts Steve Corbin Jim Viikinsalo Jim Griffith Doug McLaughlin Monroe Landrum	✓		We believe that the industry will be exposing the interconnected electrical systems of North America to a significant degree of reliability risk if a Frequency Response Standard similar to the one proposed by this SAR is not adopted. This risk can be mitigated somewhat by the turbine governor requirements of Standard MOD-014-1 from the Phase III/IV Standards SAR, if passed. However, the risk can be managed properly (and in the most economical manner) only on an interconnection/balancing authority basis, not on an individual generator basis as required by Standard MOD-014-1. *What is important is that the interconnections maintain sufficient frequency responsive resources to ensure the stability of interconnection frequency under first contingency conditions. The Frequency Response Standard, as proposed, sets requirements for the management and deployment of frequency responsive resources that achieve this goal without unduly interfering with the on going operation of the interconnection. We strongly urge the industry to support this SAR.*
Response: The Resources Subcommittee Frequency Task Force agrees with these comments.			
New York ISO (2) Mike Calimano	✓		We appreciate the opportunity to comment and believe there is a need for such a standard. Published studies show frequency response is declining when it should be increasing with load. The main concerns with this decreasing performance are:

Commenter	Yes	No	Comment
			There may be areas unable to withstand severe disturbances. Following a grid separation or collapse, control areas may be unable to fulfill their blackstart and restoration responsibilities, thereby becoming a burden to neighbors. Because engineering models use theoretical frequency response, they are likely overoptimistic and may misstate grid stability limits. This standard would allow the industry to determine whether the decline is local or global. Rather than implementing a complicated infrastructure or process, we would suggest that NERC automate the calculation of frequency response by either: Asking BAs to save their CPS-source data in a common format so a common tool can be used (MAPP BAs and some others use a common tool that can calculate frequency response with CPS-source data). Embed the calculation in the NERC ACE-monitoring application. Refer to our earlier comments the structure of the standard (where lower amounts of BA response trigger an internal assessment rather than automatic assignment of non-compliance). BAs (and ultimately generators) would only be initially non-compliant if their response was low AND the BA failed to perform a reliability assessment in conjunction with its TOP. This default assessment would be at the BA level, but could be on an area basis (likely islanding area or where a TSP has responsibility for frequency responsive and black start ancillary services). The standard should employ a methodology that not only captures initial response (first few seconds after the event) but also the sustained response until AGC action takes over Each Interconnection should have the ability to add and further define the standard to meet its needs. Providing visibility on where and when performance is substandard will likely initiate sufficient action to arrest the decline in performance. Minimum performance standards could be implemented after the industry has identified what is reasonably achievable and technically justified.

Commenter	Yes	No	Comment
			CHANGE This SAR is proposed to develop a standard to measure sub-minute responses to changes in frequency and to set minimum acceptable responses to system these events. TO This SAR is proposed to develop a standard to measure sub-minute responses to changes in frequency and to set minimum acceptable responses to these system events.
Response: The Resources Subcommittee Frequency Task Force agrees with these comments as a whole. The proposed standard does not mandate a given amount of response, but requires an analysis if response is measurably below the norm. The proposed standard accommodates the simplification ideas you propose, and in fact, if data is saved in a common format, the Resources Subcommittee has a tool that will calculate the BA's performance to the standard. The Resources Subcommittee Frequency Task Force has added to the Detailed Description requirements that all balancing authorities shall operate their AGC function on tie-line frequency bias and that all balancing authorities shall perform frequency response characteristics surveys when called for by NERC. The Resources Subcommittee Frequency Task Force agrees with the sub-minute responses comment and has made the change. The new requirements may need to be field tested for a long duration before compliance with the requirements is mandatory. A long field test with extensive data collection may be needed before justifiable minimum performance standards can be identified. The references to market solutions that were contained in the original SAR have been removed. NAESB may choose to develop associated business practices. As envisioned, the standard will measure the response for up to 60 seconds to ensure initial response is not withdrawn. The standard will also provide interconnection flexibility. The phrase noted (starting with , 'This SAR. . . ') was removed from the revised SAR.			
IESO (2) Pete Henderson	✓		We appreciate the opportunity to comment and believe there is a need for such a standard. It needs to be recognized that there are two objectives for governor response, namely, to provide response on an interconnection wide basis to maintain an acceptable frequency and secondly to control frequency in island situations. The former may allow for averaging over an area of the response requirement but the latter may limit the extent of averaging. Published studies show frequency response is declining when it should be increasing with load. The main concerns with this decreasing performance are: There may be areas unable to withstand severe disturbances. Following a grid separation or collapse, control areas may be unable to fulfill their blackstart and restoration responsibilities, thereby becoming a burden to neighbors. Because engineering models use theoretical frequency response, they are likely over optimistic and may misstate grid stability limits.

Commenter	Yes	No	Comment
			This standard would allow the industry to determine whether the decline is local or global. Rather than implementing a complicated infrastructure or process, we would suggest that NERC automate the calculation of frequency response by either: Asking BAs to save their CPS-source data in a common format so a common tool can be used (MAPP BAs and some others use a common tool that can calculate frequency response with CPS-source data). Embed the calculation in the NERC ACE-monitoring application. The standard should employ a methodology that not only captures initial response (first few seconds after the event) but also the sustained response until AGC action takes over Providing visibility on where and when performance is substandard will likely initiate sufficient action to arrest the decline in performance. Minimum performance standards could be implemented after the industry has identified what is reasonably achievable and technically justified.
Response: The Resources Subcommittee Frequency Task Force agrees with these comments. We agree that smaller areas need greater response, and this concept will be applied in establishing the initial target responses for the interconnections (the historic response will bear this out). Under the ERO, interconnections can also establish stricter targets. The new requirements may need to be field tested for a long duration before compliance with the requirements is mandatory. A long field test with extensive data collection may be needed before justifiable minimum performance standards can be identified. As envisioned, the standard will measure the response for up to 60 seconds to ensure initial response is not withdrawn. The references to market solutions that were contained in the original SAR have been removed. NAESB may choose to develop associated business practices.			
NERC Frequency Task Force Raymond L. Vice, Chairman	✓		I personally believe that the industry will be exposing the interconnected electrical systems of North America to a significant degree of reliability risk if a Frequency Response Standard similar to the one proposed by this SAR is not adopted. This risk can be mitigated somewhat by the turbine governor requirements of Standard MOD-014-1 from the Phase III/IV Standards SAR, if passed. However, the risk can be managed properly (and in the most economical manner) only on an interconnection/balancing authority basis, not on an individual generator basis as required by Standard MOD-014-1. What is important is that the interconnections maintain sufficient frequency responsive resources to ensure the stability of

Commenter	Yes	No	Comment
			interconnection frequency under first contingency conditions. The Frequency Response Standard, as proposed, sets requirements for the management and deployment of frequency responsive resources that achieve this goal without unduly interfering with the on going operation of the interconnection. I strongly urge the industry to support this SAR.
Response: The Resources Subcommittee Frequency Task Force agrees with these comments.			
Dick Schulz Chair, IEEE Task Force on Large Interconnected Power System Response to Generation Governing			First, I make these comments based on work that I've done principally at American Electric Power Service Corp, before my retirement from there in November 2000, and as founding Chair of the IEEE Task Force on Large Interconnected Power System Response to Generation Governing. These comments are entirely mine, and reflect no views of either body. Second. It appears that the final standard will differ from any single person's opinions. Thus the specific comments below may not prevail. Specific Comment 1: The comment on page 4 of the SAR, "The standard should not preclude market solutions (e.g. allow purchasing of response as long as deliverability and restoration criteria can be met).There must be a means for sale/purchase of frequency response as for any other quantity." is workable only in near-normal operating conditions. But it will fail miserably when there is any islanding condition. An analogy: Several skydivers agree that reserve parachutes are a very good idea, but don't want to invest in 1 reserve each. So they agree that they'll buy one to share among them, so each will be saved by that spare. This means that they will hold hands until they pull their ripcords. Sounded good, until they tried it, and the first guy to pull his cord came unhitched, had a failed main 'chute, and the spare was on someone else. Specific Comment 2: The comment on page 4 of the SAR, "The measurement selected must be accurate and, to the extent practical, easy to implement.' may be met in the Eastern Interconnection by the underway DOE "Eastern Interconnection Phasor Project ' and by the similar WECC measurement systems, commonly called "WAMS". Les Peieira's paper, cited in the White Paper, used the WAMS measurements.
Response: The Resources Subcommittee Frequency Task Force appreciates the comments. The proposed standard does not preclude market solutions. The SAR's intent is to define the proposed standard's scope, the actual detail that you recommend will be developed during the standard drafting phase. The phasor projects in both the Eastern and Western Interconnections may indeed be a source of accurate and time stamped frequency data for this standard's application.			

Commenter	Yes	No	Comment
Southern Co. Generation (6) Roman Carter Tony Reed Joel Dison Lucius Burris Lloyd Barnes Clifford Shepard Terry Crawley Roger Green Tom Higgins	✓		It is believed that the industry will be exposing the interconnected electrical systems of North America to a significant degree of reliability risk if a Frequency Response Standard similar to the one proposed by this SAR is not adopted. This risk can be mitigated somewhat by the turbine governor requirements of Standard MOD-014-1 from the Phase III/IV Standards SAR, if passed. However, the risk can be managed properly (and in the most economical manner) on an interconnection/Balancing Authority basis, not on an individual generator basis as required by Standard MOD-014-1. The governor response in MW for generators is not just dependent on the governor droop and dead-band settings, but on the design of the plant control system (sliding pressure boiler, nuclear pressurized water reactor, etc.). For example, nuclear plant operators must control reactivity changes in the core and generally cannot allow external controls to increase or decrease power levels on demand. This standard should take such factors into account and address frequency & MW response at the Balancing Authority level, not at the individual generator level. What is important is that the interconnections maintain sufficient frequency responsive resources to ensure the stability of interconnection frequency under first contingency conditions. The Frequency Response Standard, as proposed, sets requirements for the management and deployment of frequency responsive resources that achieve this goal without unduly interfering with the on going operation of the interconnection. We support this SAR.
Response: The Resources Subcommittee Frequency Task Force appreciates and supports your comments. As envisioned, the standard will measure response at the Interconnection and Balancing Authority level. Only when a Balancing Authority's response measurably below the norm is additional analysis involved.			
MISO Terry Bilke	✓		Thanks for the opportunity to comment. I hope the SAC puts all comments in perspective. We are in a period where the industry is reluctant to adopt new standards that generate extra work and compliance exposure. The reliability of the Interconnections can benefit with minimal impact to most BAs with a light-handed standard. Rather than implementing a complicated process, why not embed most of the effort in the NERC ACE-monitoring application? Only those BAs with unusually low response would need to drill down and do an internal assessment to determine their ability to withstand disturbances and whether they have responsive resources for blackstart. Knowing where and when performance is substandard will likely arrest the decline in performance. Minimum performance standards could be implemented once the industry has identified

Commenter	Yes	No	Comment
			what is reasonably achievable and technically justified.
Response: The Resources Subcommittee Frequency Task Force agrees with these comments.			
New York State Reliability Council (2) Theodore Pappas	✓		The Standard should define the term "event" in terms of time and frequency deviation. The frequency deviation the event must fall outside the droop deadband.
Response: Response: The Resources Subcommittee Frequency Task Force agrees that there should be clear criteria set for identifying events that will be used in calculating frequency response. The SAR was revised to indicate that the standard will require governors to provide droop characteristics within a specified range (to be determined during standard drafting). At this point, the Resources Subcommittee Frequency Task Force recommends each interconnection set a target excursion size that is used for selection of samples and recommends that the target be at least equal to the traditional 36 mHz deadband.			
CAISO (2) Ed Riley Yuri Makarov Steve McCoy		✓	
TXU Electric Delivery (1) Travis Besier or Ellis Rankin		✓	
Progress Energy – Carolinas (1, 3, 5, 6) Phil Creech		✓	
TXU Energy Delivery Roy Boyer		✓	
Robert Blohm		✓	
SPP Operating Reliability Working Group Robert Rhodes –SPP (2) Ron Ciesiel – SPP (2) Bob Cochran – SPS (1) Mike Gammon – KCPL (1) Steve Hillman – WPEK (1) Allen Klassen – Westar (1) Bill Nolte – SECI (1) Mike Stafford – GRDA (1)		✓	
ATC (1) Peter Burke		✓	
Southern Company Transmission, Operations, Planning and			

Commenter	Yes	No	Comment
EMS Divisions (1) Marc Butts Steve Corbin Jim Viikinsalo Jim Griffith Doug McLaughlin Monroe Landrum			
TVA (1) Kathie Davis Larry Akens Mitch Needham Chuck Feagans Ed Forsythe		✓	
Alliant Energy (1) Kenneth A. Goldsmith		✓	
We Energies (3, 4, 5) Howard Rulf		✓	

When completed, email to: gerry.cauley@nerc.net

Standard Authorization Request Form

Title of Proposed Standard	Frequency Response, version 1
Request Date	4/1/06

SAR Requestor Information		**SAR Type** (Put an 'x' in front of one of these selections)	
Name	Don McInnis (Terry Bilke as substitute for Mr. McInnis)	x	New Standard
Primary Contact	Terry Bilke	☐	Revision to existing Standard
Telephone	(317) 249-5463	☐	Withdrawal of existing Standard
Fax	(317) 249-5994		
E-mail	tbilke@midwestiso.org	☐	Urgent Action

Purpose/Industry Need (Provide one or two sentences)

There is evidence of continuing decline in frequency response in the three Interconnections over the past 10 years, while it should be increasing with increasing load and generation. The Interconnections may have sufficient frequency response for normal operations, however, it is not known how this response is dispersed or at what point it will pose a reliability risk. The proposed standard's intent is to ensure frequency of the Interconnections remains above under-frequency load shedding setpoints during transient period following the sudden loss of generation on the Interconnections. By addressing the requirements for control during the "seconds" timeframe, this proposed standard coordinates with and complements the Balance Resources and Demand standards, which addresses Interconnection frequency control generally 5 minutes and longer. (The whitepaper submitted with the original Frequency Response SAR provides the rationale and justification for this standard.)

Reliability Functions

The Standard will Apply to the Following Functions *(Check box for each one that applies by double clicking the grey boxes.)*		
☒	Reliability Authority	Ensures the reliability of the bulk transmission system within its Reliability Authority area. This is the highest reliability authority.
☒	Balancing Authority	Integrates resource plans ahead of time, and maintains load-interchange-resource balance within its metered boundary and supports system frequency in real time
☐	Interchange Authority	Authorizes valid and balanced Interchange Schedules
☐	Planning Authority	Plans the bulk electric system
☐	Resource Planner	Develops a long-term (>1year) plan for the resource adequacy of specific loads within a Planning Authority area.
☐	Transmission Planner	Develops a long-term (>1 year) plan for the reliability of transmission systems within its portion of the Planning Authority area.
☐	Transmission Service Provider	Provides transmission services to qualified market participants under applicable transmission service agreements
☐	Transmission Owner	Owns transmission facilities
☐	Transmission Operator	Operates and maintains the transmission facilities, and executes switching orders
☐	Distribution Provider	Provides and operates the “wires” between the transmission system and the customer
☒	Generator Owner	Owns and maintains generation unit(s)
☐	Generator Operator	Operates generation unit(s) and performs the functions of supplying energy and Interconnected Operations Services
☐	Purchasing-Selling Entity	The function of purchasing or selling energy, capacity and all necessary Interconnected Operations Services as required
☐	Market Operator	Integrates energy, capacity, balancing, and transmission resources to achieve an economic, reliability-constrained dispatch.
☒	Load-Serving Entity	Secures energy and transmission (and related generation services) to serve the end user

Reliability and Market Interface Principles

Applicable Reliability Principles *(Check boxes for all that apply by double clicking the grey boxes.)*	
☒	1. Interconnected bulk electric systems shall be planned and operated in a coordinated manner to perform reliably under normal and abnormal conditions as defined in the NERC Standards.
☒	2. The frequency and voltage of interconnected bulk electric systems shall be controlled within defined limits through the balancing of real and reactive power supply and demand.
☐	3. Information necessary for the planning and operation of interconnected bulk electric systems shall be made available to those entities responsible for planning and operating the systems reliably.
☐	4. Plans for emergency operation and system restoration of interconnected bulk electric systems shall be developed, coordinated, maintained and implemented.
☐	5. Facilities for communication, monitoring and control shall be provided, used and maintained for the reliability of interconnected bulk electric systems.
☐	6. Personnel responsible for planning and operating interconnected bulk electric systems shall be trained, qualified and have the responsibility and authority to implement actions.
☒	7. The security of the interconnected bulk electric systems shall be assessed, monitored and maintained on a wide area basis.

Does the proposed Standard comply with all of the following Market Interface Principles? *(Select 'yes' or 'no' from the drop-down box by double clicking the grey area.)*
1. The planning and operation of bulk electric systems shall recognize that reliability is an essential requirement of a robust North American economy. Yes
2. An Organization Standard shall not give any market participant an unfair competitive advantage.Yes
3. An Organization Standard shall neither mandate nor prohibit any specific market structure. Yes
4. An Organization Standard shall not preclude market solutions to achieving compliance with that Standard. Yes
5. An Organization Standard shall not require the public disclosure of commercially sensitive information. All market participants shall have equal opportunity to access commercially non-sensitive information that is required for compliance with reliability standards. Yes

Detailed Description (Provide enough detail so that an independent entity familiar with the industry could draft, modify, or withdraw a Standard based on this description.)

The proposed standard will require or provide the following:

- A technically-sound calculation and report of Balancing Authority and Interconnection frequency response.
- Flexibility to meet specific needs of each Interconnection.
- Will require Balancing Authority and Regional analysis if response is measurably below the Interconnection norm.
- An objective measure of the Balancing Authority's and Interconnection's sub-minute response to changes in frequency.
- The standard will accommodate both fixed and variable bias.
- Will not mandate a given amount of frequency response, but will provide long-term Interconnection target levels for average response to frequency excursions, performance below which triggers Balancing Authority and Regional Reliability Organizations evaluation and analysis.
    - Reasonable time to make corrections, if analysis show a Balancing Authority needs additional frequency response.
- Balancing Authorities to operate their automatic generation control function on tie-line frequency bias.
- Balancing Authorities to perform frequency response characteristic surveys when called for by NERC.
- Generator owners to equip generating units with nameplate ratings of 10 MW or greater, with a governor capable of providing immediate and sustained response to frequency deviations.
    - Governors shall provide droop characteristics within a specified range (to be determined during standard drafting.
    - Governors shall, as a minimum, respond to frequency deviations with a deadband not to exceed a specific limit (to be determined during standard drafting).
- Generator owners seeking exception to the governor requirements to provide specific information (to be determined during standard drafting) to their Balancing Authority and Regional Reliability Organization.

Related Standards

Standard No.	Explanation
BAL-001-0 through BAL-006-0	Balancing Standards, version 0
Balance Resources and Demand draft standards	Balancing Resources and Demand BAL-007 through BAL-012 draft standards, are in standards development process
MOD-013-0	The proposed standard would enable better input data to the modeling standards.

Related SARs

SAR ID	Explanation
MOD-027	Verification and Status of Generator Frequency Response. The proposed standard would provide a mechanism to validate compliance with MOD-027. The proposed standard could also provide a means to achieve MOD-027 (if the Balancing Authority implements on on-line measurement of generator frequency using SCADA data).

Regional Differences

Region	Explanation
ECAR	
ERCOT	Single Balancing Authority Interconnections calculate Frequency Response based on the change in generation (or load) rather than Tie-Line deviation (ERCOT).
FRCC	
MAAC	
MAIN	
MAPP	
NPCC	
SERC	
SPP	
WECC	

NORTH AMERICAN ELECTRIC RELIABILITY COUNCIL

Princeton Forrestal Village, 116-390 Village Boulevard, Princeton, New Jersey 08540-5731

April 4, 2006

TO: REGISTERED BALLOT BODY

Ladies and Gentlemen:

Announcement
Comment Periods, Ballot Pool, and Drafting Team Self-nominations Open April 4

The Standards Authorization Committee (SAC) announces the following standards actions:

Reliability Standards Process Manual Posted for 45-day Comment Period (April 4–May 18, 2006)

The *Reliability Standards Process Manual* was revised to align with NERC's electric reliability organization application and to make modifications based on 'lessons learned'. Several of the changes are to 'basic tenets' and, in accordance with the latest version of the *Reliability Standards Process Manual*, must go through a full review and approval process. Please use the comment form to provide comments on the changes to the manual.

One of the proposed changes to the reliability standards process is to move the responsibility for development of compliance information from standard drafting teams to the compliance program. The proposed Compliance Elements Development Process and an associated comment form are posted for review and comment.

Nominations for Reliability Standards Process Manual Drafting Team Open (April 4–18, 2006)

The SAC is soliciting drafting team members to respond to stakeholder comments on the proposed changes to the *Reliability Standards Process Manual*. If you are interested in volunteering for this drafting team, please submit the nomination form by April 18, 2006.

Ballot Pool for Reliability Standards Process Manual Open (April 4)

A ballot pool has been created in anticipation of voting on the proposed changes to the *Reliability Standards Procedure Manual*. The ballot pool is available for any ballot body member to join until the respective ballot is opened.

Two Phase III & IV Standards Posted for 30-day Comment Period (April 4–May 3, 2006)

Two of the Phase III & IV standards were revised based on stakeholder comments and are being re-posted for a fourth comment period. Please use the comment form to provide comments on these two standards:

PRC-002-1 Define Regional Disturbance Monitoring and Reporting Requirements requires regions to establish requirements for installation of disturbance monitoring equipment and reporting of disturbance data to facilitate analyses of events.

PRC-018-1 Disturbance Monitoring Equipment Installation and Data Reporting requires entities to install Disturbance Monitoring Equipment and report disturbance data to facilitate analyses of events.

One SAR Posted for 30-day Comment Period (April 4–May 3, 2006)

A revised SAR for Frequency Response is posted for a 30-day comment period. The SAR proposes adding requirements to ensure frequency of the Interconnections remains above underfrequency load shedding set points during transient periods following the sudden loss of generation. Please use the comment form to provide comments on this SAR.

Standards Development Process

The NERC posting and balloting procedures are described in the *Reliability Standards Process Manual*, which contains all the procedures governing the standards development process. The success of the NERC standards development process depends on stakeholder participation. We extend our thanks to all those who participate.

Please send questions to Maureen Long at maureen.long@nerc.net, or call 813-468-5998.

Sincerely,

Maureen E. Long

Maureen E. Long
Standards Process Manager

cc: Registered Ballot Body Registered Users
Standards Group
NERC Roster

Comment Form for Second Posting of Frequency Response SAR

Please use this form to submit comments on the second draft of the Frequency Response SAR. Comments must be submitted by **May 3, 2006**. You must submit the completed form by emailing it to sarcomm@nerc.com with the words "Frequency Response" in the subject line. If you have questions please contact Maureen Long at maureen.long@nerc.net or 813-468-5998.

ALL DATA ON THIS FORM WILL BE TRANSFERRED AUTOMATICALLY TO A DATABASE.

DO: **Do** enter text only, with no formatting or styles added.
Do use punctuation and capitalization as needed (except quotations).
Do use more than one form if responses do not fit in the spaces provided.
Do submit any formatted text or markups in a separate WORD file.

DO NOT: **Do not** insert tabs or paragraph returns in any data field.
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Individual Commenter Information **(Complete this page for comments from one organization or individual.)**		
Name:	Baj Agrawal	
Organization:	Arizona Public Service Co.	
Telephone:	602-371-6386	
E-mail:	bagrawal@apsc.com	
NERC Region		**Registered Ballot Body Segment**
☐ **ERCOT** ☐ **FRCC** ☐ **MRO** ☐ **NPCC** ☐ **RFC** ☐ **SERC** ☐ **SPP** ☒ **WECC** ☐ **NA – Not Applicable**	☒	1 — Transmission Owners
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	☐	7 — Large Electricity End Users
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Group Comments (Complete this page if comments are from a group.)

Group Name:

Lead Contact:

Contact Organization:

Contact Segment:

Contact Telephone:

Contact E-mail:

Additional Member Name	Additional Member Organization	Region*	Segment*

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Insert a "check" mark in the appropriate boxes by double-clicking the gray areas.

1. Do you agree that comments from the first posting of the SAR were adequately addressed?

   ☐ Yes

   ☐ No

   Comments:

2. Do you agree with the list of proposed requirements included in the detailed description of the revised SAR?

   ☐ Yes

   ☒ No

   The requirements on individual generator are unnecessary. The requirements should be on a group of generators in a control area to achieve a desired response. Thus, one could have some generators which are being operated as non responsive and the others which are responding well to offset for those which are not responsive.

   Additionally, the 10 MW size requirements are too restrictive and unnecessary. It should be plant based and should apply to plants of 100 MW or more aggregate capacity. In any realistic scenario, the smaller plants are not expected to contribute much to frequency response and hence subjecting them to frequency response requirements is uneconomic.

   Comments:

3. Do you agree that the proposed standard(s) would be applicable to the Reliability Coordinator, Balancing Authority, Generator Owner, and Load-serving Entity?

   ☐ Yes

   ☐ No

   Comments:

4. The current standard on Bias requires a Balancing Authority to carry a minimum bias equal to 1% of peak load. As an example, in the Eastern Interconnection, this value is double current natural frequency response. Should the standard provide an incentive, such that a Balancing Authority can use a bias equal to their natural response, but less than 1% of peak, if the response is above an acceptable target?

   ☐ Yes

   ☐ No

   Comments:

5. Several commenters suggested response should be measured for an extended period after a frequency excursion, up to the point where automatic generation control (AGC) would take over. This was to ensure initial response wasn't withdrawn prematurely. Should the standard measure out to 60 seconds following an excursion?

   ☐ Yes

   ☒ No

   Most of the frequency recovery happens in first 30 seconds. Thus anything more than 30 seconds is unnecessary. It is also seen that the response of a unit varies greatly within that 30 seconds period. Thus, it is very important that the measured response be the average response over the 30 seconds period and not be the response at 30 seconds.

   Comments:

6. Do you have other comments on the SAR?

   Comments:

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Individual Commenter Information **(Complete this page for comments from one organization or individual.)**		
Name:	Anita Lee	
Organization:	AESO - Alberta Electric System Operator	
Telephone:	403 539 2497	
E-mail:	anita.lee@aeso.ca	
NERC Region		**Registered Ballot Body Segment**
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Group Comments (Complete this page if comments are from a group.)

Group Name:

Lead Contact:

Contact Organization:

Contact Segment:

Contact Telephone:

Contact E-mail:

Additional Member Name	Additional Member Organization	Region*	Segment*

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   ☒ Yes

   ☐ No

   Comments:

2. Do you agree with the list of proposed requirements included in the detailed description of the revised SAR?

   ☐ Yes

   ☒ No

   The purpose is definitely suggested for under frequency conditions. However, when specifying that the generators shall have governors with droop etc... the role of the governor is for both high and low frequency conditions and not just underfrequency FRR. In a market environment it is very possible that not every generator will provide FRR services. Thus, the governor and governor deadband should be a requirement to interconnect to a power system. Generators that provide FRR shall have responsive governor and prime mover.

   The standard is based on balancing area response which will include generators and in some jurisdications will include load. So is the intent that whatever load is considered, additional FRR resources such as generators are used to provide the required FRR?

   What about load as FRR providers? Some industrial facilities are capable to dynamically vary the load of the facility to frequency (ie virtual governor). The standard should apply to FRR providers which can be generators and loads.

   We agree that generator owners have an obligation to have working governors or provide explanations why not. The "10 MW" requirement should be evaluated for consistency with other standards. This should not hold up the progress of the SAR, but should be evaluated by the ultimate standard drafting team. Comments:

3. Do you agree that the proposed standard(s) would be applicable to the Reliability Coordinator, Balancing Authority, Generator Owner, and Load-serving Entity?

☒ Yes

☒ No

The Generator Operator may also have some responsibilities, such as the selection of control modes.

We're not sure what the LSE can do regarding the standard. They cannot control response from load. The exception may be coordination of frequency response with UFLS.

Planners may have some responsibilities with regard to new interconnections and also using observed frequency response in models as opposed to theoretical response. Comments:

4. The current standard on Bias requires a Balancing Authority to carry a minimum bias equal to 1% of peak load. As an example, in the Eastern Interconnection, this value is double current natural frequency response. Should the standard provide an incentive, such that a Balancing Authority can use a bias equal to their natural response, but less than 1% of peak, if the response is above an acceptable target?

   ☒ Yes

   ☐ No

   There should be a safeguard in place, such that if frequency performance declines, the industry reverts to the 1% minimum. Comments:

5. Several commenters suggested response should be measured for an extended period after a frequency excursion, up to the point where automatic generation control (AGC) would take over. This was to ensure initial response wasn't withdrawn prematurely. Should the standard measure out to 60 seconds following an excursion?

   ☒ Yes

   ☐ No

   Sixty seconds is a reasonable balance to capture the period prior to AGC response. Comments:

6. Do you have other comments on the SAR?

   No Comments:

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Organization:		
Telephone:		
E-mail:		
NERC Region		**Registered Ballot Body Segment**
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Group Comments (Complete this page if comments are from a group.)	
Group Name:	CP9, Reliability Standards Working Group
Lead Contact:	**Guy V. Zito**
Contact Organization:	**Northeast Power Coordinating Council**
Contact Segment:	**2**
Contact Telephone:	**212-840-1070**
Contact E-mail:	**gzito@npcc.org**

Additional Member Name	Additional Member Organization	Region*	Segment*
Kathleen Goodman	ISO-New England	NPCC	2
Ed Thompson	ConEdison	NPCC	1
Peter Lebro	National Grid US	NPCC	1
Al Adamson	New York State Rel. Council	NPCC	2
Bill Shemley	ISO-New England	NPCC	2
Ron Falsetti	The IESO, Ontario	NPCC	2
Murale Gopinathan	Northeast Utilities	NPCC	2
Ralph Rufrano	New York Power Authority	NPCC	1
Roger Champagne	TransEnergie HydroQuebec	NPCC	1
David Kiguel	Hydro One Networks	NPCC	2
Greg Campoli	New York ISO	NPCC	2
Jim Ingleson	New York ISO	NPCC	2
Alden Briggs	New Brunswick System Operator	NPCC	2
Donald Nelson	MA Dept of Tel. and Energy	NPCC	9
Guy Zito	Northeast Power Coor. Council	NPCC	2

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1. Do you agree that comments from the first posting of the SAR were adequately addressed?

   ☐ Yes

   ☒ No

   No - The intent of this SAR is unclear which highlights that this issue requires additional studies and investigation. In the future, it may be beneficial to develop a standard after a reliabliity issue is identified, and a specific standard can be developed and implemented to address the issue.
   Comments:

2. Do you agree with the list of proposed requirements included in the detailed description of the revised SAR?

   ☐ Yes

   ☒ No

   The proposed requirements nor the White Paper adequately make the case that there is a need for a frequency response standard at this time. However, it is recommended that the subject be further investigated. The analysis should evaulate if a frequency response standard that addresses the three major short term frequency control components (inertial response, governor response, and automatic generation control) are required. The report writers should include a broad range of participants including (at least) 3 OEM's (original equipment manufacturers) representing steam, gas and hydro generation control. Some specific issues that should be addressed are:

   1. Inertial Response: Evaluate historical changes in the inertial response of the electric grid as a result of changing power equipment designs and types of load. For example, the addition of new industrial and aero-derivative turbine-generators have lower inertia-power ratios than tranditonal nuclear/fossil units and, in addition, they are not base loaded (as a result of more efficient dispatching and improved power plant controls).

   3. Governor Response: Evaulate generation governor performance as a result of newer, more configurable prime mover controls. Digital controls provide increased plant reliability, however, this may be at the expense of decreased governor response. For example, the use of main steam pressure controls on steam units and low NOx controls on gas turbines may produce unexpected droop output responses.

   3. Automatic Generation Control (AGC): Perform a control area survey to determine if there is sufficient regulation capacity within control areas to maintain generation and load balance. Include a review of incentives and

penalties for generators to respond accurately and reliably to AGC signals.
Comments:

3. Do you agree that the proposed standard(s) would be applicable to the Reliability Coordinator, Balancing Authority, Generator Owner, and Load-serving Entity?

   ☒ Yes

   ☐ No

   If required. Comments:

4. The current standard on Bias requires a Balancing Authority to carry a minimum bias equal to 1% of peak load. As an example, in the Eastern Interconnection, this value is double current natural frequency response. Should the standard provide an incentive, such that a Balancing Authority can use a bias equal to their natural response, but less than 1% of peak, if the response is above an acceptable target?

   ☐ Yes

   ☐ No

   Comments:

5. Several commenters suggested response should be measured for an extended period after a frequency excursion, up to the point where automatic generation control (AGC) would take over. This was to ensure initial response wasn't withdrawn prematurely. Should the standard measure out to 60 seconds following an excursion?

   ☐ Yes

   ☒ No

   This question is not clear. AGC control pulses generation every 5 seconds, therefore, the measurement should be based on the amount of time it takes to restore the generation load balance. Comments:

6. Do you have other comments on the SAR?

   Comments:

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Name:		
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NERC Region		**Registered Ballot Body Segment**
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Comment Form for Second Posting of Frequency Response SAR

Group Comments (Complete this page if comments are from a group.)	
Group Name:	PJM - Corporate Development Division
Lead Contact:	**Albert DiCaprio**
Contact Organization:	**PJM**
Contact Segment:	**2**
Contact Telephone:	**610 - 666 - 8854**
Contact E-mail:	**dicapram@PJM.com**

Additional Member Name	Additional Member Organization	Region*	Segment*
Joseph D. Willson	PJM	RFC	2
Mark Kuras	PJM	RFC	2

*If more than one Region or Segment applies, indicate the best fit for the purpose of these comments. Regional acronyms and segment numbers are shown on the prior page.

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Insert a "check" mark in the appropriate boxes by double-clicking the gray areas.

1. Do you agree that comments from the first posting of the SAR were adequately addressed?

   ☐ Yes

   ☒ No

   The Resources Subcommittee in a response to the first draft states "A primary purpose of this standard is to collect information so informed decisions can be made before there is a problem." It is clear from that reply that the Resources Subcommittee wishes to undertake an analysis of the system and needs to collect additional information. This data collection effort may be laudable but it does not rise to the level of being a federally enforced mandatory standard. What if later on the 'data' were to show there is no problem, then there will be a need to rescind the standard and repay those who were non-compliant to a data collection effort.

   In their response to the first draft, the Resources Subcommittee cite a WECC study. But they have no similar study for the East. The Resources Subcommittee still has not shown that the decrease in sub-minute response is either (1) a problem or (2) nothing more than an indication that a larger system has more inertia and therefore less response that the smaller system in the past.

   This SAR, with its present theoretical focus, posits the BA as the responsible entity for governor response. Even those who agreed with the first posting that Frequency Response is an important issue - stated that a standard cannot define fixed norms (MRO, NYISO, IESO(2)). The BA is not responsible to instantaneous response -at best it can establish a capacity obligation but it can't guarantee continuous response.

   Comments:

2. Do you agree with the list of proposed requirements included in the detailed description of the revised SAR?

   ☐ Yes

   ☒ No

   The SAR is still not clear about what is to be developed in the standard. Of the ten bulleted items several seem to show a misunderstanding between a sub-minute frequency response obligation and Automatic Generation control. The RS must make clear what it wants to do. Sub-minute frequency response occurs with or without frequency bias; sub-minute frequency response is not helped or hurt by having AGC. This is a major problem with the proposal. It is not clear and it is not definitive.

Item 1 indicates the standard will be a Report

Item 2 states the standard will be flexible (that is mandated in the Process Manual)

Item 3 seems to indicate that non-compliance will be met with a requirement to analyze the incident (if this is standard is so important why isn't every event critical?)

Item 5 is the most unusual - the standard will not mandate a response but will provide "LONG-TERM" targets (how is it that a sub-minute response gets translated into a long-term target?)

Item 6 is to mandate AGC. This is not related to sub-minute frequency response.

Item 7 is to mandate a post-incident survey. Again this is a good idea but it a data collection mandate - it is not a frequency response standard. The RS has the tools to collect that information today, without the need to resort to mandatory penalties.

Item 10 will allow generators to seek exceptions (which means that the RS will allow a generator to opt out and still require the BA to comply. In the absurd case that all generators opt out (let's say the BA has only nuclear units) then according to the RS, the BA is held non-compliant. This is just not a good idea.

In summary: #1 is a calculation and report on response but no measure of performance; #3 requires a BA and the RRO to perform an analysis if response is measurable (by what amount) below the norm (which is a constantly moving value); #4 is the only possibility for true standard; #9 generators must have governors is more a certification issue than a BA standard. Three of the bullets are not requirements (#2, #5, and #10). Two of the bullets are already in other standards while two of the bullets duplicate each other. The SAR team needs to better describe exactly what is being proposed to be in the standard so that the industry can evaluate the proposal. The industry does not need to get involved in a research project. Comments:

3. Do you agree that the proposed standard(s) would be applicable to the Reliability Coordinator, Balancing Authority, Generator Owner, and Load-serving Entity?

   ☐ Yes

   ☒ No

   This question would require an assumption of what the standard would be. If the standard is to provide sub-minute frequency response, then the only entity should be the generator owner.

   Comments:

4. The current standard on Bias requires a Balancing Authority to carry a minimum bias equal to 1% of peak load. As an example, in the Eastern Interconnection, this value is double current natural frequency response. Should the standard provide an incentive, such that a Balancing Authority can use a bias equal to their

natural response, but less than 1% of peak, if the response is above an acceptable target?

☐ Yes

☒ No

The RS again is avoiding the issue of what sub-minute frequency response it MUST mandate. The 1% is related to the frequency bias setting (basically a long term average response). The BRD deals with the longer term issue of frequency response - this standard was designed for the shorter-term response.

If the RS is willing to accept under-biased systems then it would seem to be going against conventional wisdom, and should explain why it would even consider such an idea. If the real intent of this frequency SAR is to establish a minimum frequency response value then the SAR needs to state that.

Perhaps the SAR should establish a minimum 1 minute response for every generator (if they can't provide it they are obligated to contract for it from another unit) and maybe a 1 minute average over a week, month, or year if a longer term value is needed. However, since the SAR authors state the problem is sub-minute response, it is suggested that the long term response is better be addressed by the BRD standard.

In addition the SAR does not adequately address the load portion of the frequency response. The standard seems to presuppose the solution is having governors.

Comments:

5. Several commenters suggested response should be measured for an extended period after a frequency excursion, up to the point where automatic generation control (AGC) would take over. This was to ensure initial response wasn't withdrawn prematurely. Should the standard measure out to 60 seconds following an excursion?

   ☐ Yes

   ☒ No

   Unsure as to what is being suggested here. The SAR drafters need to be specific about what requirements are needed and how they will be measured. The details contained in the white paper are supporting information but they do not define the standard that is being proposed. Comments:

6. Do you have other comments on the SAR?

   Please be clear about the terminology. Frequency response comes in many flavors - sub-minute; several minutes; and hours. The RS seems to touch on all of them in this proposal.

   Comments:

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Group Comments (Complete this page if comments are from a group.)	
Group Name:	Midwest Reliability Organization (MRO)
Lead Contact:	**Terry Bilke**
Contact Organization:	**Midwest ISO**
Contact Segment:	**2**
Contact Telephone:	**317-249-5463**
Contact E-mail:	**tbilke@midwestiso.org**

Additional Member Name	Additional Member Organization	Region*	Segment*
Al Boesch	NPPD	MRO	2
Robert Coish	MHEB	MRO	2
Dennis Florom	LES	MRO	2
Ken Goldsmith	ALT	MRO	2
Todd Gosnell	OPPD	MRO	2
Wayne Guttormson	SPC	MRO	2
Darrick Moe, Chair	WAPA	MRO	2
Tom Mielnik	MEC	MRO	2
Pam Oreschnick	XEL	MRO	2
Dick Pursley	GRE	MRO	2
Dave Rudolph	BEPC	MRO	2
Jim Maenner	WPS	MRO	2
Joe Knight, Secretary	MRO	MRO	2
27 Additional MRO Members	Companies Not Named Above	MRO	2

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   ☒ Yes

   ☐ No

   Comments:

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   ☒ Yes

   ☐ No

   In particular we agree that generator owners have an obligation to have working governors or provide explanations why not. The 10 MW requirement should be evaluated for consistency with other standards. This should not hold up the progress of the SAR, but should be evaluated by the ultimate standard drafting team. Comments:

3. Do you agree that the proposed standard(s) would be applicable to the Reliability Coordinator, Balancing Authority, Generator Owner, and Load-serving Entity?

   ☒ Yes

   ☐ No

   The Generator Operator may also have some responsibilities, such as the selection of control modes.

   We're not sure what the LSE can do regarding the standard. They cannot control response from load. The exception may be coordination of frequency response with UFLS.

   Planners may have some responsibilities with regard to new interconnections and also using observed frequency response in models as opposed to theoretical response. Comments:

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☒ Yes

☐ No

There should be a safeguard in place, such that if frequency performance declines, the industry reverts to the 1% minimum. Comments:

5. Several commenters suggested response should be measured for an extended period after a frequency excursion, up to the point where automatic generation control (AGC) would take over. This was to ensure initial response wasn't withdrawn prematurely. Should the standard measure out to 60 seconds following an excursion?

   ☒ Yes

   ☐ No

   This is a significant issue, because if the governor system withdraws the unit's support prior to the recovery of frequency, this does have a problematic impact. A period of at least 60 seconds should be considered, and 60 seconds may not be adequate as often frequency recovery of the interconnection extends beyond the initial 60 seconds. Comments:

6. Do you have other comments on the SAR?

   Comments:

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Individual Commenter Information **(Complete this page for comments from one organization or individual.)**		
Name:	Ron Falsetti	
Organization:	IESO	
Telephone:	905-855-6187	
E-mail:	ron.falsetti@ieso.ca	
NERC Region		**Registered Ballot Body Segment**
☐ **ERCOT** ☐ **FRCC** ☐ **MRO** ☒ **NPCC** ☐ **RFC** ☐ **SERC** ☐ **SPP** ☐ **WECC** ☐ **NA – Not Applicable**	☐	1 — Transmission Owners
	☒	2 — RTOs, ISOs, Regional Reliability Councils
	☐	3 — Load-serving Entities
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	☐	5 — Electric Generators
	☐	6 — Electricity Brokers, Aggregators, and Marketers
	☐	7 — Large Electricity End Users
	☐	8 — Small Electricity End Users
	☐	9 — Federal, State, Provincial Regulatory or other Government Entities

Group Comments (Complete this page if comments are from a group.)

Group Name:

Lead Contact:

Contact Organization:

Contact Segment:

Contact Telephone:

Contact E-mail:

Additional Member Name	Additional Member Organization	Region*	Segment*

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1. Do you agree that comments from the first posting of the SAR were adequately addressed?

   ☒ Yes

   ☒ No

   Yes, with respect to the responses to the IESO's comments. However, the revised SAR appears to get somewhat mixed up between sub-minute frequency response performance with a longer term (> 1 minute) performance, and lacks clarity on what the proposed standard is intended to stipulate.

   Is the proposed standard intended to stipulate:

   (a) a minimum frequency response performance level with which to determine if follow-up analysis is to be conducted, or,

   (b) requirements for calculating, measuring, reporting and analyzing frequency response, or,

   (c) both, in addition to,

   (d) requirements for generators to be equipped with governors and if so, the target to be responding to?

   If (a) is not specified in the standard, we see a difficulty in stipulating the threshold for (b) and the target for (d).

   From the SDT's response to our previous comments ("The new requirements may need to be field tested for an extended duration before compliance with the requirements becomes mandatory. A long field test with extensive data collection may be needed before justifiable minimum performance standards can be identified"). It is our belief the standard is intended to stipulate (b) only. We see this as a necessary first step. However, it may then beg the question of the need of having a standard to develop the basis for a future standard. Might there not be other alternatives to achieve (b) such as by means of a request from the standing committees or NERC to the BAs and the regions to compile this information? Comments:

2. Do you agree with the list of proposed requirements included in the detailed description of the revised SAR?

   ☐ Yes

   ☒ No

   The intent of some of the requirements is again unclear to the IESO, for example.

(i) Does Bullet #2 mean the flexibility in the calculation and reporting process or in the target/minimum frequency response level?

(ii) Assuming Bullet #4 a requirement, and one which relates to the minimum level of frequency response, how is this requirement stipulated at this time while data collection and follow-up analysis are to be proposed as standard requirements and field testing has yet to commence? Same comment applies to Bullet #9.

(iii) Bullet #6 appears to go beyond the sub-minute time frame. Further, we are unable to understand the leading sentence "Will not mandate a given amount of frequency response". We feel it is important that if poor frequency response performance in the sub-minute time frame is to be assessed and improved, specific target which may well be the minimum amount of frequency recovery would need to be stipulated.

(iv) Bullet #7 also appears to be beyond the sub-minute time frame, which is to mandate AGC but which should be covered by other BAL standards.

(v) Bullets #8 and #1 appear to be the main requirements for the proposed standard that are achievable at this time.

(vi) As mentioned in (ii) above, we are unable to visualize how the range and target of response be stipulated in the standard before Bullets #1 and #8 are implemented.

(v) If generators are allowed to seek exception, the standard should provide some basic premise that bounds the exception cases rather than leaving the door wide open and the decision solely to the judgment of the BAs and RROs.
Comments:

3. Do you agree that the proposed standard(s) would be applicable to the Reliability Coordinator, Balancing Authority, Generator Owner, and Load-serving Entity?

   ☐ Yes

   ☒ No

   Not having a good handle on what the standard is intended to achieve and stipulate, we are unable to comment on whom the standard should apply to. Among the ones included in the question, we are unclear on the role of the RC in requiring anyone to install devices or take actions to improve frequency response in day to day operation.

   Comments:

4. The current standard on Bias requires a Balancing Authority to carry a minimum bias equal to 1% of peak load. As an example, in the Eastern Interconnection, this value is double current natural frequency response. Should the standard provide an incentive, such that a Balancing Authority can use a bias equal to their natural response, but less than 1% of peak, if the response is above an acceptable target?

   ☐ Yes

☒ No

(i) The question seems to get the sub-minute and longer-term targets intertwined. We are unclear on which "standard be provided an incentive". Is it the proposed sub-minute standard which has yet to be determined or the current standard on Bias? If it is the former, then this question seems a bit premature as we don't even know what the performance target for sub-minute response should be. If it's the latter, then the issue belongs to other BAL standards.

Comments:

5. Several commenters suggested response should be measured for an extended period after a frequency excursion, up to the point where automatic generation control (AGC) would take over. This was to ensure initial response wasn't withdrawn prematurely. Should the standard measure out to 60 seconds following an excursion?

   ☒ Yes

   ☐ No

   This should cover the entire spectrum of immediate response before AGC kicks in. Comments:

6. Do you have other comments on the SAR?

   (i) The SAR does not address the load portion of the frequency response but it indicates that the standard would apply to the LSEs as well. Please clarify or eliminate LSE from the Reliability Function check list.

   (ii) We feel that the SAR needs to be very clear on what the proposed standard is intended and what will be included. Conducting calculation, measuring and report on frequency excursion events followed by analysis would help to ascertain whether or not poor performance exists. However, the determination of poor performance also relies on having a minimally acceptable level to gauge. If the standard is to provide requirements for calculation, reporting and conducting analysis only, then there needs to be some general guideline on the threshold for reporting and analyzing, which in turn begs the question of should this "guideline" be included as the initial standard, whose compliance would not be enforced until sufficient experience has been gained and field test conducted, with possible revision as experience and field test so suggest. Absent a minimum performance level, the requirements for governor setting would be difficult to determine. Comments:

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Individual Commenter Information **(Complete this page for comments from one organization or individual.)**		
Name:	Howard F. Illian	
Organization:	Energy Mark, Inc.	
Telephone:	847-913-5491	
E-mail:	howard.illian@energymark.com	
NERC Region		**Registered Ballot Body Segment**
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Group Name:

Lead Contact:

Contact Organization:

Contact Segment:

Contact Telephone:

Contact E-mail:

Additional Member Name	Additional Member Organization	Region*	Segment*

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Insert a "check" mark in the appropriate boxes by double-clicking the gray areas.

1. Do you agree that comments from the first posting of the SAR were adequately addressed?

   ☐ Yes

   ☒ No

   There is an expectation apparent in the first set of responses that indicates that the drafting team believes they have more knowledge of the solutions that will be required than the final standard will contain. The two greatest areas of insufficient understanding lie in the measurement of Frequency Response at less than the full interconnection level and the effect of the standard as envisioned on markets. These two problems are addressed in the comments to later questions in this comment form. Comments:

2. Do you agree with the list of proposed requirements included in the detailed description of the revised SAR?

   ☐ Yes

   ☒ No

   Requirements that apply to individual generators cannot be implemented as indicated in the standard without failing to comply with Market Interface Principle 2. Frequency Response (Governor Response) have economic costs associated with standing ready to supply. These costs have been documented in EPRI Reports on Ancillary Services. If any generator is given an exception to not provide a response, that generator will also be given a market advantage resulting from the savings they will receive by not providing a response. The SAR as currently written will create a market advantage for all generators below 10 MW and all generators that are given an exception to the governor response requirement. The alternatives to these generator requirements are either not have a competitive market and decide the provision of frequency response administratively (the old VIU method), or determine who provides frequency response through a competitive market process. Comments:

3. Do you agree that the proposed standard(s) would be applicable to the Reliability Coordinator, Balancing Authority, Generator Owner, and Load-serving Entity?

   ☒ Yes

   ☐ No

The requirements applicable to the Generator Owner and Load-serving Entity may only include requirements for measurement processes, not necessairly requirements to provide any frequency response. Comments:

4. The current standard on Bias requires a Balancing Authority to carry a minimum bias equal to 1% of peak load. As an example, in the Eastern Interconnection, this value is double current natural frequency response. Should the standard provide an incentive, such that a Balancing Authority can use a bias equal to their natural response, but less than 1% of peak, if the response is above an acceptable target?

   ☒ Yes

   ☐ No

   There is a minimum frequency response below which the interconnection will be less reliable than acceptable. We currently do not know what this value is but we do know that a value exists. We also know that this value is less than the 1% of peak load specificed in the current standards. A standard that arbitrarily requires a 1% of peak load response without a technical justification based on reliability cannot be called a reliabiltiy standard. However, even though we do not know the minimum frequency response below which the interconnection will be less reliable than acceptable, we can perform the work necessary to estimate a reasonable value for a minimum frequency response and assign responsibility for that response among the Balancing Authorities on an interconnection. A Frequency Response Standard without this characteristic cannot maintain reliability of the interconnection. Comments:

5. Several commenters suggested response should be measured for an extended period after a frequency excursion, up to the point where automatic generation control (AGC) would take over. This was to ensure initial response wasn't withdrawn prematurely. Should the standard measure out to 60 seconds following an excursion?

   ☒ Yes

   ☐ No

   There are two issues associated with this question. The first is that the change in instantaneous frequency be limited to within a range that limits the risk of a cascading outage on the interconnection. The second is that each generation technology provides a different response characteristic within the first minute after a sudden frequency excursion. Work performed at NIPSCo and published by IEEE indicated that a measurement interval of one to two minutes worked well for the measurement of frequency response. Without specific knowledge of the nature of the individual responses that make up the sustained frequency response to an excursion, it may be difficult to justify the selection of a measurement interval shorter than one-minute that might put some generation technologies at a disadvantage with respect to the measurement method. This is a subject that the drafting team should technically evaluate before including a specific measurement period in the standard. Comments:

6. Do you have other comments on the SAR?

   The current measurement methods for determining individual Balancing Authority Frequency Response may not be reliable. This is because the current measurement methods only capture a small sample of the frequency responses provided limited to only several minutes per year. The metering methods we currently use on the interconnection can shed some light on this problem. Since the each BA measures its Tie Line Error with common metering with adjancent BAs, the sum of the Tie Line Errors over the total interconnection must equal zero at all times. Each tie line has a positive error for one BA and a negative error of equal value to the other BA that the tie line connects. If the errors must sum to zero, then the change in errors must also sum to zero between any two points in time. Since the Frequency on an interconnection is the same throughtout the interconnection at any point in time for the purpose of the frequency response measurement, the change in frequency between two points in time must also be the same throughout the interconnection. Therefore, the change in tie-line error divided by the change in frequency must indicate a total frequency response for the interconnection as measured by the sum of the individual BA frequency responses must be equal to zero. In other words, there is a BA or a set of BAs that cause each frequency response on the interconnection. Only knowledge of the distribution of individual frequency responses among BAs will provide the necessary information to determine whether or not the frequency response indicated by current measurement methods will maintain adequate reliablity. It may not be the average frequency response to large events that indicates interconnection reliability, but the distribution of frequency responses among BAs including both the positive and negative responses. Therefore, the measurement methods included in the standard should have the goal of

capturing the distribution of both positive and negative frequency responses over the entire range of frequency operation should be a goal of standard. The measurement methods suggested will not accomplish this goal.
Comments:

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Individual Commenter Information **(Complete this page for comments from one organization or individual.)**		
Name:		
Organization: Southern Company Transmission		
Telephone:		
E-mail:		
NERC Region		**Registered Ballot Body Segment**
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	☐	8 — Small Electricity End Users
	☐	9 — Federal, State, Provincial Regulatory or other Government Entities

Group Comments (Complete this page if comments are from a group.)

Group Name: Southern Company Transmission

Lead Contact: **Marc Butts**

Contact Organization: **Southern Company Services (SCS)**

Contact Segment:

Contact Telephone:

Contact E-mail:

Additional Member Name	Additional Member Organization	Region*	Segment*
Raymond Vice	SCS Bulk Power Operations	SERC	1
Jim Busbin	SCS Bulk Power Operations	SERC	1
Roman Carter	SCS Bulk Power Operations	SERC	1
J T Wood	SCS Bulk Power Operations	SERC	1
Jim Viikinsalo	SCS Bulk Power Operations	SERC	1

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1. Do you agree that comments from the first posting of the SAR were adequately addressed?

   ☒ Yes

   ☐ No

   Comments:

2. Do you agree with the list of proposed requirements included in the detailed description of the revised SAR?

   ☒ Yes

   ☐ No

   Comments:

3. Do you agree that the proposed standard(s) would be applicable to the Reliability Coordinator, Balancing Authority, Generator Owner, and Load-serving Entity?

   ☒ Yes

   ☐ No

   Comments:

4. The current standard on Bias requires a Balancing Authority to carry a minimum bias equal to 1% of peak load. As an example, in the Eastern Interconnection, this value is double current natural frequency response. Should the standard provide an incentive, such that a Balancing Authority can use a bias equal to their natural response, but less than 1% of peak, if the response is above an acceptable target?

   ☒ Yes

   ☐ No

   The 1% minimum frequency bias is obsolete and does not take into account the changes in interconnection frequency response over recent years. If not modified, it will lead to increased frequency oscillations within the interconnections and needless maneuvering of generating assets with associated wear and tear on these assets.

   Comments:

5. Several commenters suggested response should be measured for an extended period after a frequency excursion, up to the point where automatic generation control (AGC) would take over. This was to ensure initial response wasn't withdrawn prematurely. Should the standard measure out to 60 seconds following an excursion?

   ☐ Yes

   ☒ No

   AGC response begins within only a few seconds after the disturbance with a maximum ramp rate achieved within three to five minutes. Governor response and load frequency response typically peak within 30 seconds. There is some logic to monitoring governor respone for sustainability past its initial peak, but we have not seen anything about that in this SAR.

   Comments:

6. Do you have other comments on the SAR?

   In our opinion, this SAR, or one like it, is required to ensure that the primary frequency response of the interconnections and the BAs do not deteriorate to a point where 1) the interconnection can not adequately respond to major generator trips (including potential multiple contingencies which, though rare, do happen) and 2) primary frequency response of the BAs is inadequate to support islanding during severe local disturbances, thus allowing local disturbances to cascade into regional or interconnection wide disturbances. Primary frequency response is declining in at least the Eastern and Western Interconnections. WECC has taken a proactive approach to addressing this problem, but there is no similar work being done in the Eastern Interconnection. This SAR, or one like it, is needed to take the best practices in the industry, wherever they may be found, and utilize them to protect the interconnections from disturbances that could be avoided if we take action now rather than waiting until the problems actually occur.

   Comments:

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Individual Commenter Information **(Complete this page for comments from one organization or individual.)**		
Name:	Jeff Baker	
Organization:	Duke Energy Midwest	
Telephone:	513-287-3368	
E-mail:	jeff.baker@duke-energy.com	
NERC Region		**Registered Ballot Body Segment**
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Group Comments (Complete this page if comments are from a group.)

Group Name: N/A

Lead Contact:

Contact Organization:

Contact Segment:

Contact Telephone:

Contact E-mail:

Additional Member Name	Additional Member Organization	Region*	Segment*

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1. Do you agree that comments from the first posting of the SAR were adequately addressed?

   ☐ Yes

   ☐ No

   Comments:

2. Do you agree with the list of proposed requirements included in the detailed description of the revised SAR?

   ☐ Yes

   ☒ No

   Not totally, I need to understand more of what would be reuired to meet the obligation of Generator owners to equip generating units with nameplate ratings of 10 MW or greater, with a governor capable of providing immediate and sustained response to frequency deviations. Comments:

3. Do you agree that the proposed standard(s) would be applicable to the Reliability Coordinator, Balancing Authority, Generator Owner, and Load-serving Entity?

   ☒ Yes

   ☐ No

   Comments:

4. The current standard on Bias requires a Balancing Authority to carry a minimum bias equal to 1% of peak load. As an example, in the Eastern Interconnection, this value is double current natural frequency response. Should the standard provide an incentive, such that a Balancing Authority can use a bias equal to their natural response, but less than 1% of peak, if the response is above an acceptable target?

   ☒ Yes

   ☐ No

   I believe that an incentive should be included in the standard Comments:

5. Several commenters suggested response should be measured for an extended period after a frequency excursion, up to the point where automatic generation control (AGC) would take over. This was to ensure initial response wasn't withdrawn prematurely. Should the standard measure out to 60 seconds following an excursion?

   ☐ Yes

   ☐ No

   I did not provide an answer but believe that this is a decision that could be made over time and not necessarily with the inception of the standard.. Comments:

6. Do you have other comments on the SAR?

   I believe we have to address the frequency issue, but feel that it can be developed over time proactivly. Comments:

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Name:		
Organization:		
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E-mail:		
NERC Region		**Registered Ballot Body Segment**
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Group Comments (Complete this page if comments are from a group.)	
Group Name:	WECC Reliability Coordination Subcommittee
Lead Contact:	**Terry Baker**
Contact Organization:	**WECC**
Contact Segment:	**2**
Contact Telephone:	**970-229-5341**
Contact E-mail:	**bakert@prpa.org**

Additional Member Name	Additional Member Organization	Region*	Segment*
Nancy Bellows	WACM	WECC	1
Tom Botello	SCE	WECC	1
Rich Cornelius	RDRC	WECC	2
Robert Johnson	PSC	WECC	1
Bert Peters	APS	WECC	1
Greg Tillitson	CMRC	WECC	2

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1. Do you agree that comments from the first posting of the SAR were adequately addressed?

   ☐ Yes

   ☐ No

   Comments:

2. Do you agree with the list of proposed requirements included in the detailed description of the revised SAR?

   ☐ Yes

   ☐ No

   Comments:

3. Do you agree that the proposed standard(s) would be applicable to the Reliability Coordinator, Balancing Authority, Generator Owner, and Load-serving Entity?

   ☐ Yes

   ☒ No

   The WECC RCS believes that although this SAR is applicable to the WECC Reliability Authority (RA), it is not applicable to the WECC Reliability Coordinator (RC). Surveys, etc. will be performed after-the-fact, not during real-time. Comments:

4. The current standard on Bias requires a Balancing Authority to carry a minimum bias equal to 1% of peak load. As an example, in the Eastern Interconnection, this value is double current natural frequency response. Should the standard provide an incentive, such that a Balancing Authority can use a bias equal to their natural response, but less than 1% of peak, if the response is above an acceptable target?

   ☐ Yes

   ☐ No

   Comments:

5. Several commenters suggested response should be measured for an extended period after a frequency excursion, up to the point where automatic generation control (AGC) would take over. This was to ensure initial response wasn't withdrawn prematurely. Should the standard measure out to 60 seconds following an excursion?

   ☐ Yes

   ☐ No

   Comments:

6. Do you have other comments on the SAR?

   Comments:

Comment Form for Second Posting of Frequency Response SAR

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Individual Commenter Information **(Complete this page for comments from one organization or individual.)**		
Name:		
Organization:		
Telephone:		
E-mail:		
NERC Region		**Registered Ballot Body Segment**
☐ **ERCOT** ☐ **FRCC** ☐ **MRO** ☐ **NPCC** ☐ **RFC** ☐ **SERC** ☐ **SPP** ☒ **WECC** ☐ **NA – Not Applicable**	☒	1 — Transmission Owners
	☐	2 — RTOs, ISOs, Regional Reliability Councils
	☒	3 — Load-serving Entities
	☐	4 — Transmission-dependent Utilities
	☒	5 — Electric Generators
	☒	6 — Electricity Brokers, Aggregators, and Marketers
	☐	7 — Large Electricity End Users
	☐	8 — Small Electricity End Users
	☐	9 — Federal, State, Provincial Regulatory or other Government Entities

Group Comments (Complete this page if comments are from a group.)	
Group Name:	BPA
Lead Contact:	**Bart McManus**
Contact Organization:	**BPA**
Contact Segment:	**1,3,5,6**
Contact Telephone:	**360-418-2309**
Contact E-mail:	**bamcmanus@bpa.gov**

Additional Member Name	Additional Member Organization	Region*	Segment*
John Anasis			
Lynn Aspaas			
Mike Viles			

*If more than one Region or Segment applies, indicate the best fit for the purpose of these comments. Regional acronyms and segment numbers are shown on the prior page.

Background Information

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You do not have to answer all questions. Enter All Comments in Simple Text Format.

Insert a "check" mark in the appropriate boxes by double-clicking the gray areas.

1. Do you agree that comments from the first posting of the SAR were adequately addressed?

   ☒ Yes

   ☐ No

   We are still concerned with a NERC standard countering some aspects of the standard we are in the process of drafting in WECC, so will continue to be active on the drafting team to insure it does not adversely impact the WECC standard. Comments:

2. Do you agree with the list of proposed requirements included in the detailed description of the revised SAR?

   ☐ Yes

   ☒ No

   RE: bullet 2: Instead of flexibility to meet interconnection needs, each interconnection should have its own requirements on frequency response, this is due to the unique frequency response of each interconnection.

   re bullet 4: This Standard will need to measure frequency response for the duration of the frequency deviation. Measuring it until frequency recovers will overlap with the Balance Resources and Demand standard slightly, but will give much better results than simply going out a few minutes.

   re bullet 6: Target levels should be BA specific to insure there is not an incentive to lean on other BA's. How will the target levels be calculated?

   Re bullet 7: BAs must be free to operate their automatic generation control in any method they desire. The tie-line frequency bias is used for compliance monitoring, but must not be a requirement for the actual automatic generation control algorithm. Recommend this be modified to state: Balancing Authorities will calculate an Area Control Error for monitoring purposes using tie-line frequency bias.

   re bullet 8: WECC should call FRC surveys for WECC instead of NERC.

   re bullet 9: Recommend generating unit nameplate of 10 MW plus multi-unit installations of 10 MW or greater be required to have a governor(s) capable of providing immediate and sustained response to frequency deviations.

   Re bullets 9 and 10: Currently wind generation does not have governor response capability. Due to the amount of wind integration planned in the next decade, new installations should have a requirement for frequency responsive units. Historically, requirements have provided incentive for

manufacturers to modify machine design (low-voltage ride-through capability, voltage control capability) to meet the requirements.

Comments:

3. Do you agree that the proposed standard(s) would be applicable to the Reliability Coordinator, Balancing Authority, Generator Owner, and Load-serving Entity?

   ☒ Yes

   ☐ No

   The only portion we can think of that would applicable to the Load-serving entity is for the load-serving entity to report their underfrequency load shedding settings. We believe LSEs should be removed as applicable entities. Comments:

4. The current standard on Bias requires a Balancing Authority to carry a minimum bias equal to 1% of peak load. As an example, in the Eastern Interconnection, this value is double current natural frequency response. Should the standard provide an incentive, such that a Balancing Authority can use a bias equal to their natural response, but less than 1% of peak, if the response is above an acceptable target?

   ☒ Yes

   ☒ No

   The standard should not provide an incentive, but the standard should provide a methodology that would allow a Balancing Authority to calculate a bias based on their natural response, provided that response is above an acceptable target. Comments:

5. Several commenters suggested response should be measured for an extended period after a frequency excursion, up to the point where automatic generation control (AGC) would take over. This was to ensure initial response wasn't withdrawn prematurely. Should the standard measure out to 60 seconds following an excursion?

   ☐ Yes

   ☒ No

   The standard should measure out to when the frequency recovers. This could be up to the 15 minute DCS limit. AGC control may or may not kick in within 60 seconds depending on deadbands, etc. However, generators on setpoint control may hold for between 10 and 60 seconds then drop back off prior to AGC pulses reaching the generator. In order to see the full response of a BA it is necessary to see data for the full event rather than just the first minute. Rather than overlapping the BRD standard, this will work hand-in-hand with this standard. Comments:

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   Comments:

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Individual Commenter Information **(Complete this page for comments from one organization or individual.)**		
Name:	Tom Pruitt	
Organization:	Duke Energy Carolinas	
Telephone:	704-382-4676	
E-mail:	tvpruitt@duke-energy.com	
NERC Region		**Registered Ballot Body Segment**
☐ **ERCOT** ☐ **FRCC** ☐ **MRO** ☐ **NPCC** ☐ **RFC** ☒ **SERC** ☐ **SPP** ☐ **WECC** ☐ **NA – Not Applicable**	☒	1 — Transmission Owners
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Group Comments (Complete this page if comments are from a group.)

Group Name:

Lead Contact:

Contact Organization:

Contact Segment:

Contact Telephone:

Contact E-mail:

Additional Member Name	Additional Member Organization	Region*	Segment*

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1. Do you agree that comments from the first posting of the SAR were adequately addressed?

   ☐ Yes

   ☐ No

   Comments:

2. Do you agree with the list of proposed requirements included in the detailed description of the revised SAR?

   ☒ Yes

   ☒ No

   Generally, yes, but more clarity is desired on a number of points, e.g., who decides which generators will be granted exemptions - the BA or the RRO; who sets the criteria - BA or RRO. In addition, I think some of the proposed requirements may conflict with each other as details are driven out; if a number of a BA's generators applied for and were granted exemptions from governor response, the (anticipated) 5% droop range may need to be adjusted for the generators which do provide governor response for the BA.

   Governor response is not the only equipment consideration at the plant/unit. Plant/unit control systems also should be operated so that the desired unit response will occur and be sustained. Comments:

3. Do you agree that the proposed standard(s) would be applicable to the Reliability Coordinator, Balancing Authority, Generator Owner, and Load-serving Entity?

   ☒ Yes

   ☐ No

   However, the standard applies to each entity in different ways. The lion's share of responsibility lies with the BA to insure that the aggregate of the Gen Owners responses provide the response needed. Comments:

4. The current standard on Bias requires a Balancing Authority to carry a minimum bias equal to 1% of peak load. As an example, in the Eastern Interconnection, this value is double current natural frequency response. Should the standard provide an incentive, such that a Balancing Authority can use a bias equal to their

natural response, but less than 1% of peak, if the response is above an acceptable target?

☒ Yes

☐ No

Calculation of each BA's bias should be based on a rigorous analysis which demonstrates that the BA can provide the expected response, regardless of peak load. This is consistent with the proposed requirements - 'technically-sound calculation and report of frequency response' and 'Will not mandate a given amount of frequency response'. Comments:

5. Several commenters suggested response should be measured for an extended period after a frequency excursion, up to the point where automatic generation control (AGC) would take over. This was to ensure initial response wasn't withdrawn prematurely. Should the standard measure out to 60 seconds following an excursion?

   ☒ Yes

   ☐ No

   At least. Based on the words in the SAR Purpose statement, 'this proposed standard coordinates with and complements the Balance Resources and Demand standards, which addresses Interconnection frequency control generally 5 minutes and longer', it seems that this standard should cover out to the 5 minute mark of an event. AGC actions will commence at the first scan cylcle or two after the event (5 -15 secs), but the actual generation response may not settle out for several minutes, depending on the type and amount of generation on AGC at the time. Comments:

6. Do you have other comments on the SAR?

   Comments:

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Individual Commenter Information **(Complete this page for comments from one organization or individual.)**		
Name:	Jason Shaver	
Organization:	American Transmission Company LLC	
Telephone:	262 506 6885	
E-mail:	jshaver@atcllc.com	
NERC Region		**Registered Ballot Body Segment**
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Group Comments (Complete this page if comments are from a group.)

Group Name:

Lead Contact:

Contact Organization:

Contact Segment:

Contact Telephone:

Contact E-mail:

Additional Member Name	Additional Member Organization	Region*	Segment*

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Insert a "check" mark in the appropriate boxes by double-clicking the gray areas.

1. Do you agree that comments from the first posting of the SAR were adequately addressed?

   ☒ Yes

   ☐ No

   Comments:

2. Do you agree with the list of proposed requirements included in the detailed description of the revised SAR?

   ☐ Yes

   ☒ No

   The SAR identifies Load-Serving Entities as a function that will be affected by any requirements that are developed from this SAR. Question three, on this comment form, goes one step further and asked the industry if the proposed standard would be applicable to Load-Serving Entities. ATC was unable to determine from the detailed description section any requirements that would apply to a Load-Serving Entity. With that being said ATC suggests that language be added to the SAR that would require the Load-Serving Entities to be responsible for procurement of adequate frequency response.

   ATC found bullet number six lacks a clear description of the standard that could be developed. ATC recommends that this bullet be rewritten to better inform the industry of the type of standard the SAR requestor wants developed. Is the SAR requestor requesting a standard that will not mandate frequency response, but instead recommend a frequency response? ATC, in general, feels that standards should require something not make recommendation. or, Is the SAR requestor requesting that a standard be develop that would set long-term Interconnection target levels and then require the industry to meet those target-levels? ATC is in support of a standard that would require entities to set long-term target levels and require other entities to meet the determined target levels. ATC is not in support of a standard that requires functions to set long-term target levels but not require other entities to meet those levels. Lastly, this bullet should clearly identify who are the responsible entities.

   ATC is concerned that Generator Owners could be allowed to categories the same generating units differently. A Generator Owner that aggregates their units for purposes of determining a voltage schedule (VAR-001-1) should then

not be allowed to individualize their units for this standard to escape under the nameplate rating of 10 MW. Comments:

3. Do you agree that the proposed standard(s) would be applicable to the Reliability Coordinator, Balancing Authority, Generator Owner, and Load-serving Entity?

   ☒ Yes

   ☐ No

   Please see comment in questions two about the Load-serving Entity. Comments:

4. The current standard on Bias requires a Balancing Authority to carry a minimum bias equal to 1% of peak load. As an example, in the Eastern Interconnection, this value is double current natural frequency response. Should the standard provide an incentive, such that a Balancing Authority can use a bias equal to their natural response, but less than 1% of peak, if the response is above an acceptable target?

   ☒ Yes

   ☐ No

   Although ATC is in support of this recommendation, we feel that it should be classified as an "allowable exemption" not an "incentive". Comments:

5. Several commenters suggested response should be measured for an extended period after a frequency excursion, up to the point where automatic generation control (AGC) would take over. This was to ensure initial response wasn't withdrawn prematurely. Should the standard measure out to 60 seconds following an excursion?

   ☒ Yes

   ☐ No

   Comments:

6. Do you have other comments on the SAR?

   Comments:

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Individual Commenter Information **(Complete this page for comments from one organization or individual.)**		
Name:		
Organization: NERC Resources Subcommittee		
Telephone:		
E-mail:		
NERC Region		**Registered Ballot Body Segment**
☐ **ERCOT** ☐ **FRCC** ☐ **MRO** ☐ **NPCC** ☐ **RFC** ☐ **SERC** ☐ **SPP** ☐ **WECC** ☐ **NA – Not Applicable**	☐	1 — Transmission Owners
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Group Comments (Complete this page if comments are from a group.)			
Group Name:	NERC Resources Subcommittee		
Lead Contact:	**Terry Bilke**		
Contact Organization:	**Resources Subcommittee**		
Contact Segment:			
Contact Telephone:			
Contact E-mail:			

Additional Member Name	Additional Member Organization	Region*	Segment*
Raymond Vice	Southern Company	SERC	
John Tolo	TEP	WECC	
Rhett Trease	Duke Power	RFC	
Sydney Niemeyer	Texas	ERCOT	
Don Badley	RS Vice Chairman	WECC	
Carlos Martinez	CERTS		
Robert Rhodes	SPP	SPP	
Tom Vandervort	NERC		
Terry Bilke	RS Chairman	RFC	
Bill Herbslab	PJM	RFC	
Larry Akens	TVA	SERC	
Bart McManus	BPA	WECC	
Mike Potishnak	NEISO	NPCC	
Gerry Beckerle	AMREN	SERC	

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   ☒ Yes

   ☐ No

   Comments:

2. Do you agree with the list of proposed requirements included in the detailed description of the revised SAR?

   ☒ Yes

   ☐ No

   Re Bullet 7 - BAs must be free to operate their automatic generation control in any method they desire. The tie-line frequeency bias is used for complinace monitoring, but should not be a requirement for the actual automatic generation algorithm. Recommend this be modified to state : Balancing authorities will calculate an Area Control Error for compliance reporting purposes using tie-line frequency bias. Comments:

3. Do you agree that the proposed standard(s) would be applicable to the Reliability Coordinator, Balancing Authority, Generator Owner, and Load-serving Entity?

   ☒ Yes

   ☐ No

   The proposed standards may apply to LSEs when demand side resources are utilized for frequency control, but will not apply to many of the LSEs. There may also be cases where Generator Operators have obligations under the standard. Comments:

4. The current standard on Bias requires a Balancing Authority to carry a minimum bias equal to 1% of peak load. As an example, in the Eastern Interconnection, this value is double current natural frequency response. Should the standard provide an incentive, such that a Balancing Authority can use a bias equal to their natural response, but less than 1% of peak, if the response is above an acceptable target?

   ☒ Yes

   ☐ No

The 1% minimum frequency bias should be evaluated to take into account the reliability requirements of the interconnections. frequency response over recent years. We suggest that the minimum bias be addressed during the development of the Frequency Response Standard. It is unclear what the word "incentive" means above.

Comments:

5. Several commenters suggested response should be measured for an extended period after a frequency excursion, up to the point where automatic generation control (AGC) would take over. This was to ensure initial response wasn't withdrawn prematurely. Should the standard measure out to 60 seconds following an excursion?

   ☒ Yes

   ☒ No

   AGC response begins within only a few seconds after the disturbance with a maximum ramp rate achieved within three to five minutes. Governor response and load frequency response typically peak within 30 seconds. There is logic to monitoring governor respone for sustainability past its initial peak and this should be investigated during standard development.

   Comments:

6. Do you have other comments on the SAR?

   In our opinion, this SAR, or one like it, is required to ensure that the primary frequency response of the interconnections and the BAs do not deteriorate to a point where 1) the interconnection can not adequately respond to major generator trips (including potential multiple contingencies which, though rare, do happen) and 2) primary frequency response of the BAs is inadequate to support islanding during severe local disturbances, thus allowing local disturbances to cascade into regional or interconnection wide disturbances. Primary frequency response is declining in all Interconnections, Eastern, Western and ERCOT. WECC and ERCOT have taken a proactive approach to addressing this problem, but there is no similar work being done in the Eastern Interconnection. This SAR, or one like it, is needed.

   Comments:

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Individual Commenter Information **(Complete this page for comments from one organization or individual.)**		
Name:	Bruce Sembrick	
Organization:	Tri-State Generation and Transmission Association	
Telephone:	303 254-3675	
E-mail:	bsembrick@tristategt.org	
NERC Region		**Registered Ballot Body Segment**
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1. Do you agree that comments from the first posting of the SAR were adequately addressed?

   ☐ Yes

   ☐ No

   Comments:

2. Do you agree with the list of proposed requirements included in the detailed description of the revised SAR?

   ☐ Yes

   ☐ No

   Comments:

3. Do you agree that the proposed standard(s) would be applicable to the Reliability Coordinator, Balancing Authority, Generator Owner, and Load-serving Entity?

   ☐ Yes

   ☒ No

   Since the standard is concerned with governor regulated frequency response of generating units that applicability should also apply to the Generator Operator (currently this box is not checked). It will ultimately be the Generator Operators responsibility to ensure frequency responsiveness of the units, e.g. ensuring that the unit is not operating in Valve Wide Open mode.
   Comments:

4. The current standard on Bias requires a Balancing Authority to carry a minimum bias equal to 1% of peak load. As an example, in the Eastern Interconnection, this value is double current natural frequency response. Should the standard provide an incentive, such that a Balancing Authority can use a bias equal to their natural response, but less than 1% of peak, if the response is above an acceptable target?

   ☐ Yes

   ☐ No

   Comments:

5. Several commenters suggested response should be measured for an extended period after a frequency excursion, up to the point where automatic generation control (AGC) would take over. This was to ensure initial response wasn't withdrawn prematurely. Should the standard measure out to 60 seconds following an excursion?

   ☐ Yes

   ☐ No

   Comments:

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E-mail:		
NERC Region		**Registered Ballot Body Segment**
☐ **ERCOT** ☐ **FRCC** ☐ **MRO** ☐ **NPCC** ☒ **RFC** ☐ **SERC** ☐ **SPP** ☐ **WECC** ☐ **NA – Not Applicable**	☒	1 — Transmission Owners
	☐	2 — RTOs, ISOs, Regional Reliability Councils
	☐	3 — Load-serving Entities
	☐	4 — Transmission-dependent Utilities
	☐	5 — Electric Generators
	☐	6 — Electricity Brokers, Aggregators, and Marketers
	☐	7 — Large Electricity End Users
	☐	8 — Small Electricity End Users
	☐	9 — Federal, State, Provincial Regulatory or other Government Entities

Group Comments (Complete this page if comments are from a group.)	
Group Name:	ITCTransmission
Lead Contact:	**Jim Cyrulewski**
Contact Organization:	**ITCTransmission**
Contact Segment:	**Transmission Owner**
Contact Telephone:	**248-374-7130**
Contact E-mail:	**jcyrulewski@itctransco.com**

Additional Member Name	Additional Member Organization	Region*	Segment*
Beth Howell	ITCTransmission	RFC	1
Mike Moltane	ITCTransmission	RFC	1
Van Greening	ITCTransmission	RFC	1

*If more than one Region or Segment applies, indicate the best fit for the purpose of these comments. Regional acronyms and segment numbers are shown on the prior page.

Background Information

Please review the drafting team's consideration of the comments submitted with the first draft of the Frequency Response SAR and then review the drafting team's conforming changes made to SAR. Because the changes to the SAR were so extensive, there is no 'red line' version to show the changes from the first draft.

You do not have to answer all questions. Enter All Comments in Simple Text Format.

Insert a "check" mark in the appropriate boxes by double-clicking the gray areas.

1. Do you agree that comments from the first posting of the SAR were adequately addressed?

   ☒ Yes

   ☐ No

   Comments:

2. Do you agree with the list of proposed requirements included in the detailed description of the revised SAR?

   ☒ Yes

   ☐ No

   However some bullets need further clarification

   Bullet 2: The standards process allows for regional differences. What more flexibility is needed?

   Bullet 6: Keep this bullet simple by simply stating target levels will be set for BAs and RROs to take actions cited. Also a sub-bullet needs to be added on what are options to get additional frequency response; specifically for the BAs. In particular what can the BAs do if the Generation Owners do not provide adequate response. The BAs don't have generation interconnection agreements, the transmission owners do.

   Comments:

3. Do you agree that the proposed standard(s) would be applicable to the Reliability Coordinator, Balancing Authority, Generator Owner, and Load-serving Entity?

   ☒ Yes

   ☐ No

   Also pertains to Generator Operator Comments:

4. The current standard on Bias requires a Balancing Authority to carry a minimum bias equal to 1% of peak load. As an example, in the Eastern Interconnection, this value is double current natural frequency response. Should the standard provide an incentive, such that a Balancing Authority can use a bias equal to their natural response, but less than 1% of peak, if the response is above an acceptable target?

☒ Yes

☐ No

However this requirement still does not address the need for enough frequency response on the system. Comments:

5. Several commenters suggested response should be measured for an extended period after a frequency excursion, up to the point where automatic generation control (AGC) would take over. This was to ensure initial response wasn't withdrawn prematurely. Should the standard measure out to 60 seconds following an excursion?

   ☒ Yes

   ☐ No

   Needs to be verified with a field trial. Comments:

6. Do you have other comments on the SAR?

   Reliability and Market Interface Principles 3, 5 and 6 should be checked as well.

   Comments:

Background:

The Frequency Response SAR Drafting Team thanks all commenters who submitted comments on the first draft of the SAR for Frequency Response. This SAR was posted for a 30-day public comment period from April 4, 2006–May 3, 2006. The SAR DT asked stakeholders to provide feedback on the SAR through a special SAR Comment Form. There were 16 sets of comments, including comments from more than 59 different people from more than 41 companies representing 6 of the 9 Industry Segments as shown in the table on the following pages.

The primary changes to the SAR were made based on comments:

- Clarification on the role of the LSE and Generator Operator.
- Inclusion of the applicability of Reliability Principles 3, 5 and 6.
- Reduced the scope to address only the collection of data needed to model Frequency Response in North America.

In this 'Consideration of Comments' document stakeholder comments have been organized so that it is easier to see the responses associated with each question. All comments received on the SAR can be viewed in their original format at:

http://www.nerc.com/~filez/standards/Frequency_Response.html

If you feel that your comment has been overlooked, please let us know immediately. Our goal is to give every comment serious consideration in this process! If you feel there has been an error or omission, you can contact the Vice President and Director of Standards, Gerry Adamski at 609-452-8060 or at gerry.adamski@nerc.net. In addition, there is a NERC Reliability Standards Appeals Process.[1]

Update:

The original SAR on Frequency Response was submitted in large part due to a study that showed a 10+% decline in Eastern Interconnection Frequency Response over a 5 year period, when response should be increasing over time as an Interconnection grows. The drafting team posted a whitepaper along with the SAR to outline the need for a standard.

The NERC Resources Subcommittee recently updated their estimate of Eastern Interconnection Frequency Response and found it to be on the order of 2800MW/0.1Hz and still trending downward.

[1] The appeals process is in the Reliability Standards Process Manual: http://www.nerc.com/standards/newstandardsprocess.html.

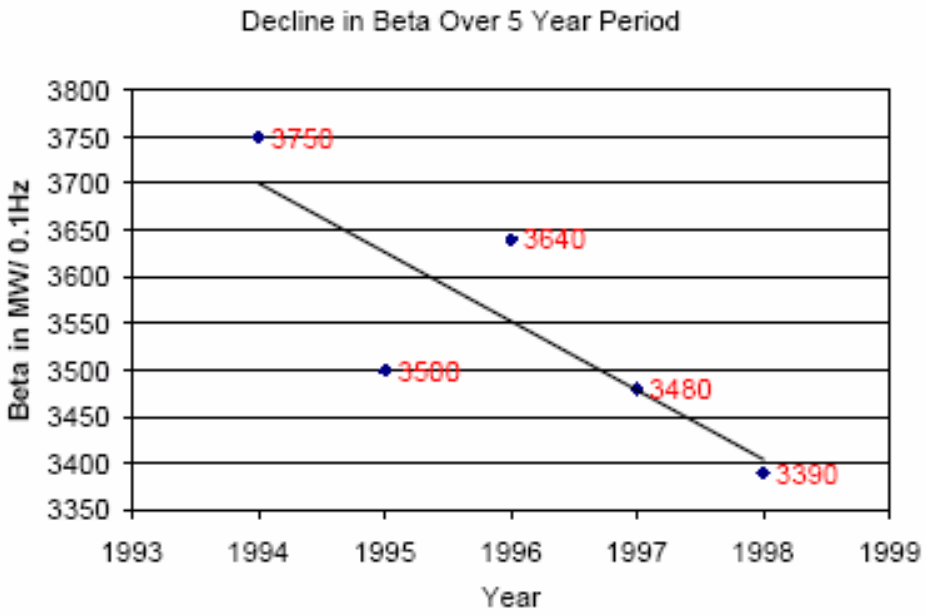


Figure 1 Original Eastern Interconnection Frequency Response Study (Ingleson and Nagle)

Figure 2 Updated Eastern Interconnection Frequency Response (NERC Resources Subcommittee)

Based on these observations, at its June, 2006 meeting, the NERC Operating Committee endorsed developing a frequency response standard that includes the following goals and objectives:

- Improving Interconnection frequency response event cataloging and benchmarking
- Calculating balancing authority frequency response and requiring balancing authorities to analyze those cases where the response is significantly below the norm
- Establishing time limits to complete the analyses

- Tabulating non-responsive generators
- Measuring generator response (including those units on line)
- Including regional participation and review

Unfortunately, the stakeholders who responded to the second draft of the proposed SAR offered a wide range of opinions on what should be in the standard, without a clear consensus. Given this, the drafting team revised the SAR to only require collection of data needed to model frequency response in each of the interconnections. Once frequency response has been modeled and analyzed, the Resources Subcommittee and the industry will be in a better position to recommend specific frequency response targets for each Interconnection.

This revised SAR was reviewed and supported by the NERC Resources Subcommittee on December 4, 2006.

Commenter	Organization	Industry Segment								
		1	2	3	4	5	6	7	8	9
Ken Goldsmith	ALT		x							
Baj Agrawal	APS	x				x				
Bert Peters	APS	x								
Dave Rudolph	BEPC									
Bart McManus	BPA	x		x		x	x			
John Anasis	BPA	x		x		x	x			
Lynn Aspaas	BPA	x		x		x	x			
Mike Viles	BPA	x		x		x	x			
Greg Tillitson	CMRC		x							
Edwin Thompson	ConEdison	x								
Rhett Trease	Duke (NERC RS)									
Tom Pruitt	Duke Energy Carolinas	x		x		x	x			
Jeffrey T. Baker	Duke Energy Midwest	x		x		x	x			
Howard Illian	Energy Mark, Inc.								x	
Dick Pursley	GRE									
David Kiguel	Hydro One Network	x								
Anita Lee	IESO	x								
Ron Falsetti	IESO (Ontario)		x							
Kathleen Goodman	ISO-New England		x							
Bill Shemley	ISO-New England		x							
Jim Cyrulewski	ITC Transmission	x								
Dennis Florom	LES		x							
Donald Nelson	MA Dept of Energy and Tele.		x							
Tom Mielnik	MEC		x							
Robert Coish	MHEB		x							
Terry Bilke	MISO		x							
Pete Lebro	National Grid	x								
Sydney Niemeyer	NRG Texas LP (NERC RS)									
Alden Briggs	NBSO									
Greg Campoli	New York ISO		x							
James W. Ingleson	New York ISO		x							
Alan Adamson	New York State Rel. Council		x							
Don Badley	NWPP (NERC RS)									
Brian Hogue	NPCC		x							
Guy Zito	NPCC		x							
Alan Boesch	NPPD	x								
Murale Gopinathan	NU		x							

Commenter	Organization	Industry Segment								
		1	2	3	4	5	6	7	8	9
Mark Kuras	PJM		x							
Joe Willson	PJM		x							
Al DiCaprio	PJM		x							
Robert Johnson	PSC	x								
Rich Cornelius	RDRC		x							
Wayne Guttormson	SaskPower	x								
Tom Botello	SCE	x								
Jim Busbin	Southern Company Services	x								
Jim Viikinsalo	Southern Company Services	x								
Marc M. Butts	Southern Company Services	x								
Raymond Vice	Southern Company Services	x								
Roman Carter	Southern Company Services	x								
J.T. Wood	Southern Company Services	x								
Wayne Guttormson	SPC		x							
John Tolo	TEP (NERC RS)									
Roger Champagne	TransEnergie (Quebec)	x								
Bruce Sembeck	Tri-State Generation and Transmission Association, Inc.	x								
Nancy Bellows	WACM	x								
Darrick Moe	WAPA									
Terry Baker	WECC Reliability Coordination Subc.		x							
Jim Maenner	WPS		x							
Pam Oreschnick	XEL		x							

Index to Questions, Comments and Responses

1. **Do you agree that comments from the first posting of the SAR were adequately addressed?**

Summary Consideration: Most commenters indicated that the SAR drafting team did provide an adequate response to the comments submitted with the first posting of the SAR.

Commenter	Yes	No	Comment
Energy Mark, Inc. (8) Howard F. Illian		✓	There is an expectation apparent in the first set of responses that indicates that the drafting team believes they have more knowledge of the solutions that will be required than the final standard will contain. The two greatest areas of insufficient understanding lie in the measurement of Frequency Response at less than the full interconnection level and the effect of the standard as envisioned on markets. These two problems are addressed in the comments to later questions in this comment form.
Response: There were varying opinions on the scope of the second draft of the SAR. The drafting team revised the scope of the SAR again to focus solely on collection of data needed to model frequency response in each of the interconnections. Once that data is collected and analyzed, a standard can be proposed that includes performance requirements that will motivate entities to operate in ways that keep frequency response within an acceptable range.			
NPCC CP9 Reliability Standards Working Group K. Goodman – ISONE Edwin Thompson – ConEd Pete Lebro – Ngrid Alan Adamson – NYSRC Bill Shemley – ISONE Ron Falsetti – IESO Murale Gopinathan – NU Ralph Rufrano – NYPA R. Champagne – TransÉnergie David Kiguel – Hydro One Greg Campoli – NYISO Jim Ingleson – NYISO Alden Briggs – NBSO Don Nelson – MA Dept. of Tel. and Energy Brian Hogue – NPCC Guy Vito – NPCC		✓	No - The intent of this SAR is unclear which highlights that this issue requires additional studies and investigation. In the future, it may be beneficial to develop a standard after a reliabliity issue is identified, and a specific standard can be developed and implemented to address the issue.

Commenter	Yes	No	Comment
Response: We agree that there needs to be additional studies and investigation. There were varying opinions on the scope of the second draft of the SAR. The drafting team revised the scope of the SAR again to focus solely on collection of data needed to model frequency response in each of the interconnections. Once that data is collected and analyzed, a standard can be proposed that includes performance requirements that will motivate entities to operate in ways that keep frequency response within an acceptable range.			
PJM Corporate Development Div. (2) Al DiCaprio Joseph D. Willson Mark Kuras		✓	The Resources Subcommittee in a response to the first draft states "A primary purpose of this standard is to collect information so informed decisions can be made before there is a problem." It is clear from that reply that the Resources Subcommittee wishes to undertake an analysis of the system and needs to collect additional information. This data collection effort may be laudable but it does not rise to the level of being a federally enforced mandatory standard. What if later on the 'data' were to show there is no problem, then there will be a need to rescind the standard and repay those who were non-compliant to a data collection effort. In their response to the first draft, the Resources Subcommittee cite a WECC study. But they have no similar study for the East. The Resources Subcommittee still has not shown that the decrease in sub-minute response is either (1) a problem or (2) nothing more than an indication that a larger system has more inertia and therefore less response that the smaller system in the past. This SAR, with its present theoretical focus, posits the BA as the responsible entity for governor response. Even those who agreed with the first posting that Frequency Response is an important issue - stated that a standard cannot define fixed norms (MRO, NYISO, IESO (2)). The BA is not responsible to instantaneous response -at best it can establish a capacity obligation but it can't guarantee continuous response.
Response: There were varying opinions on the scope of the second draft of the SAR. The drafting team revised the scope of the SAR again to focus solely on collection of data needed to model frequency response in each of the interconnections. Once that data is collected and analyzed, a standard can be proposed that includes performance requirements that will motivate entities to operate in ways that keep frequency response within an acceptable range.			
IESO (2) Ron Falsetti	✓	✓	Yes, with respect to the responses to the IESO's comments. However, the revised SAR appears to get somewhat mixed up between sub-minute frequency response performance with a longer term (> 1 minute) performance, and lacks clarity on what the proposed standard is intended to stipulate. Is the proposed standard intended to stipulate: (a) a minimum frequency response performance level with which to determine if follow-up analysis is to be conducted, or, (b) requirements for calculating, measuring, reporting and analyzing frequency response, or, (c) both, in addition to, (d) requirements for generators to be equipped with governors and if so, the target to be responding to?

Commenter	Yes	No	Comment
			If (a) is not specified in the standard, we see a difficulty in stipulating the threshold for (b) and the target for (d). From the SDT's response to our previous comments ("The new requirements may need to be field tested for an extended duration before compliance with the requirements becomes mandatory. A long field test with extensive data collection may be needed before justifiable minimum performance standards can be identified"). It is our belief the standard is intended to stipulate (b) only. We see this as a necessary first step. However, it may then beg the question of the need of having a standard to develop the basis for a future standard. Might there not be other alternatives to achieve (b) such as by means of a request from the standing committees or NERC to the BAs and the regions to compile this information?
Response: There were varying opinions on the scope of the second draft of the SAR. The drafting team revised the scope of the SAR again to focus solely on collection of data needed to model frequency response within each interconnection. Once that data is collected and analyzed, a standard can be proposed that includes performance requirements that will motivate entities to operate in ways that keep frequency response within an acceptable range.			
BPA (1, 3, 5, 6) Bart McManus John Anasis Lynn Aspaas Mike Viles	✓		We are still concerned with a NERC standard countering some aspects of the standard we are in the process of drafting in WECC, so will continue to be active on the drafting team to insure it does not adversely impact the WECC standard.
Response: We encourage WECC to be actively involved in the drafting of the standard. Note that the drafting team revised the scope of the SAR so that the SAR focuses solely on the collection of data needed to model frequency response in each interconnection. This should not conflict with WECC's work on its frequency response standard.			
ITC Transmission (1) Jim Cyrulewski Beth Howell Mike Moltane Van Greening	✓		
ATC LLC (1) Jason Shaver	✓		
NERC Resources Subcommittee Raymond Vice – SOCO John Tolo – TEP Rhett Trease – Duke Sydney Niemeyer – Texas	✓		

Commenter	Yes	No	Comment
Don Badley – NWPP Carlos Martinez – CERTS Robert Rhodes – SPP Tom Vandervort – NERC Terry Bilke – MISO Bill Herbsleb – PJM Larry Akens – TVA Bart MaManus – BPA Mike Pitishnak – ISONE Gerry Beckerle – Ameren			
IESO (1) Anita Lee	✓		
Midwest Reliability Organization (2) Terry Bilke Wayne Guttormson Jim Maenner Al Boesch – NPPD (2) Terry Bilke – MISO (2) Bob Coish – MHEB (2) Dennis Florom – LES (2) Ken Goldsmith – ALT (2) Todd Gosnell – OPPD (2) W. Guttormson – SPC (2) Tom Mielnik – MEC (2) Darrick Moe – WAPA (2) P. Oreschnick – XEL (2) Dick Pursley – GRE (2) Dave Rudolph – BEPC (2) Joe Knight – MRO (2)	✓		
Southern Company Transm. (1) Marc Butts	✓		

Commenter	Yes	No	Comment
Raymond Vice Jim Busbin Roman Carter J.T. Wood Jim Viikinsalo			
Southern Company Transm. (1) Marc Butts Raymond Vice Jim Busbin Roman Carter J.T. Wood Jim Viikinsalo	✓		

2. Do you agree with the list of proposed requirements included in the detailed description of the revised SAR?

Summary Consideration: Most commenters disagreed with the proposed requirements included in the second draft of the SAR. The drafting team revised the SAR to focus solely on the collection of data needed to model frequency response in each interconnection. Additional SARs may be proposed in the future to propose requirements for operating in ways that support frequency response.

Commenter	Yes	No	Comment
Arizona Public Service Co. (1, 5) Baj Agrawal			The requirements on individual generator are unnecessary. The requirements should be on a group of generators in a control area to achieve a desired response. Thus, one could have some generators which are being operated as non responsive and the others which are responding well to offset for those which are not responsive. Additionally, the 10 MW size requirements are too restrictive and unnecessary. It should be plant based and should apply to plants of 100 MW or more aggregate capacity. In any realistic scenario, the smaller plants are not expected to contribute much to frequency response and hence subjecting them to frequency response requirements is uneconomic.
Response: The SAR was revised and will address only the collection of data needed to model frequency response in each interconnection. Once more is known about frequency response, additional SARs may be proposed with specific performance requirements for generators.			
IESO(1) Anita Lee		✓	The purpose is definitely suggested for under frequency conditions. However, when specifying that the generators shall have governors with droop etc... the role of the governor is for both high and low frequency conditions and not just underfrequency FRR. In a market environment it is very possible that not every generator will provide FRR services. Thus, the governor and governor deadband should be a requirement to interconnect to a power system. Generators that provide FRR shall have responsive governor and prime mover. The standard is based on balancing area response which will include generators and in some jurisdications will include load. So is the intent that whatever load is considered, additional FRR resources such as generators are used to provide the required FRR? What about load as FRR providers? Some industrial facilities are capable to dynamically vary the load of the facility to frequency (ie virtual governor). The standard should apply to FRR providers which can be generators and loads. We agree that generator owners have an obligation to have working governors or provide explanations why not. The "10 MW" requirement should be evaluated for consistency with other standards. This should not hold up the progress of the SAR, but should be evaluated by the ultimate standard drafting team.
Response: The SAR drafting team agrees that governors must work for both high and low frequency events. One methodology under discussion would monitor both high and low events. The logic behind capturing low frequency (typically associated with trips of large generators) is that these events are much more common than large loss of load.			

Commenter	Yes	No	Comment
Any resource (load or generation) within the BA can provide frequency response. As envisioned, the standard would have provided a methodology whereby a BA could monitor its FRR providers. Load, by default, would have been measured along with generators when the BA calculated its performance. We agree that all generators may not need to provide frequency response. As envisioned, as long as the BA had adequate response, it would have had some flexibility under the proposed standard. Note, however, that the SAR has been revised and no longer includes these performance requirements. The SAR was revised and will address only the collection of data needed to model frequency response in each interconnection. Once more is known about frequency response, additional SARs may be proposed with specific performance requirements for generators. As each new standard is developed, greater attention will be paid on the 'applicability'. The threshold of '10 MW' will need to be reviewed from a reliability-related perspective rather than 'consistency across all standards' perspective.			
IESO (2) Ron Falsetti		✓	The intent of some of the requirements is again unclear to the IESO, for example. (i) Does Bullet #2 mean the flexibility in the calculation and reporting process or in the target/minimum frequency response level? (ii) Assuming Bullet #4 a requirement, and one which relates to the minimum level of frequency response, how is this requirement stipulated at this time while data collection and follow-up analysis are to be proposed as standard requirements and field testing has yet to commence? Same comment applies to Bullet #9. (iii) Bullet #6 appears to go beyond the sub-minute time frame. Further, we are unable to understand the leading sentence "Will not mandate a given amount of frequency response". We feel it is important that if poor frequency response performance in the sub-minute time frame is to be assessed and improved, specific target which may well be the minimum amount of frequency recovery would need to be stipulated. (iv) Bullet #7 also appears to be beyond the sub-minute time frame, which is to mandate AGC but which should be covered by other BAL standards. (v) Bullets #8 and #1 appear to be the main requirements for the proposed standard that are achievable at this time. (vi) As mentioned in (ii) above, we are unable to visualize how the range and target of response be stipulated in the standard before Bullets #1 and #8 are implemented. (v) If generators are allowed to seek exception, the standard should provide some basic premise that bounds the exception cases rather than leaving the door wide open and the decision solely to the judgment of the BAs and RROs.
Response: "Flexibility to meet the needs of each Interconnection" was intended to mean some flexibility in calculation (for example ERCOT is interested in "point C" (the extreme) of an event, but this point is not observable and has little value in the East. The WECC has expressed			

Commenter	Yes	No	Comment
concern for extended contribution of response (perhaps out several minutes). As envisioned, there would have been different target levels in each Interconnection. Interconnections would have been able to choose to have a tighter target droop setting. Bullet 4 relates to a statistically-sound measurement of frequency response at both the Interconnection and BA level. The data would have been collected and reported each year of the standard. In effect, the data collection in the first year of the standard would have served as the field test. "Long term target measure" intended to imply that the BA would be measured on many events over the year and its performance would have been evaluated on the whole, not on single events. It is true operation of AGC goes beyond the sub-minute window of time. The intent of this bullet was that the bias a BA provides should match its natural frequency response. Just as was originally intended in Policy 1, a BA calculates its natural response in one year and uses those observations to operate in the next year. The drafting team envisioned the same would occur in the originally proposed standard. The establishment of the "12 month basis" either on a calendar year or on a rolling 12 month period like CPS1 would have been determined during standard drafting. Note, however, that the SAR was revised and will address only the collection of data needed to model frequency response in each interconnection. Once more is known about frequency response, additional SARs may be proposed with specific performance requirements for generators.			
NPCC CP9 Reliability Standards Working Group		✓	The proposed requirements nor the White Paper adequately make the case that there is a need for a frequency response standard at this time. However, it is recommended that the subject be further investigated. The analysis should evaulate if a frequency response standard that addresses the three major short term frequency control components (inertial response, governor response, and automatic generation control) are required. The report writers should include a broad range of participants including (at least) 3 OEM's (original equipment manufacturers) representing steam, gas and hydro generation control. Some specific issues that should be addressed are: 1. Inertial Response: Evaluate historical changes in the inertial response of the electric grid as a result of changing power equipment designs and types of load. For example, the addition of new industrial and aero-derivative turbine-generators have lower inertia-power ratios than tranditonal nuclear/fossil units and, in addition, they are not base loaded (as a result of more efficient dispatching and improved power plant controls). 2. Governor Response: Evaulate generation governor performance as a result of newer, more configurable prime mover controls. Digital controls provide increased plant reliability, however, this may be at the expense of decreased governor response. For example, the use of main steam pressure controls on steam units and low NOx controls on gas turbines may

Commenter	Yes	No	Comment
			produce unexpected droop output responses. 3. Automatic Generation Control (AGC): Perform a control area survey to determine if there is sufficient regulation capacity within control areas to maintain generation and load balance. Include a review of incentives and penalties for generators to respond accurately and reliably to AGC signals.
Response: When the first draft of the SAR was posted for comment, the drafting team asked stakeholders if they felt that there was a reliability-related need for a standard that focuses on frequency response, and most stakeholders indicated there is a reliability-related need for a frequency response standard. While we don't know the exact amount of frequency response needed for each interconnection, a 12 year decline in response when it is expected to be increasing and without knowledge of where the response is low is a reliability concern. Failure of generators to follow AGC signals would appear to be either a CPS issue or a business practice. The SAR was revised and will address only the collection of data needed to model frequency response in each interconnection. Once more is known about frequency response, additional standards may be proposed with specific performance requirements for generators. This will allow analyses to focus on the different types of response and should, eventually, facilitate the development of another standard that includes performance requirements aimed at providing a specified amount of frequency response.			
Energy Mark, Inc. (8) Howard F. Illian		✓	Requirements that apply to individual generators cannot be implemented as indicated in the standard without failing to comply with Market Interface Principle 2. Frequency Response (Governor Response) have economic costs associated with standing ready to supply. These costs have been documented in EPRI Reports on Ancillary Services. If any generator is given an exception to not provide a response, that generator will also be given a market advantage resulting from the savings they will receive by not providing a response. The SAR as currently written will create a market advantage for all generators below 10 MW and all generators that are given an exception to the governor response requirement. The alternatives to these generator requirements are either not have a competitive market and decide the provision of frequency response administratively (the old VIU method), or determine who provides frequency response through a competitive market process.
Response: We appreciate the comments on Market Interface Principle 2. As envisioned the original SAR proposed measuring the approximately 140 Balancing Authorities rather than the roughly 4000 individual generators (*NERC 2004 Generating Unit Statistical Brochure*). The SAR intended to be indifferent to what entity provides response (whether load, large generator or small generator). It was intended to measure the BA, with the expectation that the BA would have had to document exceptions that would have been reviewed by the BA and the Region for reliability implications. As envisioned, the drafting team did not expect owners to install many small generators rather than one larger generator to avoid providing data for the standard.			

Commenter	Yes	No	Comment
Note that the SAR was revised and will address only the collection of data needed to model frequency response in each interconnection. Once more is known about frequency response, additional standards may be proposed with specific performance requirements for generators.			
Duke Energy Midwest (1, 3, 6) Jeff Baker		✓	Not totally, I need to understand more of what would be required to meet the obligation of Generator owners to equip generating units with nameplate ratings of 10 MW or greater, with a governor capable of providing immediate and sustained response to frequency deviations.
Response: As envisioned, all generators would have governors that respond to frequency deviations. The BA and the Region would need to be aware of exceptions for study purposes. If the BA's performance were significantly below the norm, an analysis and assessment would have been required. Note, however, that the SAR was revised and will address only the collection of data needed to model frequency response in each interconnection. Once more is known about frequency response, additional standards may be proposed with specific performance requirements for generators.			
BPA (1, 3, 5, 6)		✓	RE: bullet 2: Instead of flexibility to meet interconnection needs, each interconnection should have its own requirements on frequency response, this is due to the unique frequency response of each interconnection. re bullet 4: This Standard will need to measure frequency response for the duration of the frequency deviation. Measuring it until frequency recovers will overlap with the Balance Resources and Demand standard slightly, but will give much better results than simply going out a few minutes. re bullet 6: Target levels should be BA specific to insure there is not an incentive to lean on other BA's. How will the target levels be calculated? Re bullet 7: BAs must be free to operate their automatic generation control in any method they desire. The tie-line frequency bias is used for compliance monitoring, but must not be a requirement for the actual automatic generation control algorithm. Recommend this be modified to state: Balancing Authorities will calculate an Area Control Error for monitoring purposes using tie-line frequency bias. re bullet 8: WECC should call FRC surveys for WECC instead of NERC. re bullet 9: Recommend generating unit nameplate of 10 MW plus multi-unit installations of 10 MW or greater be required to have a governor(s) capable of providing immediate and sustained response to frequency deviations. Re bullets 9 and 10: Currently wind generation does not have governor response capability. Due to the amount of wind integration planned in the next decade, new installations should have a requirement for frequency responsive units. Historically, requirements have provided incentive for manufacturers to modify machine design (low-voltage ride-through capability, voltage control capability) to meet the requirements.

Commenter	Yes	No	Comment
Response: We agree – the proposed standard would have assumed that each interconnection had a unique frequency response. Regarding bullet 4, some thought would have to be given on how to measure over the entire duration of a frequency disturbance (typically up to 15 minutes for a DCS event) and how to remove AGC response from the estimate of frequency response. Suggestions are welcome. However, the Interconnection would be able to define specific requirements. Regarding bullet 8, WECC has the right to call FRC Surveys for WECC, as does NERC (historically through the NERC OC and Resources subcommittee) We agree with your comment regarding bullet 9. Regarding wind generation, governor response is normally provided by calling on more energy from the prime mover when frequency drops. We are unsure how this would normally be done with wind, unless the goal would be to under-utilize the wind during normal operation and then call for full available energy when the frequency drops. Again, this standard as originally proposed, was intended to measure BA response- as long as the pool of generation within the BA provided adequate response, it would have allowed the BA flexibility on which generators provide that response. Note, however, that the SAR was revised and will address only the collection of data needed to model frequency response in each interconnection. Once more is known about frequency response, additional standards may be proposed with specific performance requirements for generators. This will allow analyses to focus on the different types of response and should, eventually, facilitate the development of another standard that includes performance requirements aimed at providing a specified amount of frequency response.			
ATC LLC (1) Jason Shaver		✓	The SAR identifies Load-Serving Entities as a function that will be affected by any requirements that are developed from this SAR. Question three, on this comment form, goes one step further and asked the industry if the proposed standard would be applicable to Load-Serving Entities. ATC was unable to determine from the detailed description section any requirements that would apply to a Load-Serving Entity. With that being said ATC suggests that language be added to the SAR that would require the Load-Serving Entities to be responsible for procurement of adequate frequency response. ATC found bullet number six lacks a clear description of the standard that could be developed. ATC recommends that this bullet be rewritten to better inform the industry of the type of standard the SAR requestor wants developed. Is the SAR requestor requesting a standard that will not mandate frequency response, but instead recommend a frequency response? ATC, in general, feels that standards should require something not make recommendation. or, Is the SAR requestor requesting that a standard be develop that would set long-term Interconnection target levels and then require the industry to meet those target-levels? ATC is in support of a standard that would require entities to set long-term target levels and require other entities to meet the determined target levels. ATC is not in support

Commenter	Yes	No	Comment
			of a standard that requires functions to set long-term target levels but not require other entities to meet those levels. Lastly, this bullet should clearly identify who are the responsible entities. ATC is concerned that Generator Owners could be allowed to categories the same generating units differently. A Generator Owner that aggregates their units for purposes of determining a voltage schedule (VAR-001-1) should then not be allowed to individualize their units for this standard to escape under the nameplate rating of 10 MW.
Response: We agree that the LSE is the ultimate beneficiary of frequency response. However, since the standard isn't mandating a particular amount of frequency response for individual events, it would seem inappropriate to have the LSE obtain a given amount of frequency response for any specific event. As originally proposed, this standard would have been primarily a technical/preparedness standard. Initially, the target levels of frequency response would have been based on observed interconnection history. We agree that bullet # 6 needs additional clarification for it to be understood. The long-term measure was envisioned to be an annual metric, based on a calendar year or on a rolling 12 month basis like CPS1 that captures many events over the year to come up with a composite estimate of performance. It was expected that the standard would allow interconnections to set their own frequency response limits. Absent specific frequency response bounds for an interconnection, the standard would have used recent history. The standard was intended to focus on the frequency response needs of each interconnection, and would have allocated a portion of each interconnection's frequency response responsibility to each of the interconnection's Balancing Authorities. Note that the SAR was revised and will address only the collection of data needed to model frequency response in each interconnection. Once more is known about frequency response, additional standards may be proposed with specific performance requirements for generators. This will allow analyses to focus on the different types of response and should, eventually, facilitate the development of another standard that includes performance requirements aimed at providing a specified amount of frequency response.			
PJM Corporate Development Div. (2)		✓	The SAR is still not clear about what is to be developed in the standard. Of the ten bulleted items several seem to show a misunderstanding between a sub-minute frequency response obligation and Automatic Generation control. The RS must make clear what it wants to do. Sub-minute frequency response occurs with or without frequency bias; sub-minute frequency response is not helped or hurt by having AGC. This is a major problem with the proposal. It is not clear and it is not definitive. Item 1 indicates the standard will be a Report Item 2 states the standard will be flexible (that is mandated in the Process Manual) Item 3 seems to indicate that non-compliance will be met with a requirement to analyze the incident (if this is standard is so important why isn't every event critical?) Item 5 is the most unusual - the standard will not mandate a response but will provide

Commenter	Yes	No	Comment
			"LONG-TERM" targets (how is it that a sub-minute response gets translated into a long-term target?) Item 6 is to mandate AGC. This is not related to sub-minute frequency response. Item 7 is to mandate a post-incident survey. Again this is a good idea but it a data collection mandate - it is not a frequency response standard. The RS has the tools to collect that information today, without the need to resort to mandatory penalties. Item 10 will allow generators to seek exceptions (which means that the RS will allow a generator to opt out and still require the BA to comply. In the absurd case that all generators opt out (let's say the BA has only nuclear units) then according to the RS, the BA is held non-compliant. This is just not a good idea. In summary: #1 is a calculation and report on response but no measure of performance; #3 requires a BA and the RRO to perform an analysis if response is measurable (by what amount) below the norm (which is a constantly moving value); #4 is the only possibility for true standard; #9 generators must have governors is more a certification issue than a BA standard. Three of the bullets are not requirements (#2, #5, and #10). Two of the bullets are already in other standards while two of the bullets duplicate each other. The SAR team needs to better describe exactly what is being proposed to be in the standard so that the industry can evaluate the proposal. The industry does not need to get involved in a research project.

Response: The standard was intended to measure response within the first minute (or longer if determined it was needed by the interconnection) following a frequency disturbance (which is prior to the timeframe when AGC contributes to frequency stabilization). Since natural frequency response is much less than Bias for most control areas, AGC will make a contribution to frequency stabilization over a period of time.

Regarding item 1, part of this technical/readiness standard was envisioned as a report, much as BAs are responsible to calculate and report CPS or DCS. Refer to the *NERC Reliability Standards Process Manual* for the different types of standards.

Regarding item 2, thank you.

Regarding item 3, the standard would not have required analysis of single events, but rather performance over a 12-month period.

Regarding item 5, as envisioned, the BA would have calculated its response based on several events over the long term (12 months). Interconnection performance is tracked by the Regions and NERC over years.

Item 6 refers to using a bias in AGC that is reflective of the BA's natural frequency response. However, based on comments, the Resources Subcommittee agrees this requirement more appropriately belongs in the AGC standard.

Commenter	Yes	No	Comment
Regarding item 10, the SAR was not proposing that generators may opt out of participation. As envisioned, generators were expected to have governors that respond to frequency. Exceptions would have been documented. Nevertheless, the standard would have measured overall BA response. Note, however, that the SAR was revised and will address only the collection of data needed to model frequency response in each interconnection. Once more is known about frequency response, additional standards may be proposed with specific performance requirements for generators. This will allow analyses to focus on the different types of response and should, eventually, facilitate the development of another standard that includes performance requirements aimed at providing a specified amount of frequency response.			
Duke Energy Carolinas (1, 3, 5, 6) Tom Pruitt	✓	✓	Generally, yes, but more clarity is desired on a number of points, e.g., who decides which generators will be granted exemptions - the BA or the RRO; who sets the criteria - BA or RRO. In addition, I think some of the proposed requirements may conflict with each other as details are driven out; if a number of a BA's generators applied for and were granted exemptions from governor response, the (anticipated) 5% droop range may need to be adjusted for the generators which do provide governor response for the BA. Governor response is not the only equipment consideration at the plant/unit. Plant/unit control systems also should be operated so that the desired unit response will occur and be sustained.
Response: The SAR was revised and will address only the collection of data needed to model frequency response in each interconnection. Once more is known about frequency response, additional standards may be proposed with specific performance requirements for generators. This will allow analyses to focus on the different types of response and should, eventually, facilitate the development of another standard that includes performance requirements aimed at providing a specified amount of frequency response.			
NERC Resources Subcommittee	✓		Re Bullet 7 - BAs must be free to operate their automatic generation control in any method they desire. The tie-line frequeency bias is used for complinace monitoring, but should not be a requirement for the actual automatic generation algorithm. Recommend this be modified to state : Balancing authorities will calculate an Area Control Error for compliance reporting purposes using tie-line frequency bias.
Response: Based on comments, the Resources Subcommittee recommends this requirement more appropriately belongs in the AGC standard. The SAR was revised and will address only the collection of data needed to model frequency response in each interconnection. Once more is known about frequency response, additional standards may be proposed with specific performance requirements for generators. This will allow analyses to focus on the different types of response and should, eventually, facilitate the development of another standard that includes performance requirements aimed at providing a specified amount of frequency response.			
ITC Transmission (1) Jim Cyrulewski	✓		However some bullets need further clarification Bullet 2: The standards process allows for regional differences. What more flexibility is needed?

Commenter	Yes	No	Comment
Beth Howell Mike Moltane Van Greening			Bullet 6: Keep this bullet simple by simply stating target levels will be set for BAs and RROs to take actions cited. Also a sub-bullet needs to be added on what are options to get additional frequency response; specifically for the BAs. In particular what can the BAs do if the Generation Owners do not provide adequate response. The BAs don't have generation interconnection agreements, the transmission owners do.
Response: As originally envisioned, the primary differences would have been at the Interconnection level. For example, it was envisioned that there might be more than one authorized method that could be used by a BA to calculate response. We agree that transmission owners have interconnection agreements that provide leverage to get generators to perform through "good utility practices" provisions. The SAR was revised and will address only the collection of data needed to model frequency response in each interconnection. Once more is known about frequency response, additional standards may be proposed with specific performance requirements for generators. This will allow analyses to focus on the different types of response and should, eventually, facilitate the development of another standard that includes performance requirements aimed at providing a specified amount of frequency response.			
Midwest Reliability Organization (2)	✓		In particular we agree that generator owners have an obligation to have working governors or provide explanations why not. The 10 MW requirement should be evaluated for consistency with other standards. This should not hold up the progress of the SAR, but should be evaluated by the ultimate standard drafting team.
Response: The SAR was revised and will address only the collection of data needed to model frequency response in each interconnection. Once more is known about frequency response, additional standards may be proposed with specific performance requirements for generators. This will allow analyses to focus on the different types of response and should, eventually, facilitate the development of another standard that includes performance requirements aimed at providing a specified amount of frequency response. With respect to the 10 MW threshold - As each new standard is developed, greater attention will be paid on the 'applicability'. The threshold of '10 MW' will need to be reviewed from a reliability-related perspective rather than 'consistency across all standards' perspective.			
Southern Company Transm. (1)	✓		

3. Do you agree that the proposed standard(s) would be applicable to the Reliability Coordinator, Balancing Authority, Generator Owner, and Load-serving Entity?

Summary Consideration: Although most commenters agreed with the proposed applicability, the drafting team has reduced the scope of the proposed standard, and the proposed applicability has been changed. The revised SAR shows that, in addition to the functional entities listed above, the Generator Operator may have some requirements in the proposed standard.

Commenter	Yes	No	Comment
Tri-State G&T (1) Bruce Sembeck		✓	Since the standard is concerned with governor regulated frequency response of generating units that applicability should also apply to the Generator Operator (currently this box is not checked). It will ultimately be the Generator Operators responsibility to ensure frequency responsiveness of the units, e.g. ensuring that the unit is not operating in Valve Wide Open mode.
Response: Note that the SAR was revised and will address only the collection of data needed to model frequency response in each interconnection. We will include generator operator as an applicable entity.			
PJM Corporate Development Div. (2)		✓	This question would require an assumption of what the standard would be. If the standard is to provide sub-minute frequency response, then the only entity should be the generator owner.
Response: The SAR was revised and will address only the collection of data needed to model frequency response in each interconnection.			
IESO. (2) Ron Falsetti		✓	Not having a good handle on what the standard is intended to achieve and stipulate, we are unable to comment on whom the standard should apply to. Among the ones included in the question, we are unclear on the role of the RC in requiring anyone to install devices or take actions to improve frequency response in day to day operation.
Response: The SAR was revised and will address only the collection of data needed to model frequency response in each interconnection. We expect the Reliability Coordinator's role to be limited (most likely only alerting other Reliability Coordinators of generation or load events causing significant frequency excursions)			
Duke Energy Midwest (1, 3, 6) Jeff Baker		✓	
IESO (1) Anita Lee	✓	✓	The Generator Operator may also have some responsibilities, such as the selection of control modes. We're not sure what the LSE can do regarding the standard. They cannot control response from load. The exception may be coordination of frequency response with UFLS. Planners may have some responsibilities with regard to new interconnections and also using observed frequency response in models as opposed to theoretical response.

Commenter	Yes	No	Comment
Response: The SAR was revised and will address only the collection of data needed to model frequency response in each interconnection. The LSE does need to provide some of this data and is listed as an applicable entity in the revised SAR.			
BPA (1, 3, 5, 6)	✓	✓	The only portion we can think of that would applicable to the Load-serving entity is for the load-serving entity to report their underfrequency load shedding settings. We believe LSEs should be removed as applicable entities.
Response: The SAR was revised and will address only the collection of data needed to model frequency response in each interconnection. The LSE does need to provide some of this data and is listed as an applicable entity in the revised SAR.			
Duke Energy Carolinas (1, 3, 5, 6) Tom Pruitt	✓		However, the standard applies to each entity in different ways. The lion's share of responsibility lies with the BA to insure that the aggregate of the Gen Owners responses provide the response needed.
Response: The SAR was revised and will address only the collection of data needed to model frequency response in each interconnection.			
WECC Reliability Coordination Subc.	✓		The only portion we can think of that would applicable to the Load-serving entity is for the load-serving entity to report their underfrequency load shedding settings. We believe LSEs should be removed as applicable entities.
Response: The SAR was revised and will address only the collection of data needed to model frequency response in each interconnection. The Load-serving Entity does need to provide some of this data and is listed as an applicable entity in the revised SAR.			
ATC LLC (1) Jason Shaver	✓		Please see comment in questions two about the Load-serving Entity.
Response: Please see the response to your comment on question 2.			
Midwest Reliability Organization (2)	✓		The Generator Operator may also have some responsibilities, such as the selection of control modes. We're not sure what the LSE can do regarding the standard. They cannot control response from load. The exception may be coordination of frequency response with UFLS. Planners may have some responsibilities with regard to new interconnections and also using observed frequency response in models as opposed to theoretical response.
Response: The SAR was revised and will address only the collection of data needed to model frequency response in each interconnection. The Load-serving Entity does need to provide some of this data and is listed as an applicable entity in the revised SAR.			
NERC Resources Subcommittee	✓		The proposed standards may apply to LSEs when demand side resources are utilized for frequency control, but will not apply to many of the LSEs. There may also be cases where Generator Operators have obligations under the standard.
Response: The SAR was revised and will address only the collection of data needed to model frequency response in each interconnection. The Load-serving Entity does need to provide some of this data and is listed as an applicable entity in the revised SAR.			
Energy Mark, Inc. (8)	✓		The requirements applicable to the Generator Owner and Load-serving Entity may only

Commenter	Yes	No	Comment
Howard F. Illian			include requirements for measurement processes, not necessairly requirements to provide any frequency response.
Response: The SAR was revised and will address only the collection of data needed to model frequency response in each interconnection. The Load-serving Entity does need to provide some of this data and is listed as an applicable entity in the revised SAR.			
NPCC CP9 Reliability Standards Working Group	✓		If required.
Response: Thank you.			
ITC Transmission (1) Jim Cyrulewski Beth Howell Mike Moltane Van Greening	✓		Also pertains to Generator Operator.
Response: The SAR was revised and will address only the collection of data needed to model frequency response in each interconnection. In the revised SAR, the Generator Operator is responsible for providing data when the BA's performance is below an Interconnection target.			
Southern Company Transm. (1)	✓		

4. **The current standard on Bias requires a Balancing Authority to carry a minimum bias equal to 1% of peak load. As an example, in the Eastern Interconnection, this value is double current natural frequency response. Should the standard provide an incentive, such that a Balancing Authority can use a bias equal to their natural response, but less than 1% of peak, if the response is above an acceptable target?**

Summary Consideration: While most commenters supported this suggestion, there was not consensus on the scope of the proposed requirements, and the drafting team revised the SAR to focus solely on collecting data needed to model frequency response in each of the interconnections. The drafting team will forward these comments to the Director of Standards Development so that they can be addressed by the Balance Resources and Demand standard drafting team or another drafting team. This shall serve as a summary response to all comments provided.

Commenter	Yes	No	Comment
IESO. (2) Ron Falsetti		✓	(i) The question seems to get the sub-minute and longer-term targets intertwined. We are unclear on which "standard be provided an incentive". Is it the proposed sub-minute standard which has yet to be determined or the current standard on Bias? If it is the former, then this question seems a bit premature as we don't even know what the performance target for sub-minute response should be. If it's the latter, then the issue belongs to other BAL standards.
		✓	The RS again is avoiding the issue of what sub-minute frequency response it MUST mandate. The 1% is related to the frequency bias setting (basically a long term average response). The BRD deals with the longer term issue of frequency response - this standard was designed for the shorter-term response. If the RS is willing to accept under-biased systems then it would seem to be going against conventional wisdom, and should explain why it would even consider such an idea. If the real intent of this frequency SAR is to establish a minimum frequency response value then the SAR needs to state that. Perhaps the SAR should establish a minimum 1 minute response for every generator (if they can't provide it they are obligated to contract for it from another unit) and maybe a 1 minute average over a week, month, or year if a longer term value is needed. However, since the SAR authors state the problem is sub-minute response, it is suggested that the long term response is better be addressed by the BRD standard. In addition the SAR does not adequately address the load portion of the frequency response. The standard seems to presuppose the solution is having governors.
BPA (1, 3, 5, 6)	✓	✓	The standard should not provide an incentive, but the standard should provide a methodology that would allow a Balancing Authority to calculate a bias based on their natural response, provided that response is above an acceptable target.

Commenter	Yes	No	Comment
Southern Company Transm. (1)	✓		The 1% minimum frequency bias is obsolete and does not take into account the changes in interconnection frequency response over recent years. If not modified, it will lead to increased frequency oscillations within the interconnections and needless maneuvering of generating assets with associated wear and tear on these assets.
IESO(1) Anita Lee	✓		There should be a safeguard in place, such that if frequency performance declines, the industry reverts to the 1% minimum.
Midwest Reliability Organization (2)	✓		There should be a safeguard in place, such that if frequency performance declines, the industry reverts to the 1% minimum.
Energy Mark, Inc. (8) Howard F. Illian	✓		There is a minimum frequency response below which the interconnection will be less reliable than acceptable. We currently do not know what this value is but we do know that a value exists. We also know that this value is less than the 1% of peak load specificed in the current standards. A standard that arbitrarily requires a 1% of peak load response without a technical justification based on reliability cannot be called a reliabiltiy standard. However, even though we do not know the minimum frequency response below which the interconnection will be less reliable than acceptable, we can perform the work necessary to estimate a reasonable value for a minimum frequency response and assign responsibility for that response among the Balancing Authorities on an interconnection. A Frequency Response Standard without this characteristic cannot maintain reliability of the interconnection.
Duke Energy Midwest (1, 3, 6) Jeff Baker	✓		I believe that an incentive should be included in the standard.
Duke Energy Carolinas (1, 3, 5, 6) Tom Pruitt	✓		Calculation of each BA's bias should be based on a rigorous analysis which demonstrates that the BA can provide the expected response, regardless of peak load. This is consistent with the proposed requirements - 'technically-sound calculation and report of frequency response' and 'Will not mandate a given amount of frequency response'.
ATC LLC (1) Jason Shaver	✓		Although ATC is in support of this recommendation, we feel that it should be classified as an "allowable exemption" not an "incentive".
NERC Resources Subcommittee	✓		The 1% minimum frequency bias should be evaluated to take into account the reliability requirements of the interconnections. frequency response over recent years. We suggest that the minimum bias be addressed during the development of the Frequency Response Standard. It is unclear what the word "incentive" means above.
ITC Transmission (1) Jim Cyrulewski Beth Howell	✓		However this requirement still does not address the need for enough frequency response on the system.

Commenter	Yes	No	Comment
Mike Moltane Van Greening			

5. Several commenters suggested response should be measured for an extended period after a frequency excursion, up to the point where automatic generation control (AGC) would take over. This was to ensure initial response wasn't withdrawn prematurely. Should the standard measure out to 60 seconds following an excursion?

Summary Consideration: There was not consensus on the scope of the proposed requirements, and the drafting team revised the SAR to focus solely on collecting data needed to model frequency response in each of the interconnections. The drafting team modified the SAR to specify that data will be collected to measure response over a period up to 5 minutes. This window may be reduced during the standard drafting phase. This should provide sufficient data to analyze frequency response and should help identify the window of time where frequency response appears to be masked by Automatic Generation Control action.

Commenter	Yes	No	Comment
Duke Energy Midwest (1, 3, 6) Jeff Baker			I did not provide an answer but believe that this is a decision that could be made over time and not necessarily with the inception of the standard.
Response: We agree.			
Arizona Public Service Co. (1, 5) Baj Agrawal		✓	Most of the frequency recovery happens in first 30 seconds. Thus anything more than 30 seconds is unnecessary. It is also seen that the response of a unit varies greatly within that 30 seconds period. Thus, it is very important that the measured response be the average response over the 30 seconds period and not be the response at 30 seconds.
Response: We agree that frequency response should be measured over a period of time (as opposed to a measure for a single event).			
Southern Company Transm. (1)		✓	AGC response begins within only a few seconds after the disturbance with a maximum ramp rate achieved within three to five minutes. Governor response and load frequency response typically peak within 30 seconds. There is some logic to monitoring governor respone for sustainability past its initial peak, but we have not seen anything about that in this SAR.
Response: There was no consensus on this matter. The drafting team modified the SAR to specify that data will be collected to measure response over a period up to 5 minutes. This should provide sufficient data to analyze frequency response and should help identify the window of time where frequency response appears to be masked by AGC action.			
		✓	The standard should measure out to when the frequency recovers. This could be up to the 15 minute DCS limit. AGC control may or may not kick in within 60 seconds depending on deadbands, etc. However, generators on setpoint control may hold for between 10 and 60 seconds then drop back off prior to AGC pulses reaching the generator. In order to see the full response of a BA it is necessary to see data for the full event rather than just the first minute. Rather than overlapping the BRD standard, this will work hand-in-hand with this standard.
Response: There was no consensus on this matter. The drafting team modified the SAR to specify that data will be collected to measure response over a period up to 5 minutes. This should provide sufficient data to analyze frequency response and should help identify the window			

Commenter	Yes	No	Comment
of time where frequency response appears to be masked by AGC action.			
NPCC CP9 Reliability Standards Working Group		✓	This question is not clear. AGC control pulses generation every 5 seconds, therefore, the measurement should be based on the amount of time it takes to restore the generation load balance.
Response: In general, following a unit trip, frequency will not recover until the contingent BA has replaced the energy that was lost. This typically takes up to 15 minutes. Unless over-biased, a non-contingent BA will not contribute AGC response to a frequency event.			
PJM Corporate Development Div. (2)		✓	Unsure as to what is being suggested here. The SAR drafters need to be specific about what requirements are needed and how they will be measured. The details contained in the white paper are supporting information but they do not define the standard that is being proposed.
Response: There was no consensus on the scope of the proposed requirements, and the drafting team revised the SAR to focus solely on collecting data needed to model frequency response in each of the interconnections.			
NERC Resources Subcommittee	✓	✓	AGC response begins within only a few seconds after the disturbance with a maximum ramp rate achieved within three to five minutes. Governor response and load frequency response typically peak within 30 seconds. There is logic to monitoring governor response for sustainability past its initial peak and this should be investigated during standard development.
Response: We agree with this comment. The drafting team modified the SAR to specify that data will be collected to measure response over a period up to 5 minutes. This should provide sufficient data to analyze frequency response and should help identify the window of time where frequency response appears to be masked by AGC action.			
IESO(1) Anita Lee	✓		Sixty seconds is a reasonable balance to capture the period prior to AGC response.
Response: Agree – However, several commenters indicated there may be value in analyzing response for several minutes and the drafting team modified the SAR to specify that data will be collected to measure response over a period up to 5 minutes. This should provide sufficient data to analyze frequency response and should help identify the window of time where frequency response appears to be masked by AGC action.			
IESO. (2) Ron Falsetti	✓		This should cover the entire spectrum of immediate response before AGC kicks in.
Response: Agree However, several commenters indicated there may be value in analyzing response for several minutes and the drafting team modified the SAR to specify that data will be collected to measure response over a period up to 5 minutes. This should provide sufficient data to analyze frequency response and should help identify the window of time where frequency response appears to be masked by AGC action.			
Energy Mark, Inc. (8) Howard F. Illian	✓		There are two issues associated with this question. The first is that the change in instantaneous frequency be limited to within a range that limits the risk of a cascading outage on the interconnection. The second is that each generation technology provides a different response characteristic within the first minute after a sudden frequency excursion. Work

Commenter	Yes	No	Comment
			performed at NIPSCo and published by IEEE indicated that a measurement interval of one to two minutes worked well for the measurement of frequency response. Without specific knowledge of the nature of the individual responses that make up the sustained frequency response to an excursion, it may be difficult to justify the selection of a measurement interval shorter than one-minute that might put some generation technologies at a disadvantage with respect to the measurement method. This is a subject that the drafting team should technically evaluate before including a specific measurement period in the standard.
Response: Several commenters indicated there may be value in analyzing response for several minutes and the drafting team modified the SAR to specify that data will be collected to measure response over a period up to 5 minutes. This should provide sufficient data to analyze frequency response and should help identify the window of time where frequency response appears to be masked by AGC action.			
Duke Energy Carolinas (1, 3, 5, 6) Tom Pruitt	✓		At least. Based on the words in the SAR Purpose statement, 'this proposed standard coordinates with and complements the Balance Resources and Demand standards, which addresses Interconnection frequency control generally 5 minutes and longer', it seems that this standard should cover out to the 5 minute mark of an event. AGC actions will commence at the first scan cylcle or two after the event (5 -15 secs), but the actual generation response may not settle out for several minutes, depending on the type and amount of generation on AGC at the time.
Response: Several commenters indicated there may be value in analyzing response for several minutes and the drafting team modified the SAR to specify that data will be collected to measure response over a period up to 5 minutes. This should provide sufficient data to analyze frequency response and should help identify the window of time where frequency response appears to be masked by AGC action.			
Midwest Reliability Organization (2)	✓		This is a significant issue, because if the governor system withdraws the unit's support prior to the recovery of frequency, this does have a problematic impact. A period of at least 60 seconds should be considered, and 60 seconds may not be adequate as often frequency recovery of the interconnection extends beyond the initial 60 seconds.
Response: Several commenters indicated there may be value in analyzing response for several minutes and the drafting team modified the SAR to specify that data will be collected to measure response over a period up to 5 minutes. This should provide sufficient data to analyze frequency response and should help identify the window of time where frequency response appears to be masked by AGC action.			
ITC Transmission (1) Jim Cyrulewski Beth Howell Mike Moltane Van Greening	✓		Needs to be verified with a field trial.
Response: Several commenters indicated there may be value in analyzing response for several minutes and the drafting team modified the SAR to specify that data will be collected to measure response over a period up to 5 minutes. This should provide sufficient data to analyze frequency response and should help identify the window of time where frequency response appears to be masked by AGC action. Note that the			

Commenter	Yes	No	Comment
drafting team modified the scope of the entire SAR to focus solely on collecting data needed to model frequency response in each of the interconnections.			
ATC LLC (1) Jason Shaver	✓		

6. Do you have other comments on the SAR?

Commenter	Comment
ITC Transmission (1) Jim Cyrulewski Beth Howell Mike Moltane Van Greening	Reliability and Market Interface Principles 3, 5 and 6 should be checked as well.
Response: We made this change.	
PJM Corporate Development Div. (2)	Please be clear about the terminology. Frequency response comes in many flavors - sub-minute; several minutes; and hours. The RS seems to touch on all of them in this proposal.
Response: There was no consensus on the scope of the proposed requirements, and the drafting team revised the SAR to focus solely on collecting data needed to model frequency response in each of the interconnections. The data collection will include data to model and analyze frequency response up to five minutes.	
Southern Company Transm. (1)	In our opinion, this SAR, or one like it, is required to ensure that the primary frequency response of the interconnections and the BAs do not deteriorate to a point where 1) the interconnection can not adequately respond to major generator trips (including potential multiple contingencies which, though rare, do happen) and 2) primary frequency response of the BAs is inadequate to support islanding during severe local disturbances, thus allowing local disturbances to cascade into regional or interconnection wide disturbances. Primary frequency response is declining in at least the Eastern and Western Interconnections. WECC has taken a proactive approach to addressing this problem, but there is no similar work being done in the Eastern Interconnection. This SAR, or one like it, is needed to take the best practices in the industry, wherever they may be found, and utilize them to protect the interconnections from disturbances that could be avoided if we take action now rather than waiting until the problems actually occur.
Response: There was no consensus on the scope of the proposed requirements, and the drafting team revised the SAR to focus solely on collecting data needed to model frequency response in each of the interconnections. Your support is very much appreciated.	
IESO. (2) Ron Falsetti	(i) The SAR does not address the load portion of the frequency response but it indicates that the standard would apply to the LSEs as well. Please clarify or eliminate LSE from the Reliability Function check list. (ii) We feel that the SAR needs to be very clear on what the proposed standard is intended and what will be included. Conducting calculation, measuring and report on frequency excursion events followed by analysis would help to ascertain whether or not poor performance exists. However, the determination of poor performance also relies on having a minimally acceptable level to gauge. If the standard is to provide requirements for calculation, reporting and conducting analysis only, then there

Commenter	Comment
	needs to be some general guideline on the threshold for reporting and analyzing, which in turn begs the question of should this "guideline" be included as the initial standard, whose compliance would not be enforced until sufficient experience has been gained and field test conducted, with possible revision as experience and field test so suggest. Absent a minimum performance level, the requirements for governor setting would be difficult to determine.
Response: There was no consensus on the scope of the proposed requirements, and the drafting team revised the SAR to focus solely on collecting data needed to model frequency response in each of the interconnections. The Load-serving Entity will need to provide some of the data needed to model frequency response.	
Energy Mark, Inc. (8) Howard F. Illian	The current measurement methods for determining individual Balancing Authority Frequency Response may not be reliable. This is because the current measurement methods only capture a small sample of the frequency responses provided limited to only several minutes per year. The metering methods we currently use on the interconnection can shed some light on this problem. Since the each BA measures its Tie Line Error with common metering with adjancent BAs, the sum of the Tie Line Errors over the total interconnection must equal zero at all times. Each tie line has a positive error for one BA and a negative error of equal value to the other BA that the tie line connects. If the errors must sum to zero, then the change in errors must also sum to zero between any two points in time. Since the Frequency on an interconnection is the same throughtout the interconnection at any point in time for the purpose of the frequency response measurement, the change in frequency between two points in time must also be the same throughout the interconnection. Therefore, the change in tie-line error divided by the change in frequency must indicate a total frequency response for the interconnection as measured by the sum of the individual BA frequency responses must be equal to zero. In other words, there is a BA or a set of BAs that cause each frequency response on the interconnection. Only knowledge of the distribution of individual frequency responses among BAs will provide the necessary information to determine whether or not the frequency response indicated by current measurement methods will maintain adequate reliablity. It may not be the average frequency response to large events that indicates interconnection reliability, but the distribution of frequency responses among BAs including both the positive and negative responses. Therefore, the measurement methods included in the standard should have the goal of capturing the distribution of both positive and negative frequency responses over the entire range of frequency operation should be a goal of standard. The measurement methods suggested will not accomplish this goal.
Response: We agree with the concerns on errors induced in the measurement process. The standard will be designed to capture enough events to provide a statistically-sound estimate of Balancing Authority response. We also agree that the distribution of responses needs to be considered.	
Duke Energy Midwest (1, 3, 6) Jeff Baker	I believe we have to address the frequency issue, but feel that it can be developed over time proactivly.
Response: The revised SAR focuses solely on the collection of data needed to model frequency response. The data can be analyzed and additional standards can be developed that build on the results of those analyses. This supports your suggestion that the standard(s) be	

Commenter	Comment
developed proactively over time.	
NERC Resources Subcommittee	In our opinion, this SAR, or one like it, is required to ensure that the primary frequency response of the interconnections and the BAs do not deteriorate to a point where 1) the interconnection can not adequately respond to major generator trips (including potential multiple contingencies which, though rare, do happen) and 2) primary frequency response of the BAs is inadequate to support islanding during severe local disturbances, thus allowing local disturbances to cascade into regional or interconnection wide disturbances. Primary frequency response is declining in all Interconnections, Eastern, Western and ERCOT. WECC and ERCOT have taken a proactive approach to addressing this problem, but there is no similar work being done in the Eastern Interconnection. This SAR, or one like it, is needed.
Response: There was no consensus on the scope of the proposed requirements, and the drafting team revised the SAR to focus solely on collecting data needed to model frequency response in each of the interconnections. Your support is very much appreciated.	

Standard Authorization Request Form

Title of Proposed Standard	Frequency Response Draft 3
Revised:	12/06/06

SAR Requestor Information		**SAR Type** (Put an 'x' in front of one of these selections)	
Name	Terry Bilke	x	New Standard
Primary Contact	Terry Bilke	☐	Revision to existing Standard
Telephone	(317) 249-5463	☐	Withdrawal of existing Standard
Fax	(317) 249-5994		
E-mail	tbilke@midwestiso.org	☐	Urgent Action

Purpose/Industry Need

Frequency Response, a measure of an Interconnection's ability to stabilize frequency immediately following the sudden loss of generation or load, is a critical component to the reliable operation of the bulk power system, particularly during disturbances and restoration. The proposed standard's intent is to collect data needed to accurately model existing Frequency Response. There is evidence of continuing decline in Frequency Response in the three Interconnections over the past 10 years, but no confirmed reason for the apparent decline. The proposed standard requires entities to provide data so that Frequency Response in each of the Interconnections can be modeled, and the reasons for the decline in Frequency Response can be identified. Once the reasons for the decline in Frequency Response are confirmed, requirements can be written to control Frequency Response to within defined reliability parameters.

Reliability Functions

The Standard will Apply to the Following Functions *(Check box for each one that applies by double clicking the grey boxes.)*		
☒	Reliability Coordinator	Responsible for the real-time operating reliability of its Reliability Coordinator Area in coordination with its neighboring Reliability Coordinator's wide area view.
☒	Balancing Authority	Integrates resource plans ahead of time, and maintains load-interchange-resource balance within its metered boundary and supports system frequency in real time
☐	Interchange Authority	Ensures communication of interchange transactions for reliability evaluation purposes and coordinates implementation of valid and balanced interchange schedules between Balancing Authority Areas.
☐	Planning Coordinator	Assesses the longer-term reliability of its Planning Coordinator Area.
☐	Resource Planner	Develops a long-term (>1year) plan for the resource adequacy of specific loads within its portion of a Planning Coordinator Area.
☐	Transmission Planner	Develops a (>one year) plan for the reliability of the interconnected Bulk Electric System within its portion of the Planning Coordinator Area.
☐	Transmission Service Provider	Administers the transmission tariff and provides transmission services under applicable transmission service agreements (e.g., the pro forma tariff).
☐	Transmission Owner	Owns and maintains transmission facilities.
☐	Transmission Operator	Ensures the real-time operating reliability of the transmission assets within a Transmission Operator Area.
☐	Distribution Provider	Delivers electrical energy to the End-use customer.
☒	Generator Owner	Owns and maintains generation facilities.
☒	Generator Operator	Operates generation unit(s) to provide real and reactive power.
☐	Purchasing-Selling Entity	Purchases or sells energy, capacity, and necessary reliability-related services as required.
☐	Market Operator	Interface point for reliability functions with commercial functions.
☒	Load-Serving Entity	Secures energy and transmission service (and related reliability-related services) to serve the End-use Customer.

Reliability and Market Interface Principles

Applicable Reliability Principles *(Check boxes for all that apply by double clicking the grey boxes.)*	
☒	1. Interconnected bulk electric systems shall be planned and operated in a coordinated manner to perform reliably under normal and abnormal conditions as defined in the NERC Standards.
☒	2. The frequency and voltage of interconnected bulk electric systems shall be controlled within defined limits through the balancing of real and reactive power supply and demand.
☒	3. Information necessary for the planning and operation of interconnected bulk electric systems shall be made available to those entities responsible for planning and operating the systems reliably.
☐	4. Plans for emergency operation and system restoration of interconnected bulk electric systems shall be developed, coordinated, maintained and implemented.
☒	5. Facilities for communication, monitoring and control shall be provided, used and maintained for the reliability of interconnected bulk electric systems.
☒	6. Personnel responsible for planning and operating interconnected bulk electric systems shall be trained, qualified and have the responsibility and authority to implement actions.
☒	7. The security of the interconnected bulk electric systems shall be assessed, monitored and maintained on a wide area basis.

Does the proposed Standard comply with all of the following Market Interface Principles? *(Select 'yes' or 'no' from the drop-down box by double clicking the grey area.)*
1. The planning and operation of bulk electric systems shall recognize that reliability is an essential requirement of a robust North American economy. Yes
2. An Organization Standard shall not give any market participant an unfair competitive advantage.Yes
3. An Organization Standard shall neither mandate nor prohibit any specific market structure. Yes
4. An Organization Standard shall not preclude market solutions to achieving compliance with that Standard. Yes
5. An Organization Standard shall not require the public disclosure of commercially sensitive information. All market participants shall have equal opportunity to access commercially non-sensitive information that is required for compliance with reliability standards. Yes

Detailed Description (Provide enough detail so that an independent entity familiar with the industry could draft, modify, or withdraw a Standard based on this description.)

The proposed technical/preparedness standard will require or provide the following:

1. Each Balancing Authority shall collect and provide data [scan rate tie deviation and frequency for up to 5* minutes per event] needed to model its sub-minute Frequency Response to loss of large generating units and load.

2. Each Balancing Authority shall report each loss of generation or load greater than the respective Interconnection reporting threshold to its Reliability Coordinator.

3. Each Reliability Coordinator shall relay Frequency Response Standard (FRS) event information to other Reliability Coordinators in its Interconnection. The Interconnection Time Monitor will maintain a log of FRS events.

4. NERC shall annually post a list of FRS events. These events shall be used by Balancing Authorities to calculate and report their annual Frequency Response and Bias.

5. NERC, in conjunction with the respective Regions, shall establish a Target Frequency Response for each Interconnection. Absent an agreement, the observed Frequency Response in the first year of the FRS shall be used as a target.

6. Balancing Authorities with less than [75%]* of their share of Target Frequency Response shall provide generation-level data to their Region for use by Transmission Planners and Planning Coordinators.

    a. Each Generator Operator that operates a generator larger than [10 MW]*, shall provide data to its Balancing Authority, as required in item 6, to support this standard and for use in developing models of Frequency Response in the associated Interconnection.

    b. Load Serving Entities shall provide data, as required in item 6, to their BA and Region to support the standard.

*These values are representative and will be refined based on stakeholder input during the standard drafting phase.

Related Standards

Standard No.	Explanation
BAL-001-0 through BAL-006-0	Balancing Standards, version 0
Balance Resources and Demand draft standards	Balancing Resources and Demand BAL-007 through BAL-011 draft standards, are in standards development process
MOD-013-0	The proposed standard would enable better input data to the

	modeling standards.

Related SARs

SAR ID	Explanation
Frequency Response SAR, version 0	Original Frequency Response SAR
MOD-027	Verification and Status of Generator Frequency Response. The proposed standard would provide a mechanism to validate compliance with MOD-027. The proposed standard could also provide a means to achieve MOD-027 (if the Balancing Authority implements on on-line measurement of generator frequency using SCADA data).

Regional Differences

Region	Explanation
ECAR	
ERCOT	Single Balancing Authority Interconnections calculate Frequency Response based on the change in generation (or load) rather than Tie-Line deviation (ERCOT).
FRCC	
MAAC	
MAIN	
MAPP	
NPCC	
SERC	
SPP	
WECC	

NERC
NORTH AMERICAN ELECTRIC RELIABILITY CORPORATION

Maureen E. Long
Standards Process Manager

February 8, 2007

TO: REGISTERED BALLOT BODY

Ladies and Gentlemen:

Announcement: Comment Periods Open for three SARs

System Restoration and Blackstart SAR (February 8–March 9, 2007)

The second draft of the System Restoration and Blackstart SAR has been posted for a 30-day comment period from February 8 through March 9, 2007. The SAR calls for the modification of the following standards:

EOP-005 — System Restoration Plans
EOP-006 — Reliability Coordination – System Restoration
EOP-007 — Establish, Maintain, and Document a Regional Blackstart Capability Plan
EOP-009 — Documentation of Blackstart Generating Unit Test Results

This project involves upgrading the overall quality of the four standards; eliminating some gaps in the requirements, ambiguity, and "fill-in-the-blank" components.

The development may include other improvements to the standards deemed appropriate by the drafting team, with the consensus of stakeholders, consistent with establishing high-quality, enforceable, and technically sufficient bulk power system reliability standards.

Please use the comment form to provide comments on this SAR.

Underfrequency Load Shedding SAR (February 8–March 9, 2007)

The second draft of the Underfrequency Load Shedding SAR has been posted for a 30-day comment period from February 8 through March 9, 2007. The SAR calls for the modification of the following standards:

PRC-006 — Development and Documentation of Regional Reliability Organizations' Underfrequency Load Shedding Programs

PRC-007 — Assuring Consistency with Regional UFLS Programs

PRC-009 — UFLS Performance Following an Underfrequency Event

This project involves upgrading the overall quality of the four standards; eliminating some gaps in the requirements, ambiguity, and "fill-in-the-blank" components.

The development may include other improvements to the standards deemed appropriate by the drafting team, with the consensus of stakeholders, consistent with establishing high-quality, enforceable, and technically sufficient bulk power system reliability standards.

Please use the comment form to provide comments on this SAR.

Frequency Response SAR (February 8–March 9, 2007)

The third draft of the Frequency Response SAR has been posted for a 30-day comment period from February 8 through March 9, 2007. The SAR calls for the collection of data needed to model each interconnection's frequency response.

Please use the comment form to provide comments on this SAR.

Standards Development Process

The *Reliability Standards Development Procedure* contains all the procedures governing the standards development process. The success of the NERC standards development process depends on stakeholder participation. We extend our thanks to all those who participate. If you have any questions, please contact me at 813-468-5998 or maureen.long@nerc.net.

Sincerely,

Maureen E. Long

cc: Registered Ballot Body Registered Users
Standards Mailing List
NERC Roster

Comment Form for Draft 3 of the Frequency Response SAR

Please use this form to submit comments on the third draft of the Frequency Response SAR. Comments must be submitted by **March 9, 2007**. You may submit the completed form by e-mail to sarcomm@nerc.com with the words "FR SAR Draft 3" in the subject line. If you have questions please contact Maureen Long at maureen.long@nerc.net or by telephone at 813-468-5998.

Individual Commenter Information **(Complete this page for comments from one organization or individual.)**		
Name:		
Organization:		
Telephone:		
E-mail:		
NERC Region		**Registered Ballot Body Segment**
☐ **ERCOT** ☐ **FRCC** ☐ **MRO** ☐ **NPCC** ☐ **RFC** ☐ **SERC** ☐ **SPP** ☒ **WECC** ☐ **NA – Not Applicable**	☐	1 — Transmission Owners
	☐	2 — RTOs, ISOs
	☐	3 — Load-serving Entities
	☐	4 — Transmission-dependent Utilities
	☐	5 — Electric Generators
	☐	6 — Electricity Brokers, Aggregators, and Marketers
	☐	7 — Large Electricity End Users
	☐	8 — Small Electricity End Users
	☐	9 — Federal, State, Provincial Regulatory or other Government Entities
	☐	10 — Regional Reliability Organizations, Regional Entities

Group Comments (Complete this page if comments are from a group.)

Group Name: Bonneville Power Administration

Lead Contact: **Bart McManus**

Contact Organization: **Bonneville Power Administration**

Contact Segment: **1**

Contact Telephone: **360-418-2309**

Contact E-mail: **bamcmanus@bpa.gov**

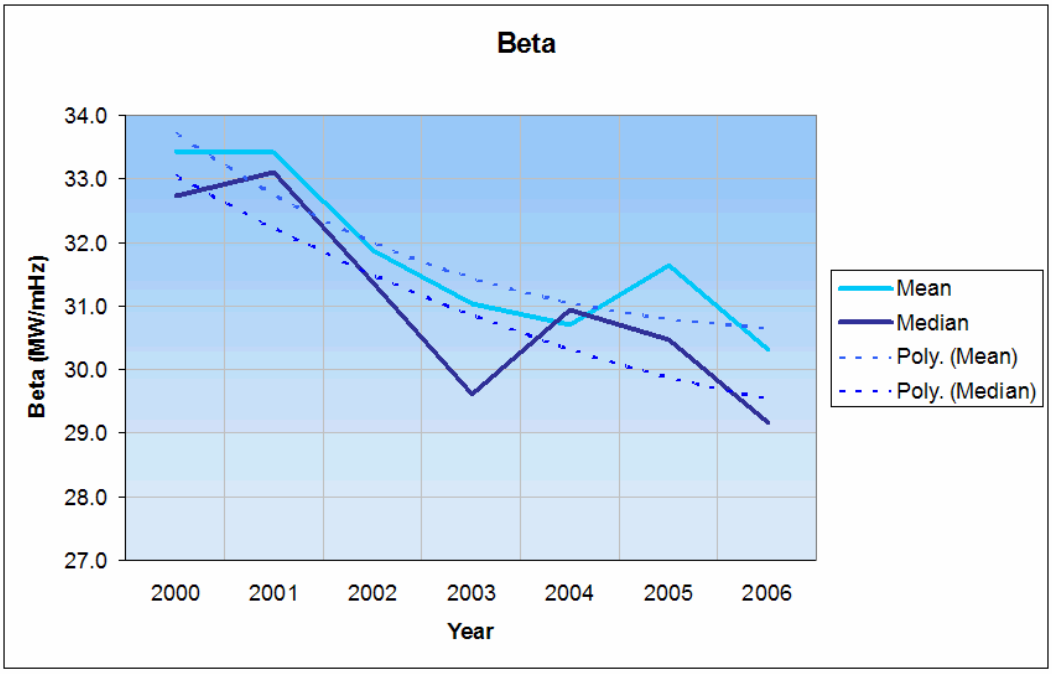
Additional Member Name	Additional Member Organization	Region*	Segment*
James Murphy	Bonneville Power Administration	**WECC**	1
John Anasis	Bonneville Power Administration	**WECC**	1
Brenda Anderson	Bonneville Power Administration	**WECC**	6

*If more than one Region or Segment applies, indicate the best fit for the purpose of these comments. Regional acronyms and segment numbers are shown on prior page.

Background Information:

The original SAR on Frequency Response was submitted in large part due to a study that showed a 10+% decline in Eastern Interconnection Frequency Response over a 5-year period, when response should be increasing over time as the Interconnection grows. Other Interconnections were observing similar declines. The drafting team posted a white paper along with the SAR to outline the need for a standard.

The NERC Resources Subcommittee recently updated their estimate of Eastern Interconnection Frequency Response and found it still trending downward. Response in 2006 was on the order of 2,800 MW/0.1Hz (compared to 3,750 MW/0.1Hz in 1994). Frequency Response for larger events (greater than 35 mHz) in 2006 may be as low as 2,600 MW/0.1Hz. Below is an independently calculated estimate of the trend in Eastern Interconnection Frequency Response provided by the New York ISO. Note: Response is stated in engineering terms (MW/mHz) as opposed to the traditional MW/01.Hz.



The proposed Frequency Response standard (FRS) is a technical standard. Technical standards are described in the *Reliability Standards Development Procedure*. The FRS is not proposed to be a performance standard and does not propose a minimum Frequency Response, below which penalties are applied.

Industry commenters agreed there is a reliability need for the FRS. Comments varied on the technical details of the standard. Because of the divergent views on the details of the FRS SAR, the NERC Standards Committee (SC) directed the SAR drafting team to revise the SAR to focus only on the data collection needed to support the development of accurate models of Frequency Response in North America.

The SAR drafting team has tried to meet the Standards Committee's directive with this third version of the SAR.

The Version 3 of the Frequency Response SAR represents the changes requested by the NERC Standards Committee, while still meeting the June 2006 direction of the NERC Operating Committee. Specifically, the Operating Committee endorsed developing a Frequency Response standard that includes the following goals and objectives:

- Improving Interconnection Frequency Response event cataloging and benchmarking.
- Calculating balancing authority Frequency Response and requiring balancing authorities to analyze those cases where the response is significantly below the norm.
- Establishing time limits to complete the analyses.
- Tabulating non-responsive generators.
- Measuring generator response (those units on line).
- Including regional participation and review.

This revised SAR was reviewed and supported by the NERC Resources Subcommittee on December 4, 2006. The major changes between Draft 2 and Draft 3 include:

- Clarification on the role of the Load-serving Entity and Generator Operator.
- Inclusion of the applicability of Reliability Principles 3, 5, and 6.
- Reduced the scope to address only the collection of data needed to model Frequency Response in North America.
- Clarified that the data collected to model frequency response over a period of up to 5 minutes per event to help identify the window of time where frequency response appears to be masked by AGC action.

Note that because the changes to the SAR were quite significant, no redline showing the changes from Version 2 to Version 3 will be posted.

Please review the revised SAR and then answer the questions on the following page. Comments must be submitted by **March 9, 2007**. You may submit the completed form by e-mail to sarcomm@nerc.com with the words "FR SAR Draft 3" in the subject line.

You do not have to answer all questions. Enter All Comments in Simple Text Format.

Insert a "check" mark in the appropriate boxes by double-clicking the gray areas.

1. Do you agree with the reduced scope of this SAR — focusing only on the data collection needed to support the development of accurate models of Frequency Response in North America?
   ☒ Yes
   ☐ No
   Comments:

2. The proposed standard would have requirements for the following functional entities: Reliability Coordinator, Balancing Authority, Generator Owner, Generator Operator, and Load-serving Entity. Do you agree that these are the right functional entities for the proposed standard?
   ☒ Yes
   ☐ No
   Comments:

3. The SAR drafting team modified the SAR to clarify that data will be collected to model up to 5 minutes of frequency response. This should help identify the window of time where frequency response appears to be masked by AGC action. Do you agree with this clarification?
   ☒ Yes
   ☐ No
   Comments: With the caveat that more data may be collected if the need arises (out to 10 or 15 minutes)

4. Should a field trial be initiated, whereby a set of events for each Interconnection is posted throughout the year, to be used by BAs to calculate their 2007 Frequency Response?
   ☐ Yes
   ☒ No
   Comments: BPA does not believe a field trial is needed for this standard. The standard should be written and implemented with the levels of noncompliance structured around data submittal.

5. Please provide any other comments (that you have not already provided in response to the first three questions on this form) that you have on the revised SAR.
   Comments: BPA agrees with the necessity of a frequency response standard. BPA highly encourages that this effort be implemented as soon as possible.

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Group Comments (Complete this page if comments are from a group.)

Group Name: PJM

Lead Contact: **Albert DiCaprio**

Contact Organization: **PJM**

Contact Segment: **2**

Contact Telephone: **610-666-8854**

Contact E-mail: **dicapram@pjm.com**

Additional Member Name	Additional Member Organization	Region*	Segment*
Tom Bowe	PJM	**RFC**	2
Alicia Daughtery	PJM	**RFC**	2
Joseph Willson	PJM	**RFC**	2

*If more than one Region or Segment applies, indicate the best fit for the purpose of these comments. Regional acronyms and segment numbers are shown on prior page.

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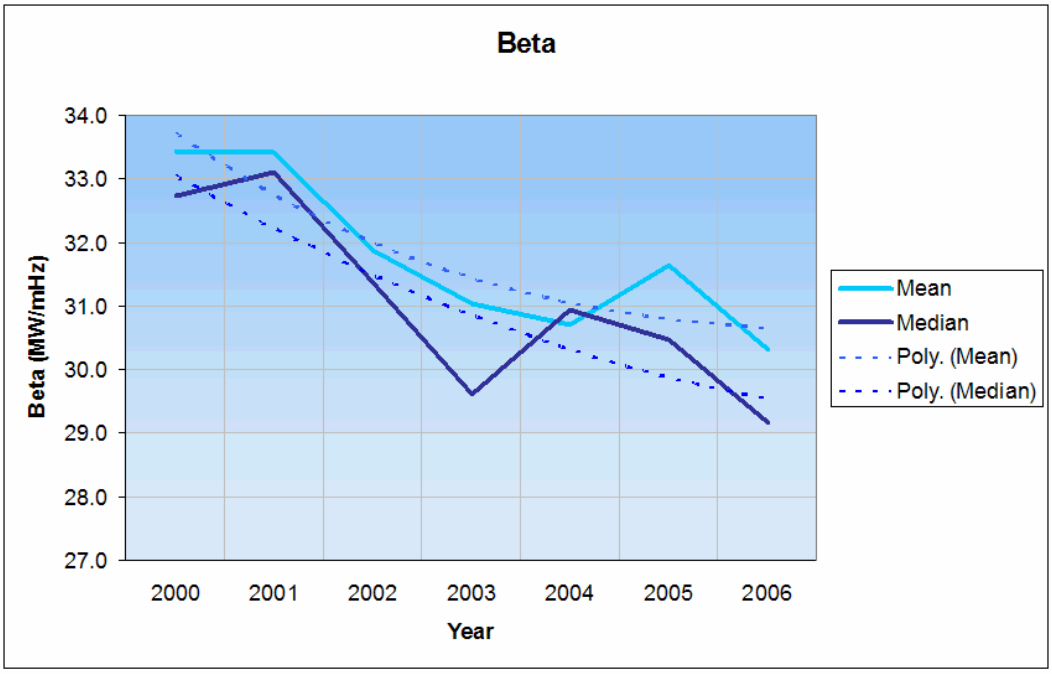

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You do not have to answer all questions. Enter All Comments in Simple Text Format.

Insert a "check" mark in the appropriate boxes by double-clicking the gray areas.

1. Do you agree with the reduced scope of this SAR — focusing only on the data collection needed to support the development of accurate models of Frequency Response in North America?

   ☐ Yes

   ☒ No

   Comments: The primary objective of this SAR is to collect data; to analyze the data; and only then to recommend a performance value. The SAR DT insists that collecting data is a Technical Standard. The RSDP states:

   "Technical standards…will contain Measures (not measuring - AMD) of physical parameters…" At this point this SAR proposal does not contain such a measure, it does not even assert that the measure is really needed (hence the need to analyze the data).

   Page 19 (of 43) of the RSPM states "The drafting team may recommend the scope of the standard be reduced to allow the effort to move forward, while still remaining within the scope of the SAR. Reducing the scope of the SAR is acceptable if the drafting team finds, for instance, THAT ADDITIONAL TECHNICAL RESEARCH IS NEEDED PRIOR TO DEVELOPING (emphasis added) a portion of the standard or issues need to be resolved before consensus can be achieved on a portion of the standard. "The highlighted section applies directly to the scope of this SAR. The SAR Team recognizes work is needed. There is no question about that. The Team should do that work BEFORE proposing a mandatory standard.
   PJM supports the concept of doing such a study, and would encourage NERC to assign a group to do such a study, but PJM does not agree that collecting data rises to the level of a valid NERC reliability standard.

2. The proposed standard would have requirements for the following functional entities: Reliability Coordinator, Balancing Authority, Generator Owner, Generator Operator, and Load-serving Entity. Do you agree that these are the right functional entities for the proposed standard?

   ☐ Yes

   ☒ No

   Comments: The proposal as written appears to be headed towards mandating a given unit response. As such there would be an obligation on the Generator Operator - there does not seem to be any requirements that would apply to the Generator Owner - unless of course the requestor includes a requirement to install a governor (this has, to date, be an implied obligation just as having a turbine has been an implied obligation). If the requestor does intend to assert an obligation on the Generator Owner to install a governor then the question arises should that be a standard or should that be a part of the Certification of a GO?

   It is not clear what the LSE requirements are in this proposal.

3. The SAR drafting team modified the SAR to clarify that data will be collected to model up to 5 minutes of frequency response. This should help identify the window of time where frequency response appears to be masked by AGC action. Do you agree with this clarification?

   ☐ Yes

   ☒ No

   Comments: As noted above PJM does not consider collecting data in order to decide what a requirement should be as grounds for a standard. Thus the sampling period which is outside of a NERC standard, can be defined in whatever way the group doing the sampling desires.

4. Should a field trial be initiated, whereby a set of events for each Interconnection is posted throughout the year, to be used by BAs to calculate their 2007 Frequency Response?

   ☐ Yes

   ☒ No

   Comments: There are field trials for standards (which this question is directed) and there are field trials for good ideas. This proposed SAR would seem to fall into the second category; and while posting events is interesting, it does not rate being a NERC standard. Collecting and posting data can be effected without a standard.

5. Please provide any other comments (that you have not already provided in response to the first three questions on this form) that you have on the revised SAR.
   Comments: PJM would also note that the proposal references two distinct parameters - the Natural response of a BA; and the natural response of a unit. It is not clear how the requestor intends to link the two parameters. The sum of the units' natural responses will not equal the natural response of the BA. Does the requestor intend to link the two, or to keep them separate? As written it appears that the requestor intends for the BA to be held responsible for an annual measured value. The SAR DT does not recognize that during different times there are different number of units opperating and available to respond. The SAR DT makes no mention of whether or not a BA(?) would have to shed load to maintain such frequency response (for those periods when all units are at full load). The SAR DT makes no mention of distance from an event. An event in NE will effect more response in NE then in Florida - how will that be addressed? PJM would ask for clarification on what the requestor would intend to mandate.

   FERC has recognized the need to include suppliers that use load control - how does this SAR intend to address such 'natural response suppliers'?

   As written this proposal becomes an ambiguous standard as it obligates a BA to get data from a generator (as opposed to directly obligating generators to supply the data to the analysis team - this is important from the perspective of who would be non-compliant if the data were not supplied - the BA or the GO?).

   PJM would suggest that NERC create a Frequency Project, budget the project through its members rather then create a standard and risk imposing non-compliance penalities for what potentially could be a non-issue. Deal with this for what it is - a research activity.

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Organization:		
Telephone:		
E-mail:		
NERC Region		**Registered Ballot Body Segment**
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Group Comments (Complete this page if comments are from a group.)

Group Name: Southwest Power Pool Operating Reliability Working Group

Lead Contact: **Wayne Galli**

Contact Organization: **Southwest Power Pool**

Contact Segment: **RTO**

Contact Telephone: **501-614-3344**

Contact E-mail: **wgalli@spp.org**

Additional Member Name	Additional Member Organization	Region*	Segment*
Pete Kuebeck	Oklahoma Gas and Electric	**SPP**	1
Jim Useldinger	Kansas City Power and Light	**SPP**	1
Bill Grant	Southwestern Public Service	**SPP**	1
Jason Atwood	Kelson Energy	**SPP**	4
Steve Massey	Westar Energy	**SPP**	5
Mike Crouch	Western Farmers Electric Coop	**SPP**	1
Dan Boezio	American Electric Power	**SPP**	1
Wayne Galli	Southwest Power Pool	**SPP**	10

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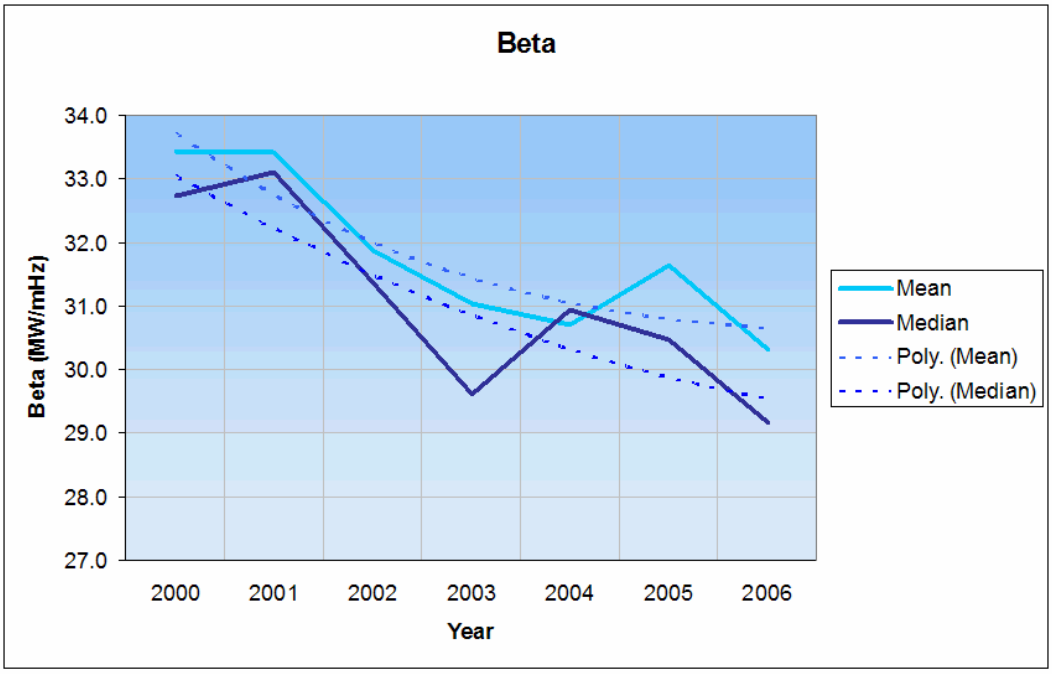

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1. Do you agree with the reduced scope of this SAR — focusing only on the data collection needed to support the development of accurate models of Frequency Response in North America?

   ☐ Yes

   ☒ No

   Comments: Do not agree with the notion in point 5 regarding the need for a Target Frequency Response for each interconnection at this time. It is beyond the scope of this technical SAR to propose anything other than collection of data to support the study.

   Do not agree with point 6 of the description. In order to get a handle on what is really going on, all Balancing Authorities should be required to produce data valid to the study. Also the language in point 6 is poorly worded compared to the right wording in 6a and 6b. 6a and 6b should be included in the SAR and 6 should be removed.

2. The proposed standard would have requirements for the following functional entities: Reliability Coordinator, Balancing Authority, Generator Owner, Generator Operator, and Load-serving Entity. Do you agree that these are the right functional entities for the proposed standard?

   ☐ Yes

   ☒ No

   Comments: A standard can not be imposed on the response of load to frequency. Load Serving Entities can only provide data.

3. The SAR drafting team modified the SAR to clarify that data will be collected to model up to 5 minutes of frequency response. This should help identify the window of time where frequency response appears to be masked by AGC action. Do you agree with this clarification?

   ☐ Yes

   ☒ No

   Comments: The 5 minute time is adaquate, but it lacks substance. Small changes in load and generation due to frequency response are very difficult to separate from normal load changes and AGC action on generation units (as was pointed out). It is important to include in the description of data collection that the 5 minutes should include 1 minute of data prior to a study event and 4 minutes after a study event. It is also important to include a sample rate, such as 4 seconds (obviously, faster samples are better, but may not be practicle).

   The SAR, as written, lacks specifics on what data is required to perform a valid study. Some examples of necessary data may include, but are not limited to, AGC pulses, special protection systems, generator MW, tie line MW, frequency, etc.

4. Should a field trial be initiated, whereby a set of events for each Interconnection is posted throughout the year, to be used by BAs to calculate their 2007 Frequency Response?

   ☒ Yes

   ☐ No

   Comments:

5. Please provide any other comments (that you have not already provided in response to the first three questions on this form) that you have on the revised SAR.
   Comments: The reasoning for this technical standard is based on the perception that the frequency response of the electrical system is declining and a concern that the interconnect's ability to arrest significant system disturbances is slowly being compromised. Although it is not disagreeable that a study be conducted to determine if an actual decline in frequency response is occuring and then to determine cause, it is diagreeable to propose a potential remedy for a problem that may not exist or, dependent on the findings, in inappropriate remedy.

   Types of generating units online (e.g., wind generation, combined cycle, etc) and their subsequent loading will have an influence on the frequency response of the system. As long as Balancing Authorities are maintaining their reserve obligations, even large contingencies should be manageable. However, over the years because of the trend to get more out of invested generation resources, it would give the appearance of a decline in frequency response since most frequency degradations are a result of losses of generation and a resultant decline in system frequency and those are what is studied and scrutinized. The August 14, 2003 disturbance was an opportunity to study the frequency response of all on-line generating units due to the frequency event resulting in a high frequency. High frequency is the only event where all on-line generating units will respond.

   Proposing the establishment of a Target Frequency Response for the interconnect before concluding if an actual decline in frequency response is occuring and the cause(s) for the decline is finding a solution before defining the problem. Any standards involving frequency response need to also consider the role system reserves play in the interconnect as well as the frequency response of generators and system load to frequency. As long as generating reserve obligations are being met in accordance with current Reliability Standards and Regional Operating Criteria there may not be a need to go further dependent on the outcome of the study proposed by this SAR.

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Individual Commenter Information **(Complete this page for comments from one organization or individual.)**		
Name:	Jason Shaver	
Organization:	American Transmission Co.	
Telephone:	262 506 6885	
E-mail:	jshaver@atcllc.com	
NERC Region		**Registered Ballot Body Segment**
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Contact Organization:

Contact Segment:

Contact Telephone:

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Additional Member Name	Additional Member Organization	Region*	Segment*

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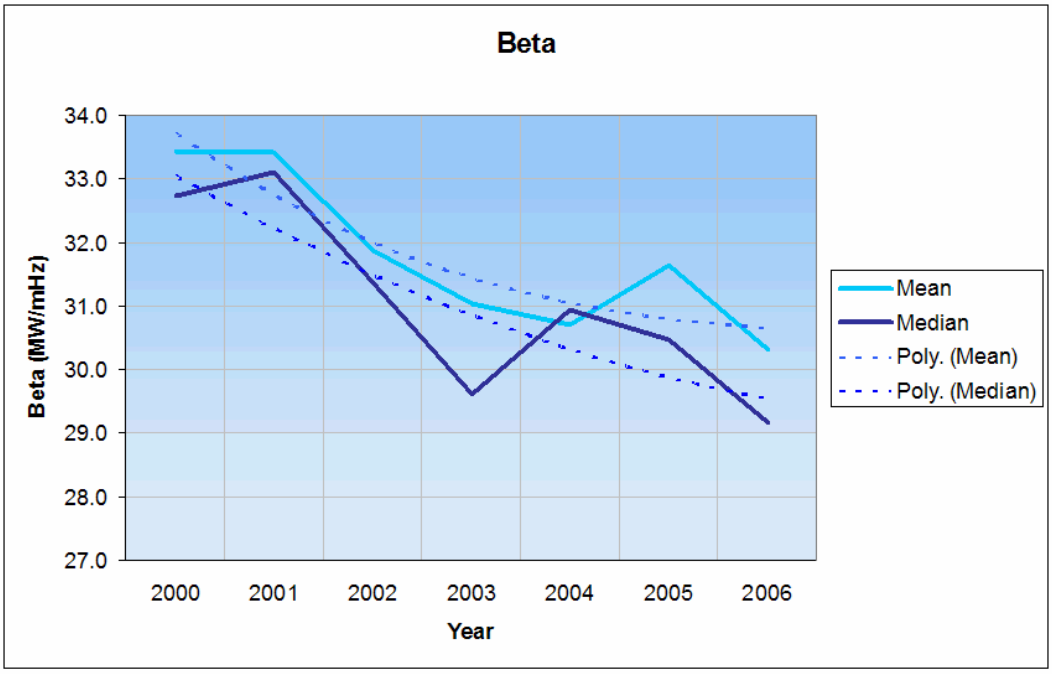

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   ☒ Yes
   ☐ No
   Comments:

2. The proposed standard would have requirements for the following functional entities: Reliability Coordinator, Balancing Authority, Generator Owner, Generator Operator, and Load-serving Entity. Do you agree that these are the right functional entities for the proposed standard?
   ☐ Yes
   ☒ No
   Comments: ATC does not see the need to identify the Load Serving Entity in the Applicability section. The SDT should provide an explanation as to the reasoning behind the selection of Load Serving Entities.

3. The SAR drafting team modified the SAR to clarify that data will be collected to model up to 5 minutes of frequency response. This should help identify the window of time where frequency response appears to be masked by AGC action. Do you agree with this clarification?
   ☐ Yes
   ☐ No
   Comments:

4. Should a field trial be initiated, whereby a set of events for each Interconnection is posted throughout the year, to be used by BAs to calculate their 2007 Frequency Response?
   ☐ Yes
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Individual Commenter Information **(Complete this page for comments from one organization or individual.)**		
Name:	Brent Kingsford	
Organization:	CAISO	
Telephone:	916-608-1100	
E-mail:	bkingsford@caiso.com	
NERC Region		**Registered Ballot Body Segment**
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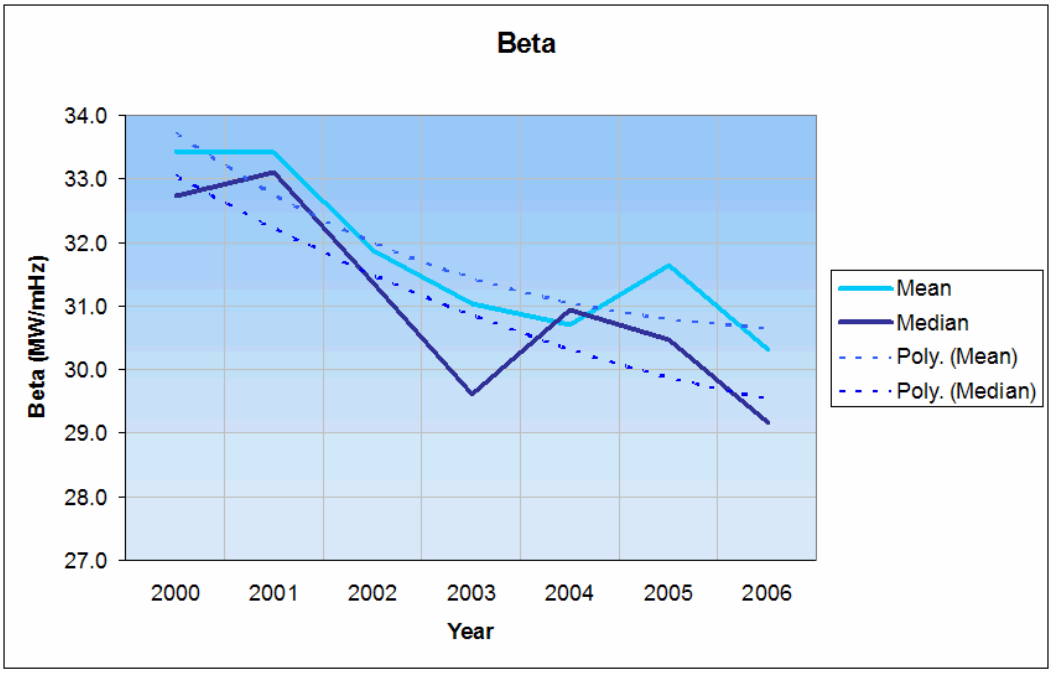

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Individual Commenter Information **(Complete this page for comments from one organization or individual.)**		
Name:	Michael Gildea	
Organization:	Constellation Generation	
Telephone:	410.230.4901	
E-mail:	michael.gildea@constellation.com	
NERC Region		**Registered Ballot Body Segment**
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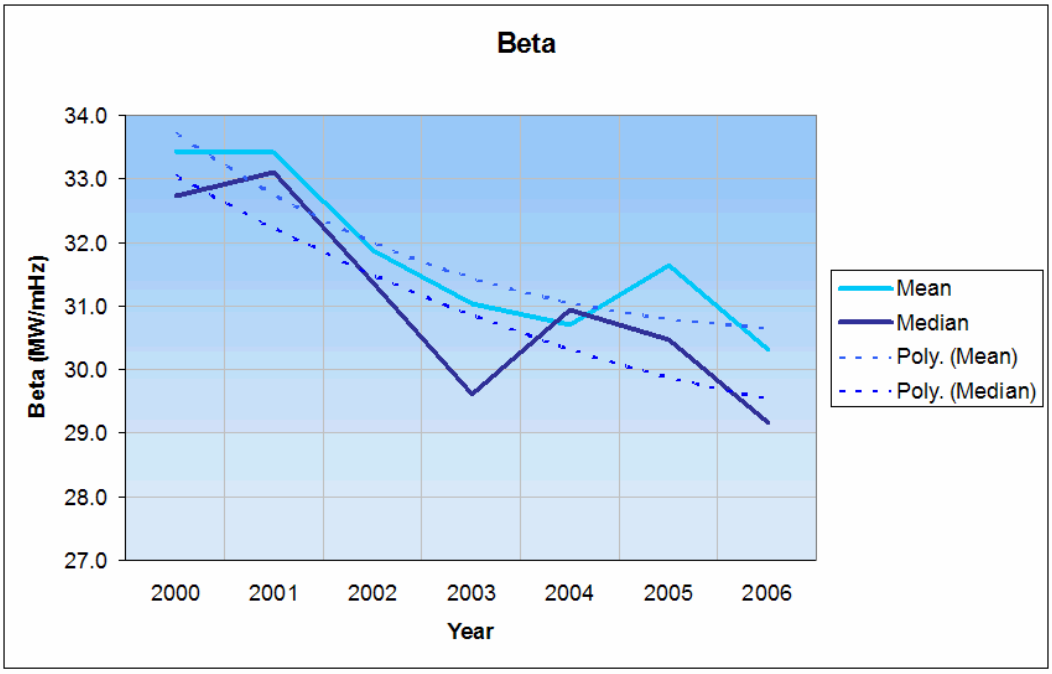

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   ☐ No
   Comments:

5. Please provide any other comments (that you have not already provided in response to the first three questions on this form) that you have on the revised SAR.
   Comments:
   Specific to the Requirement 6 a which states:

   Each Generator Operator that operates a generator larger than [10 MW]*, shall provide data to its Balancing Authority, as required in item 6, to support this standard and for use in developing models of Frequency Response in the associated Interconnection.

Balancing Authorities may seek Speed Droop characteristics for our generators. Speed Droop is a design characteristic of the steam turbine (or the prime mover's governor response in the case of a combustion turbine or diesel) .

Our concern is the only data we may be able to provide would be turbine manufacturer design data. For our older units where turbine control systems have been retrofitted and upgraded with more modern controls, we may not really know the speed droop characteristic of the unit. Collecting performance data to demonstrate the speed droop is extremely difficult if not impossible on a large unit. (Requires the grid connection frequency be allowed to "droop" as the generator is loaded). Hence, as now written, Constellation Generation is not clear how we could comply.

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Individual Commenter Information **(Complete this page for comments from one organization or individual.)**		
Name:	Howard F. Illian	
Organization:	Energy Mark, Inc.	
Telephone:	847-913-5491	
E-mail:	howard.illian@energymark.org	
NERC Region		**Registered Ballot Body Segment**
☐ **ERCOT** ☐ **FRCC** ☐ **MRO** ☐ **NPCC** ☐ **RFC** ☐ **SERC** ☐ **SPP** ☐ **WECC** ☒ **NA – Not Applicable**	☐	1 — Transmission Owners
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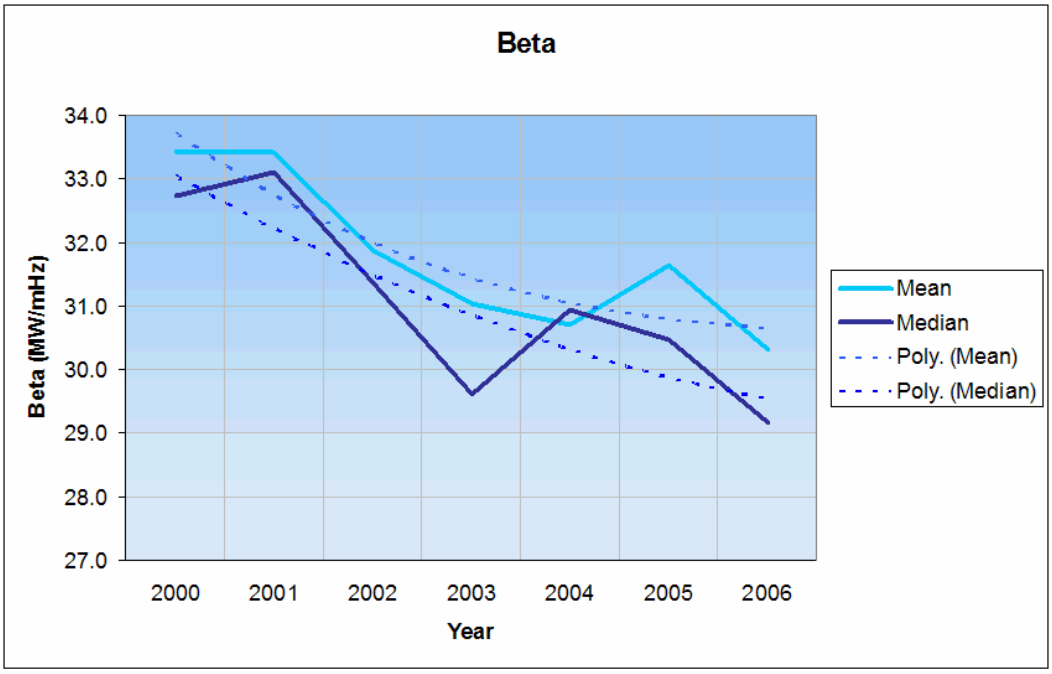

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Insert a "check" mark in the appropriate boxes by double-clicking the gray areas.

1. Do you agree with the reduced scope of this SAR — focusing only on the data collection needed to support the development of accurate models of Frequency Response in North America?

   ☒ Yes

   ☐ No

   Comments: At this time information is not available that would provide a sound technical basis for the development of a performance standard. However, with the recent increased interest in Frequency Response, new data and analysis could become available at any time that would change the focus from a technical standard to a performance standard. If new information and analysis becomes available during the development of the technical standard, consideration should be given to how the development of the technical standard could delay the development and implementation of a performance standard. Must the technical standard be completed and approved before work can start on a performance standard?

2. The proposed standard would have requirements for the following functional entities: Reliability Coordinator, Balancing Authority, Generator Owner, Generator Operator, and Load-serving Entity. Do you agree that these are the right functional entities for the proposed standard?

   ☒ Yes

   ☒ No

   Comments: I agree that the proposed list includes those entities that would be affected by a technical standard. However, there are many questions that must be resolved before any standard that affects the Generation Owner, Generation Operator or Load-serving Entity can be implemented. These questions relate to how a performance standard can or should be implemented. If there is no reasonable expectation that they would be included in a future performance standard, it would be unreasonable to implement a technical standard that requires these three functional entities to provide data. In a fair market that allows voluntary participation by Generation Owners, Generation Operators and Load-serving Entities, the direct application of a Frequency Response Performance Standard to these entities is not currently possible without creating unreasonable inequities in the market. Any standard applied directly to one generator but not another will create unreasonble inequities in a market. Since each generation technology has different Frequency Response capabilities, only a solution that provides Frequency Response through a market based mechanism can be fairly implimented in a market. Under these conditions, the measurement methods and data collection for a technical standard should only be applied to those entities that would have resposibilities under a performance standard. The correct alternative for collecting data from these entities is to collect it indirectly through the Balancing Authority or Reliability Coordinator that would be directly affected by a performance standard. The inclusion of Generation Owner, Generation Operator, and Load-serving Entity directly in the data collection will lead to the development of data collection systems that will need to be replaced, if and when, a performance standard is developed. This is an inefficient way to develop the technology for a new standard.

3. The SAR drafting team modified the SAR to clarify that data will be collected to model up to 5 minutes of frequency response. This should help identify the window of time where frequency response appears to be masked by AGC action. Do you agree with this clarification?

   ☒ Yes

   ☒ No

   Comments: I agree with the concept of measuring Frequency Response for an extended period after a disturbance, but I do not agree that the reason is related to masking by AGC action. If the Frequency Bias for a Balancing Authority is set to a value that approximates the actual Frequency Response, the AGC action will always provide the correct response for reliable interconnection performance. The Frequency Response should be measured for an extended period after a disturbance to identify entities that are prematurely withdrawing their expected frequency response support from the interconnection. This has been demonstrated for entities that have outer loop control that only includes scheduled deliveries without adjustment for frequency response.

4. Should a field trial be initiated, whereby a set of events for each Interconnection is posted throughout the year, to be used by BAs to calculate their 2007 Frequency Response?

   ☒ Yes

   ☒ No

   Comments: This would be a good way to insure that every entity select a similar set of events for calculation of their Frequency Response, but it will not insure conformity of the results. The difficulty with any method for selecting a common set of events is that each of those events is caused by a disturbance within one or more of the Balancing Authorities on the interconnection. Those entities that cause the disturbance will experience a different frequency response than those entities that are responding. The net effect is that the sum of the responses for all of the entities on the interconnection must sum to zero. This means that each entity must eliminate those disturbances for which they are the cause, from the set of disturbances they use to estimate their response. The real advantage is an entity cannot influence the results of the measurement through selection of the events they choose to include in the calculation.

5. Please provide any other comments (that you have not already provided in response to the first three questions on this form) that you have on the revised SAR.
   Comments: One of my concerns is a majority of entities in NERC must agree that there is a need for a standard before the standard process moves forward. This could have undesirable long-term results with respect to the quality of the standards that are developed. This standard provides a good example of this problem. From what I have observed, both the Texas and Western Interconnections have concluded that there is a reliability need for a Frequency Response Standard on their interconnections. Unfortunately, reasonable opposition from the Eastern Interconnection will prevent the development of a common standard for those two interconnections. The only alternative will be for the Texas and Western Interconnections to each develop their own standards for Frequency Response without considering ways of making those two standards similar to each other. If the Eastern Interconnection, after a few years, finds that it needs a Frequency Response Standard, it will then become necessary for a new

standard to be developed that applies to all three interconnections. If each interconnection has a different Frequency Response Standard, it means there is no standard at all, but three different rules for NERC. The next logical step is to develop a common standard for all three interconnections requiring the first two standards developed by the Texas and Western Interconnections separately be modified to conform to a North American Standard on Frequency Response. Combining these three separate needs into a single standard will result in a natural opposition to change by those interconnections that have already implemented an interconnection standard that meets their individual needs. This will make it very difficult to gain the support necessary to enact a common standard for NERC. This multi-step development can only be avoided by having all three interconnections participate and contribute to standards identified and developed by individual interconnections. I believe that NERC needs to find a way to address this problem. If they do not, the standard development and approval process will lead to fractured standards and an unacceptable fractured standard process for NERC. One alternative might be to find a way for all interconnections to participate in the solution of individual interconnection problems as part of the standard development process.

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Individual Commenter Information **(Complete this page for comments from one organization or individual.)**		
Name:	Steve Myers	
Organization:	ERCOT	
Telephone:	512-248-3077	
E-mail:	smyers@ercot.com	
NERC Region		**Registered Ballot Body Segment**
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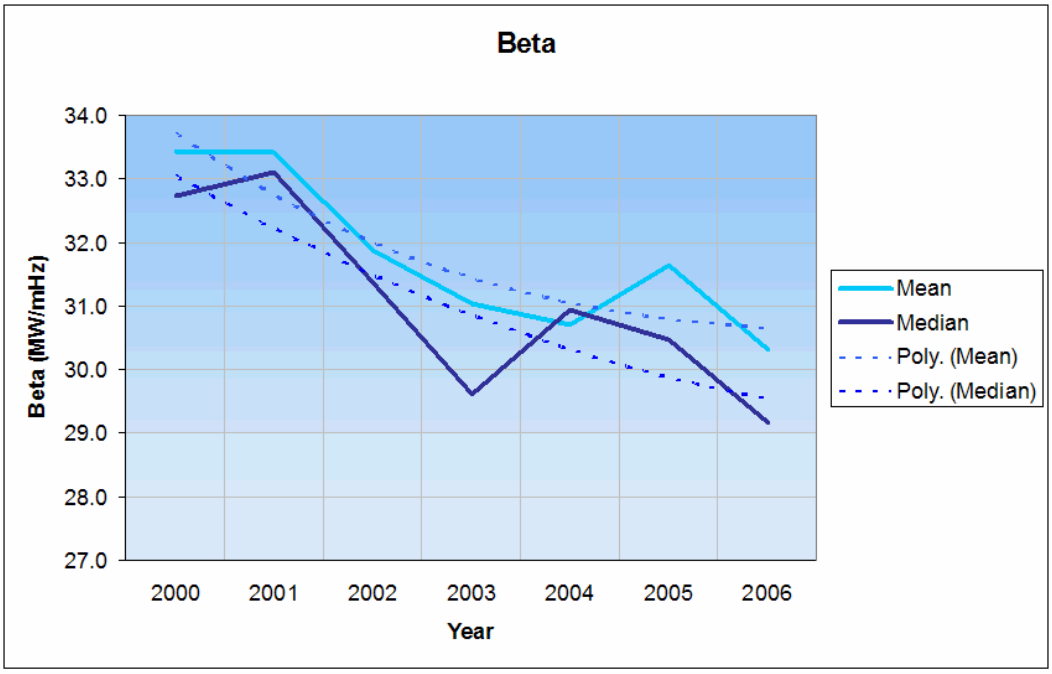

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1. Do you agree with the reduced scope of this SAR — focusing only on the data collection needed to support the development of accurate models of Frequency Response in North America?
   ☒ Yes
   ☐ No
   Comments:

2. The proposed standard would have requirements for the following functional entities: Reliability Coordinator, Balancing Authority, Generator Owner, Generator Operator, and Load-serving Entity. Do you agree that these are the right functional entities for the proposed standard?
   ☒ Yes
   ☐ No
   Comments:

3. The SAR drafting team modified the SAR to clarify that data will be collected to model up to 5 minutes of frequency response. This should help identify the window of time where frequency response appears to be masked by AGC action. Do you agree with this clarification?
   ☒ Yes
   ☐ No
   Comments: This time frame should be sufficient for determination of frequency response. If it is intended that this data should also be useful for evaluating generating unit governor functioning, a longer time may be appropriate.

4. Should a field trial be initiated, whereby a set of events for each Interconnection is posted throughout the year, to be used by BAs to calculate their 2007 Frequency Response?
   ☒ Yes
   ☐ No
   Comments: A field trial would be beneficial to ensure that no gaps in the need for data exist. This could relate to whether other data is needed or whether data for a longer time is needed.

5. Please provide any other comments (that you have not already provided in response to the first three questions on this form) that you have on the revised SAR.
   Comments:

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Individual Commenter Information **(Complete this page for comments from one organization or individual.)**		
Name:	Roger Champagne	
Organization:	Hydro-Québec TransÉnergie (HQT)	
Telephone:	514 289-2211, X2766	
E-mail:	champagne.roger.2@hydro.qc.ca	
NERC Region		**Registered Ballot Body Segment**
☐ **ERCOT** ☐ **FRCC** ☐ **MRO** ☒ **NPCC** ☐ **RFC** ☐ **SERC** ☐ **SPP** ☐ **WECC** ☐ **NA – Not Applicable**	☒	1 — Transmission Owners
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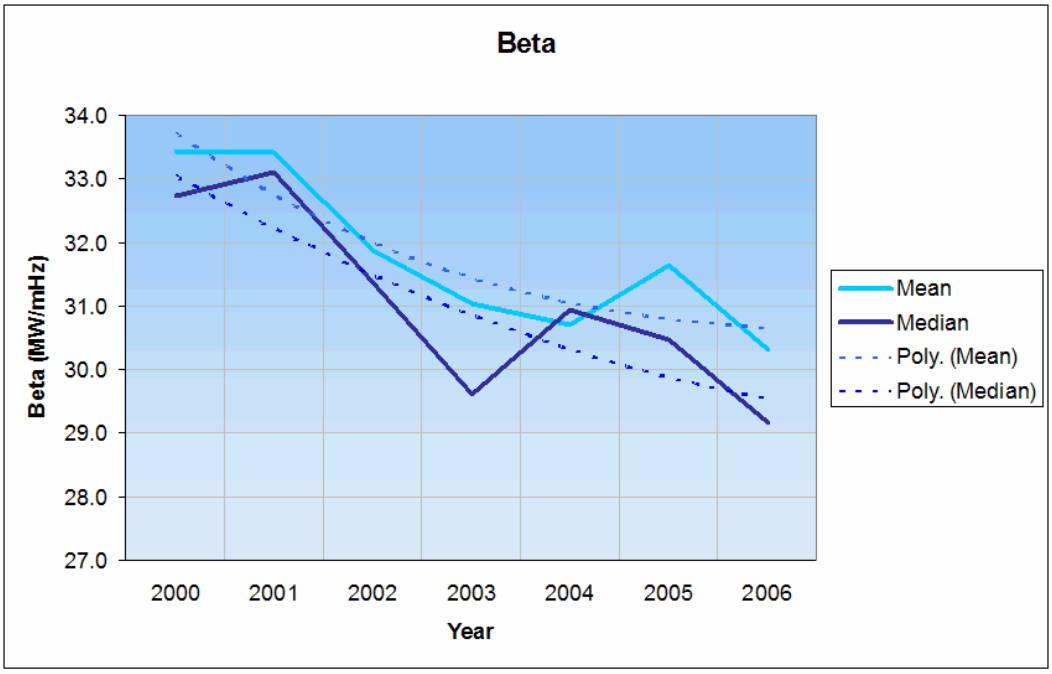

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   ☒ Yes
   ☒ No
   Comments: HQT believe there might be other means than Reliability Standards to accomplish this data collection.

2. The proposed standard would have requirements for the following functional entities: Reliability Coordinator, Balancing Authority, Generator Owner, Generator Operator, and Load-serving Entity. Do you agree that these are the right functional entities for the proposed standard?
   ☐ Yes
   ☒ No
   Comments: We question the need to include the applicability to the LSEs in this SAR and requests the drafting team to explain the purpose.

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   ☒ Yes
   ☒ No
   Comments: We requests clarification as to what data and at what periodicity will be collected from the identitified entities.

4. Should a field trial be initiated, whereby a set of events for each Interconnection is posted throughout the year, to be used by BAs to calculate their 2007 Frequency Response?
   ☒ Yes
   ☐ No
   Comments:

5. Please provide any other comments (that you have not already provided in response to the first three questions on this form) that you have on the revised SAR.
   Comments: Being a single Balancing Authority Interconnection, there might be a need for a «regional»difference for the Québec Interconnection when specific value will be established. Same as ERCOT, frequency response will be based on the change in generation (or load) rather than Tie-Line deviation.

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Name:	Ron Falsetti	
Organization:	IESO	
Telephone:	905-855-6187	
E-mail:	ron.falsetti@ieso.ca	
NERC Region		**Registered Ballot Body Segment**
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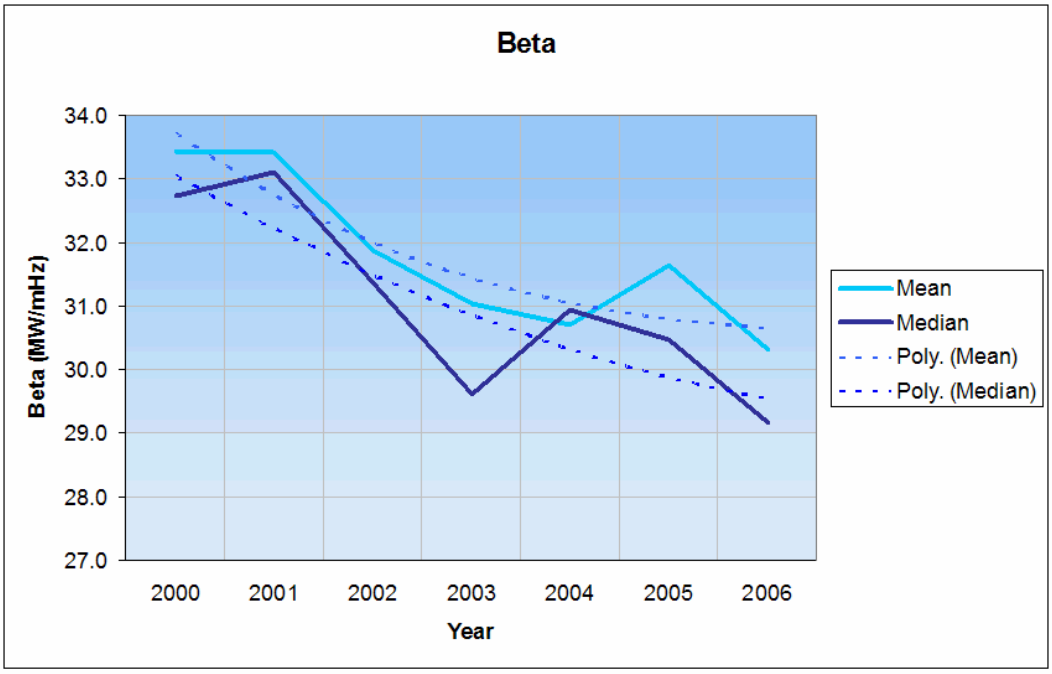

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You do not have to answer all questions. Enter All Comments in Simple Text Format.

Insert a "check" mark in the appropriate boxes by double-clicking the gray areas.

1. Do you agree with the reduced scope of this SAR — focusing only on the data collection needed to support the development of accurate models of Frequency Response in North America?

   ☐ Yes

   ☒ No

   Comments:

   We do not agree with the reduced scope of this SAR. It does not require a standard to enable a data collection task(s). Data collection procedures and processes, charged by a standing committee, e.g. the OC, or respective working groups, would be more than sufficient.

2. The proposed standard would have requirements for the following functional entities: Reliability Coordinator, Balancing Authority, Generator Owner, Generator Operator, and Load-serving Entity. Do you agree that these are the right functional entities for the proposed standard?

   ☐ Yes

   ☒ No

   Comments:

   For the purpose of data collection, assigning responsibility to the Balancing Authority, Generator Operator and Load-serving Entity would suffice.

3. The SAR drafting team modified the SAR to clarify that data will be collected to model up to 5 minutes of frequency response. This should help identify the window of time where frequency response appears to be masked by AGC action. Do you agree with this clarification?

   ☒ Yes

   ☐ No

   Comments:

4. Should a field trial be initiated, whereby a set of events for each Interconnection is posted throughout the year, to be used by BAs to calculate their 2007 Frequency Response?

   ☒ Yes

   ☐ No

   Comments: A field test is a must and would definitely provide useful information on the types of event that would necessiate such data collection (The threshold needs to be clarified though - e.g. should it be >10MW loss of generator or some other threshold?), and any specific areas that need to be worked on in order to ensure that all relevant and required data is collected.

5. Please provide any other comments (that you have not already provided in response to the first three questions on this form) that you have on the revised SAR.
   Comments:

   While we felt that the previous SAR was unclear on the intent, this SAR has such a reduced scope that the intended task does not require a reliability standard to achieve . A task team charged by a standing committee (the OC), would suffice. The requirements proposed in the SAR can be set as conditions for completing the data collection effort by the task team.

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Individual Commenter Information **(Complete this page for comments from one organization or individual.)**		
Name:	Kathleen Goodman	
Organization:	ISO New England	
Telephone:	(413) 535-4111	
E-mail:	kgoodman@iso-ne.com	
NERC Region		**Registered Ballot Body Segment**
☐ **ERCOT** ☐ **FRCC** ☐ **MRO** ☒ **NPCC** ☐ **RFC** ☐ **SERC** ☐ **SPP** ☐ **WECC** ☐ **NA – Not Applicable**	☐	1 — Transmission Owners
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Group Name:

Lead Contact:

Contact Organization:

Contact Segment:

Contact Telephone:

Contact E-mail:

Additional Member Name	Additional Member Organization	Region*	Segment*

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Background Information:

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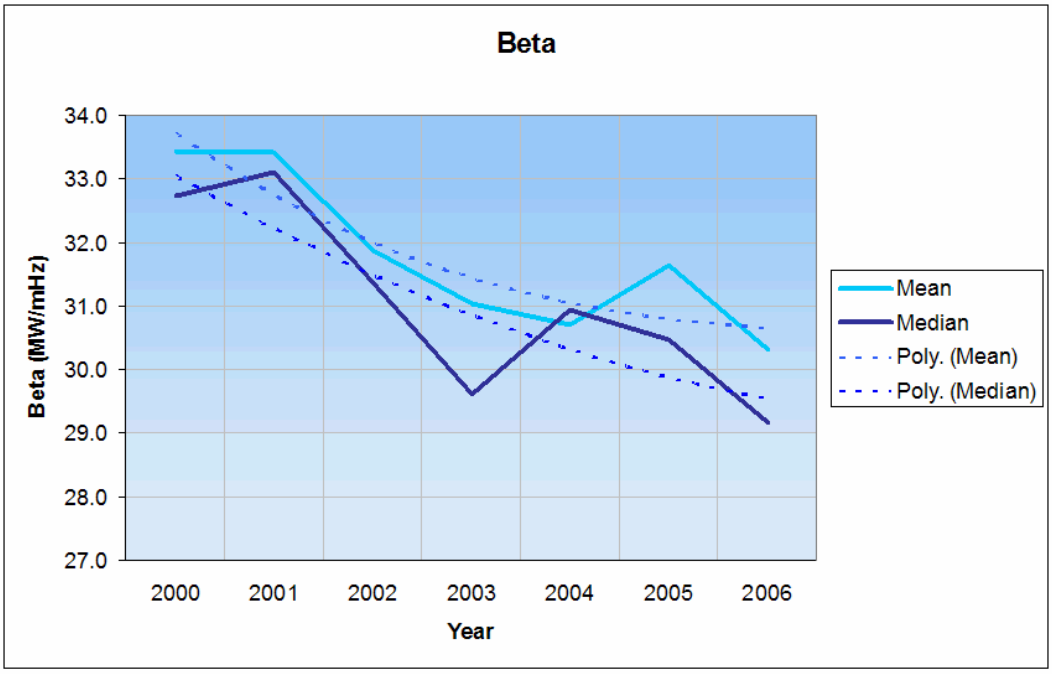

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Industry commenters agreed there is a reliability need for the FRS. Comments varied on the technical details of the standard. Because of the divergent views on the details of the FRS SAR, the NERC Standards Committee (SC) directed the SAR drafting team to revise the SAR to focus only on the data collection needed to support the development of accurate models of Frequency Response in North America.

The SAR drafting team has tried to meet the Standards Committee's directive with this third version of the SAR.

The Version 3 of the Frequency Response SAR represents the changes requested by the NERC Standards Committee, while still meeting the June 2006 direction of the NERC Operating Committee. Specifically, the Operating Committee endorsed developing a Frequency Response standard that includes the following goals and objectives:

- Improving Interconnection Frequency Response event cataloging and benchmarking.
- Calculating balancing authority Frequency Response and requiring balancing authorities to analyze those cases where the response is significantly below the norm.
- Establishing time limits to complete the analyses.
- Tabulating non-responsive generators.
- Measuring generator response (those units on line).
- Including regional participation and review.

This revised SAR was reviewed and supported by the NERC Resources Subcommittee on December 4, 2006. The major changes between Draft 2 and Draft 3 include:

- Clarification on the role of the Load-serving Entity and Generator Operator.
- Inclusion of the applicability of Reliability Principles 3, 5, and 6.
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1. Do you agree with the reduced scope of this SAR — focusing only on the data collection needed to support the development of accurate models of Frequency Response in North America?
   ☒ Yes
   ☐ No
   Comments:

2. The proposed standard would have requirements for the following functional entities: Reliability Coordinator, Balancing Authority, Generator Owner, Generator Operator, and Load-serving Entity. Do you agree that these are the right functional entities for the proposed standard?
   ☐ Yes
   ☒ No
   Comments: ISO New England does not see a need to include the applicability to the LSEs in this SAR and requests the drafting team to explain this.

3. The SAR drafting team modified the SAR to clarify that data will be collected to model up to 5 minutes of frequency response. This should help identify the window of time where frequency response appears to be masked by AGC action. Do you agree with this clarification?
   ☒ Yes
   ☒ No
   Comments: ISO New England requests clarification as to what data and at what periodicity will be collected.

4. Should a field trial be initiated, whereby a set of events for each Interconnection is posted throughout the year, to be used by BAs to calculate their 2007 Frequency Response?
   ☒ Yes
   ☐ No
   Comments:

5. Please provide any other comments (that you have not already provided in response to the first three questions on this form) that you have on the revised SAR.
   Comments:

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Individual Commenter Information **(Complete this page for comments from one organization or individual.)**		
Name:	Michael Gammon	
Organization:	Kansas City Power & Light	
Telephone:	816-654-1242	
E-mail:	mike.gammon@kcpl.com	
NERC Region		**Registered Ballot Body Segment**
☐ **ERCOT** ☐ **FRCC** ☐ **MRO** ☐ **NPCC** ☐ **RFC** ☐ **SERC** ☒ **SPP** ☐ **WECC** ☐ **NA – Not Applicable**	☒	1 — Transmission Owners
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Additional Member Name	Additional Member Organization	Region*	Segment*

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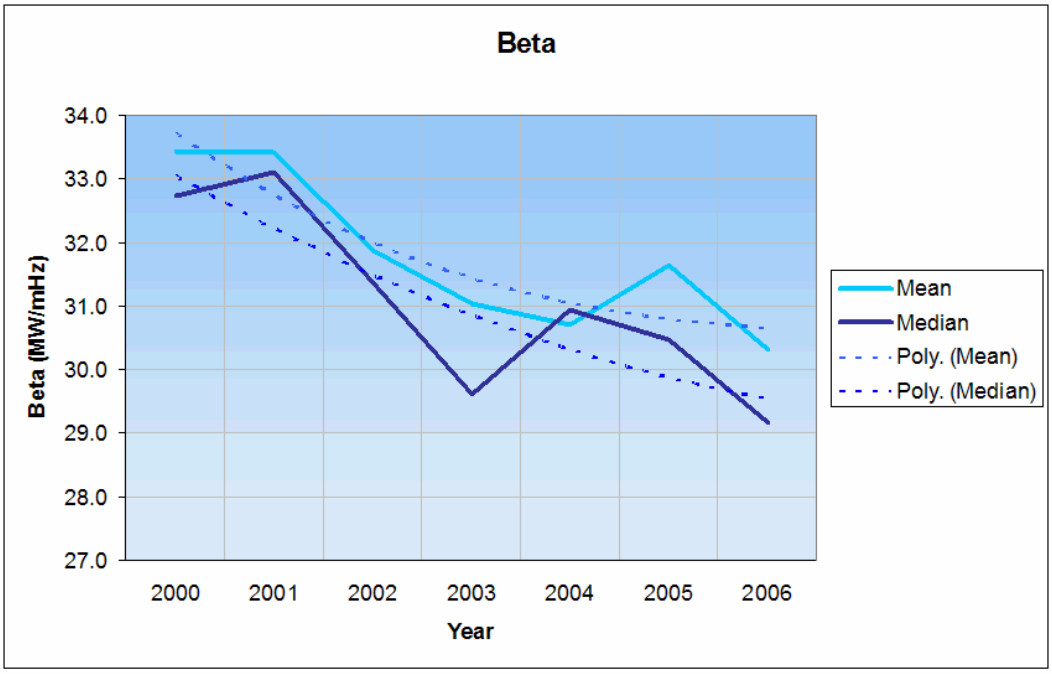

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The SAR drafting team has tried to meet the Standards Committee's directive with this third version of the SAR.

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Insert a "check" mark in the appropriate boxes by double-clicking the gray areas.

1. Do you agree with the reduced scope of this SAR — focusing only on the data collection needed to support the development of accurate models of Frequency Response in North America?

   ☐ Yes

   ☒ No

   Comments: Do not agree with the notion in point 5 regarding the need for a Target Frequency Response for each interconnection at this time. It is presumptuous to advance a remedy prior to determining cause of the perceived decline in frequency response. Allow the techincal SAR to perform its function to determine cause. Any appropriate remedy in operating standards should become apparent.

   Do not agree with point 6 of the description. In order to get a handle on what is really going on, all Balancing Authorities should be required to produce data valid to the study. Also the language in point 6 is poorly worded compared to the right wording in 6a and 6b. 6a and 6b should be included in the SAR and 6 should be removed.

2. The proposed standard would have requirements for the following functional entities: Reliability Coordinator, Balancing Authority, Generator Owner, Generator Operator, and Load-serving Entity. Do you agree that these are the right functional entities for the proposed standard?

   ☒ Yes

   ☐ No

   Comments:

3. The SAR drafting team modified the SAR to clarify that data will be collected to model up to 5 minutes of frequency response. This should help identify the window of time where frequency response appears to be masked by AGC action. Do you agree with this clarification?

   ☐ Yes

   ☒ No

   Comments: The 5 minute time is adaquate, but it lacks substance. Small changes in load and generation due to frequency response are very difficult to separate from normal load changes and AGC action on generation units (as was pointed out). It is important to include in the description of data collection that the 5 minutes should include 1 minute of data prior to a study event and 4 minutes after a study event. It is also important to include a sample rate, such as 4 seconds (obviously, faster samples are better, but may not be practicle).

4. Should a field trial be initiated, whereby a set of events for each Interconnection is posted throughout the year, to be used by BAs to calculate their 2007 Frequency Response?

☒ Yes

☐ No

Comments:

5. Please provide any other comments (that you have not already provided in response to the first three questions on this form) that you have on the revised SAR.
   Comments: The reasoning for this technical standard is based on the perception that the frequency response of the electrical system is declining and a concern that the interconnect's ability to arrest significant system disturbances is slowly being compromised. Although it is not disagreeable that a study be conducted to determine if an actual decline in frequency response is occuring and then to determine cause, it is diagreeable to propose a potential remedy for a problem that may not exist or, dependent on the findings, in inappropriate remedy.

   One reason a decline in frequency response may be perceived occuring is a result of more on-line generating units being fully loaded. That means when a frequency decline occurs there are less units able to respond because they are already loaded. That does not mean the interconnection is at risk. As long as Balancing Authorities are maintaining their reserve obligations, even large contingencies should be manageable. However, over the years because of the trend to get more out of invested generation resources, it would give the appearance of a decline in frequency response since most frequency degradations are a result of losses of generation and a resultant decline in system frequency and those are what is studied and scrutinized. The August 14, 2003 disturbance was an opportunity to study the frequency response of all on-line generating units due to the frequency event resulting in a high frequency. High frequency is the only event where all on-line generating units will respond.

   Proposing the establishment of a Target Frequency Response for the interconnect before concluding if an actual decline in frequency response is occuring and the subsequent cause(s) for the decline is finding a solution before defining the problem. Any standards involving frequency response needs to also consider the role system reserves play in the interconnect as well as the frequency response of generators and system load to frequency. As long as generating reserve obligations are being met to meet current Reliability Standards and Regional Operating Criteria there may not be a need to go further dependent on the outcome of the study proposed by this SAR.

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Individual Commenter Information **(Complete this page for comments from one organization or individual.)**		
Name:	Robert Coish	
Organization:	Manitoba Hydro	
Telephone:	204-487-5479	
E-mail:	rgcoish@hydro.mb.ca	
NERC Region		**Registered Ballot Body Segment**
☐ **ERCOT** ☐ **FRCC** ☒ **MRO** ☐ **NPCC** ☐ **RFC** ☐ **SERC** ☐ **SPP** ☐ **WECC** ☐ **NA – Not Applicable**	☒	1 — Transmission Owners
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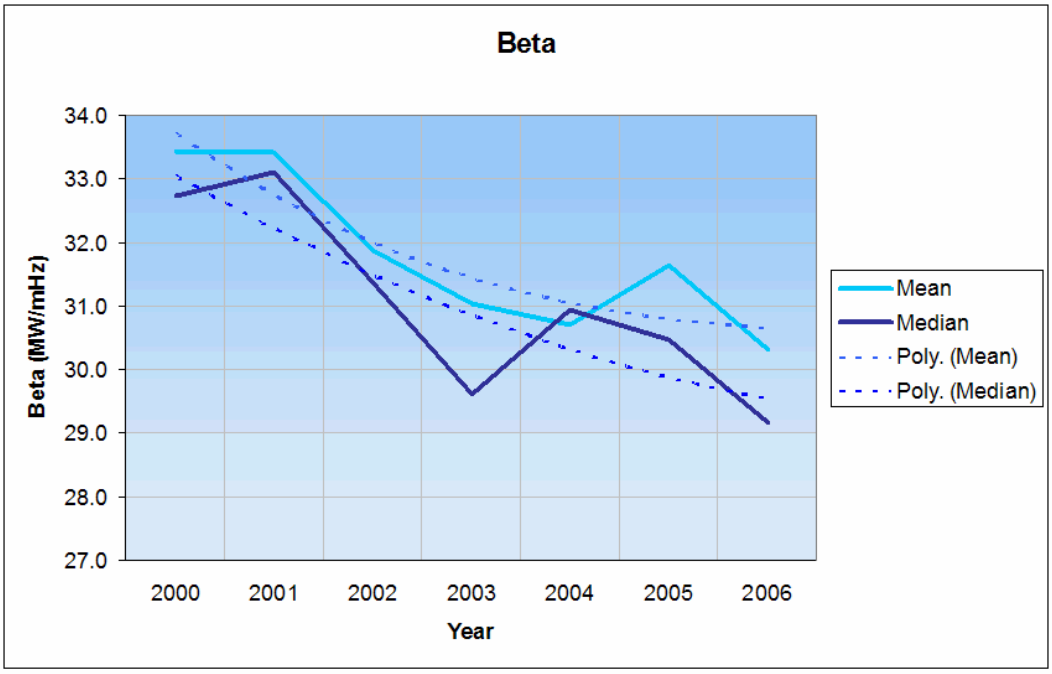

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   Comments:

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   ☒ Yes
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   Comments:

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   ☒ Yes
   ☐ No
   Comments: Ten minutes might be more useful, especially in any areas where it appears to take a long time to settle down after a frequency deviation event. This could be left up to the discretion of operators and balancing authorities in any areas where slow or bumpy returns to normal frequency levels are experienced.

4. Should a field trial be initiated, whereby a set of events for each Interconnection is posted throughout the year, to be used by BAs to calculate their 2007 Frequency Response?
   ☐ Yes
   ☐ No
   Comments: Only if field trials are deemed to have very high probability of not causing significant difficulties on overly sensitive network area.

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   Comments:

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Individual Commenter Information **(Complete this page for comments from one organization or individual.)**		
Name:	Alan R Oneal	
Organization:	MidAmerican Energy Company	
Telephone:	515-252-6449	
E-mail:	aroneal@midamerican.com	
NERC Region		**Registered Ballot Body Segment**
☐ **ERCOT**	☐	1 — Transmission Owners
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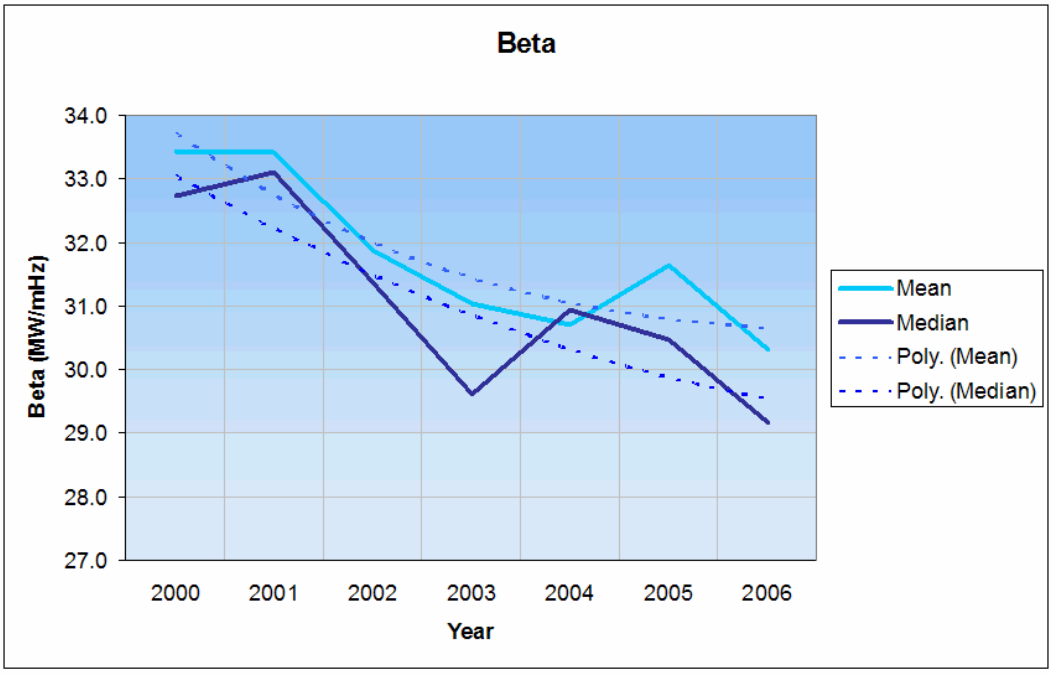

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   ☒ Yes
   ☐ No
   Comments: This standard would be a start, at least, at bringing to light where and why response is being lost. It may well be that exposure and peer pressure, as well as the tiered reporting requirements, will keep plant and operations personnel abreast of their obligations for providing reserves of all types.

2. The proposed standard would have requirements for the following functional entities: Reliability Coordinator, Balancing Authority, Generator Owner, Generator Operator, and Load-serving Entity. Do you agree that these are the right functional entities for the proposed standard?
   ☒ Yes
   ☐ No
   Comments:

3. The SAR drafting team modified the SAR to clarify that data will be collected to model up to 5 minutes of frequency response. This should help identify the window of time where frequency response appears to be masked by AGC action. Do you agree with this clarification?
   ☒ Yes
   ☐ No
   Comments:

4. Should a field trial be initiated, whereby a set of events for each Interconnection is posted throughout the year, to be used by BAs to calculate their 2007 Frequency Response?
   ☐ Yes
   ☒ No
   Comments: This is not a new concept. I support institution of the standard as written so a start can be made to identify and, with luck, remediate the decline in frequency response.

5. Please provide any other comments (that you have not already provided in response to the first three questions on this form) that you have on the revised SAR.
   Comments: I have concern about the "shall"s in the standard, in that there is no apparent enforcement behind the requirements for data submittals. If I'm wrong in

this, then I would be comfortable with the effectiveness possible. If I'm right, what is to be done with an entity which finds it convenient not to report?

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Individual Commenter Information **(Complete this page for comments from one organization or individual.)**		
Name:		
Organization:		
Telephone:		
E-mail:		
NERC Region		**Registered Ballot Body Segment**
☐ **ERCOT** ☐ **FRCC** ☐ **MRO** ☐ **NPCC** ☐ **RFC** ☐ **SERC** ☐ **SPP** ☐ **WECC** ☐ **NA – Not Applicable**	☐	1 — Transmission Owners
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	☐	10 — Regional Reliability Organizations, Regional Entities

Group Comments (Complete this page if comments are from a group.)

Group Name: Midwest ISO and individual stakeholders

Lead Contact: **Jason Marshall**

Contact Organization: **Midwest ISO**

Contact Segment: **2**

Contact Telephone: **(317) 249-5494**

Contact E-mail: **jmarshall@midwestiso.org**

Additional Member Name	Additional Member Organization	Region*	Segment*
Doug Hils	Duke Energy	**RFC**	1
Brian F. Thumm	ITC	**RFC**	1
Jim Cyrulewski	JDRJC Associates	**RFC**	8

*If more than one Region or Segment applies, indicate the best fit for the purpose of these comments. Regional acronyms and segment numbers are shown on prior page.

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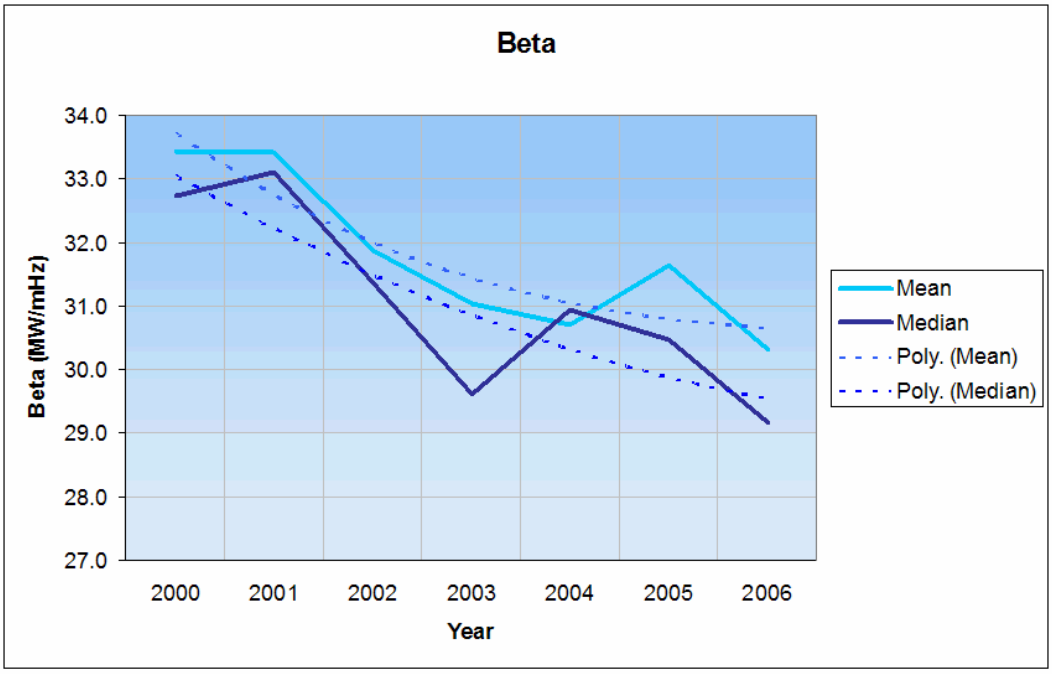

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Insert a "check" mark in the appropriate boxes by double-clicking the gray areas.

1. Do you agree with the reduced scope of this SAR — focusing only on the data collection needed to support the development of accurate models of Frequency Response in North America?
   ☒ Yes
   ☐ No
   Comments:

2. The proposed standard would have requirements for the following functional entities: Reliability Coordinator, Balancing Authority, Generator Owner, Generator Operator, and Load-serving Entity. Do you agree that these are the right functional entities for the proposed standard?
   ☒ Yes
   ☐ No
   Comments:

3. The SAR drafting team modified the SAR to clarify that data will be collected to model up to 5 minutes of frequency response. This should help identify the window of time where frequency response appears to be masked by AGC action. Do you agree with this clarification?
   ☒ Yes
   ☒ No
   Comments: Five minutes is acceptable. There may be merit in collecting 15 minutes of data to cover the DCS window. The data should be readily available since the BAs are already examining this data to determine their compliance with the DCS standard. The final decision can be made during the standards drafting phase.

4. Should a field trial be initiated, whereby a set of events for each Interconnection is posted throughout the year, to be used by BAs to calculate their 2007 Frequency Response?
   ☒ Yes
   ☐ No
   Comments: This should not be a problem as BAs should already be performing this calculation in the annual determination of their frequency bias.

5. Please provide any other comments (that you have not already provided in response to the first three questions on this form) that you have on the revised SAR.
   Comments:

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Group Comments (Complete this page if comments are from a group.)

Group Name: NPCC CP9, Reliability Standards Working Group

Lead Contact: **Guy V. Zito**

Contact Organization: **Northeast Power Coordinating Council**

Contact Segment: **10**

Contact Telephone: **212-840-1070**

Contact E-mail: **gzito@npcc.org**

Additional Member Name	Additional Member Organization	Region*	Segment*
Ralph Rufrano	New York Power Authority	**NPCC**	1
Roger Champagne	TransEnergie HydroQuebec	**NPCC**	1
Ed Thompson	ConEd	**NPCC**	1
Al Adamson	New York St. Reliability Council	**NPCC**	10
Kathleen Goodman	ISO-New England	**NPCC**	2
Bill Shemley	ISO-New England	**NPCC**	2
Greg Campoli	New York ISO	**NPCC**	2
Don Nelson	MA Dept. of Tele. and Energy	**NPCC**	9
Ron Falsetti	The IESO, Ontario	**NPCC**	2
Bruno Jesus	Hydro One Networks	**NPCC**	1
Randy McDonald	New Brunswick Sys. Operator	**NPCC**	2
Guy V. Zito	Northeast Power Coor. Council	**NPCC**	10
Herb Schrayshuen	National Grid US	**NPCC**	1
Jerad Barnhart	NStar	**NPCC**	1

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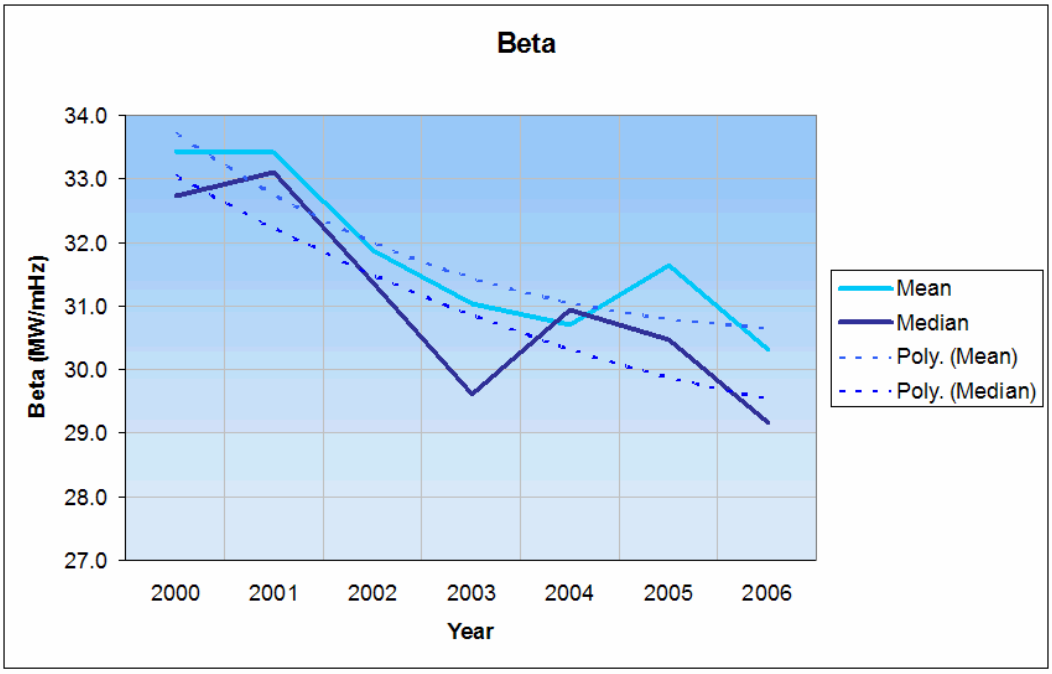

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1. Do you agree with the reduced scope of this SAR — focusing only on the data collection needed to support the development of accurate models of Frequency Response in North America?

   ☒ Yes

   ☒ No

   Comments: Many of NPCC's participating members believe there are other means to accomplish this phase of the initiative and that appropriate revisions to existing standard(s) may address the issue determined by the data analysis could be proposed.

2. The proposed standard would have requirements for the following functional entities: Reliability Coordinator, Balancing Authority, Generator Owner, Generator Operator, and Load-serving Entity. Do you agree that these are the right functional entities for the proposed standard?

   ☐ Yes

   ☒ No

   Comments: NPCC participating members question the need to include the applicability to the LSEs in this SAR and requests the drafting team to explain this.

3. The SAR drafting team modified the SAR to clarify that data will be collected to model up to 5 minutes of frequency response. This should help identify the window of time where frequency response appears to be masked by AGC action. Do you agree with this clarification?

   ☐ Yes

   ☒ No

   Comments: It is not clear what type of data is going to be collected from this requirement. AGC response is continuous. What is the justification for the specific "five minutes" reffered to? Since AGC control is every 4 seconds, five minutes appears to be too long a period to collect this data. Imposing this requirement will require the installation of local data storage retention facilities & telemetering equipment that may not be necessary and NPCC participating members would like the drafting team to explain why 5 minutes is necessary.

   Also, when requesting data from a generator what is expected scan-rate/exception reporting clarity of the data?

4. Should a field trial be initiated, whereby a set of events for each Interconnection is posted throughout the year, to be used by BAs to calculate their 2007 Frequency Response?

   ☒ Yes

   ☐ No

   Comments:

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   Comments:

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Individual Commenter Information **(Complete this page for comments from one organization or individual.)**		
Name:	Sydney L. Niemeyer	
Organization:	NRG Texas, Qualified Scheduling Entity (QSE)	
Telephone:	713-795-6108	
E-mail:	sydney.niemeyer@nrgenergy.com	
NERC Region		**Registered Ballot Body Segment**
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Lead Contact:

Contact Organization:

Contact Segment:

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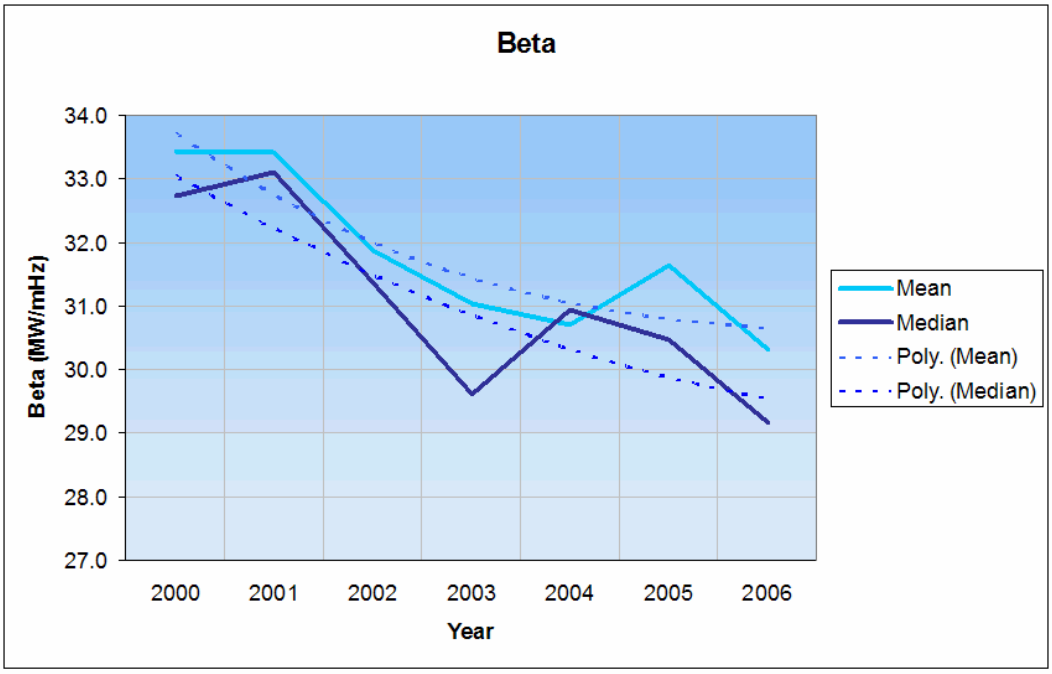

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   ☒ Yes
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   ☒ Yes
   ☐ No
   Comments:

4. Should a field trial be initiated, whereby a set of events for each Interconnection is posted throughout the year, to be used by BAs to calculate their 2007 Frequency Response?
   ☒ Yes
   ☐ No
   Comments: A field trial may indicate the need for more or different data for the proper calculation of a BAs Frequency Response.

5. Please provide any other comments (that you have not already provided in response to the first three questions on this form) that you have on the revised SAR.
   Comments: Frequency Response of Resources is vital to the reliability of an interconnection. Large differences between the measured Frequency Response of a BA, its Bias setting and the models of Frequency Response may indicate a reliability risk. Updating the models with accurate Frequency Response data will improve the evaluation of this reliability risk. Please implement this process as soon as possible.

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Individual Commenter Information **(Complete this page for comments from one organization or individual.)**		
Name:	Michael Calimano	
Organization:	New York Independent System Operator	
Telephone:	518-356-6129	
E-mail:	mcalimano@nyiso.com	
NERC Region		**Registered Ballot Body Segment**
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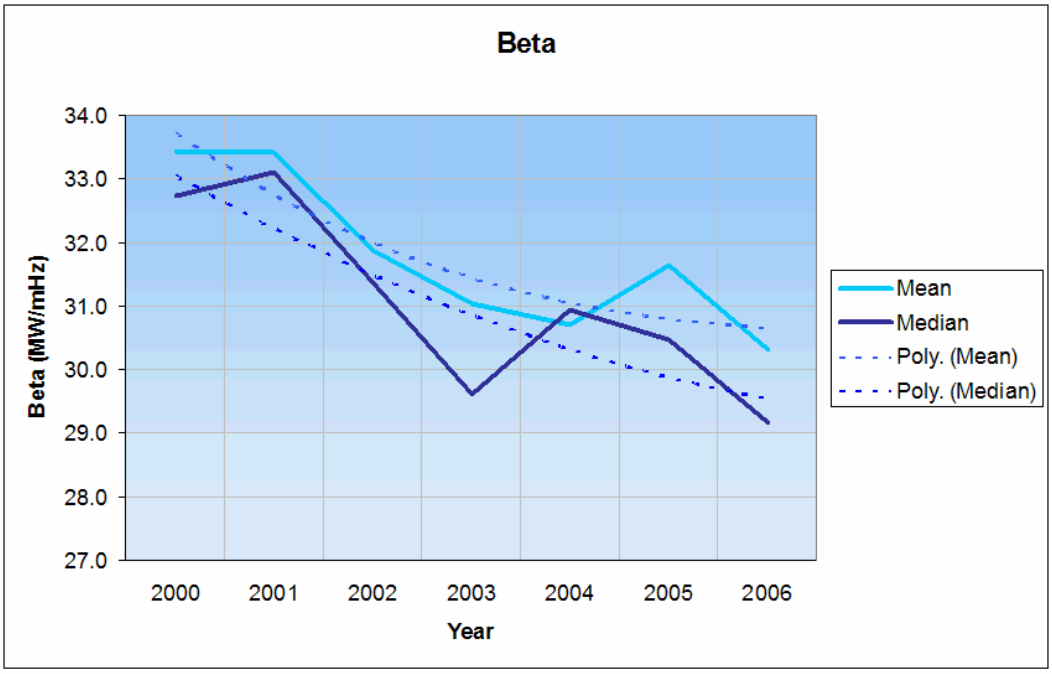

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   ☒ Yes

   ☒ No

   Comments: The NYISO is uncertain if this is the appropriate means to require data collection for purposes of developing models. A review should be made to be certain that this proposed scope meets the criteria for a standard.

2. The proposed standard would have requirements for the following functional entities: Reliability Coordinator, Balancing Authority, Generator Owner, Generator Operator, and Load-serving Entity. Do you agree that these are the right functional entities for the proposed standard?

   ☒ Yes

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Individual Commenter Information **(Complete this page for comments from one organization or individual.)**		
Name:	Theodore Papaps	
Organization:	New York State Relaibility Council	
Telephone:	516-545-4007	
E-mail:	tpappas@service.lipower.org	
NERC Region		**Registered Ballot Body Segment**
☐ **ERCOT** ☐ **FRCC** ☐ **MRO** ☒ **NPCC** ☐ **RFC** ☐ **SERC** ☐ **SPP** ☐ **WECC** ☐ **NA – Not Applicable**	☐	1 — Transmission Owners
	☐	2 — RTOs, ISOs
	☐	3 — Load-serving Entities
	☐	4 — Transmission-dependent Utilities
	☐	5 — Electric Generators
	☐	6 — Electricity Brokers, Aggregators, and Marketers
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	☒	10 — Regional Reliability Organizations, Regional Entities

Group Comments (Complete this page if comments are from a group.)

Group Name:

Lead Contact:

Contact Organization:

Contact Segment:

Contact Telephone:

Contact E-mail:

Additional Member Name	Additional Member Organization	Region*	Segment*

*If more than one Region or Segment applies, indicate the best fit for the purpose of these comments. Regional acronyms and segment numbers are shown on prior page.

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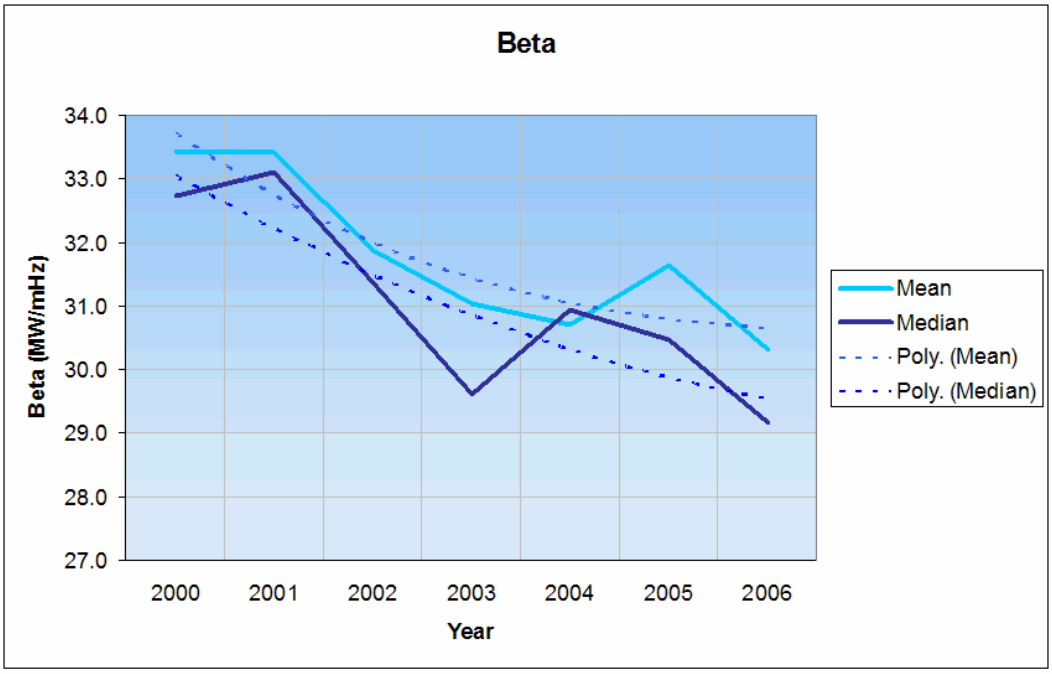

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The SAR drafting team has tried to meet the Standards Committee's directive with this third version of the SAR.

The Version 3 of the Frequency Response SAR represents the changes requested by the NERC Standards Committee, while still meeting the June 2006 direction of the NERC Operating Committee. Specifically, the Operating Committee endorsed developing a Frequency Response standard that includes the following goals and objectives:

- Improving Interconnection Frequency Response event cataloging and benchmarking.
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- Establishing time limits to complete the analyses.
- Tabulating non-responsive generators.
- Measuring generator response (those units on line).
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This revised SAR was reviewed and supported by the NERC Resources Subcommittee on December 4, 2006. The major changes between Draft 2 and Draft 3 include:

- Clarification on the role of the Load-serving Entity and Generator Operator.
- Inclusion of the applicability of Reliability Principles 3, 5, and 6.
- Reduced the scope to address only the collection of data needed to model Frequency Response in North America.
- Clarified that the data collected to model frequency response over a period of up to 5 minutes per event to help identify the window of time where frequency response appears to be masked by AGC action.

Note that because the changes to the SAR were quite significant, no redline showing the changes from Version 2 to Version 3 will be posted.

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You do not have to answer all questions. Enter All Comments in Simple Text Format.

Insert a "check" mark in the appropriate boxes by double-clicking the gray areas.

1. Do you agree with the reduced scope of this SAR — focusing only on the data collection needed to support the development of accurate models of Frequency Response in North America?
   ☒ Yes
   ☐ No
   Comments:

2. The proposed standard would have requirements for the following functional entities: Reliability Coordinator, Balancing Authority, Generator Owner, Generator Operator, and Load-serving Entity. Do you agree that these are the right functional entities for the proposed standard?
   ☐ Yes
   ☒ No
   Comments: Explain the applicability of the SAR to LSEs

3. The SAR drafting team modified the SAR to clarify that data will be collected to model up to 5 minutes of frequency response. This should help identify the window of time where frequency response appears to be masked by AGC action. Do you agree with this clarification?
   ☐ Yes
   ☒ No
   Comments: It is not clear what type of data is going to be collected from this requirement. AGC response is continuous. What is the justification for the specific "five minutes" reffered to? Since AGC control is every 4 seconds, five minutes appears to be too long a period to collect this data. Imposing this requirement will require the installation of local data storage retention facilities & telemetering equipment that may not be necessary.

4. Should a field trial be initiated, whereby a set of events for each Interconnection is posted throughout the year, to be used by BAs to calculate their 2007 Frequency Response?
   ☒ Yes
   ☐ No
   Comments:

5. Please provide any other comments (that you have not already provided in response to the first three questions on this form) that you have on the revised SAR.
   Comments: The results of the data collection efforts should be used to develop a standard governing frequency response.

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Name:		
Organization:		
Telephone:		
E-mail:		
NERC Region		**Registered Ballot Body Segment**
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Group Comments (Complete this page if comments are from a group.)

Group Name: Southern Company Transmission

Lead Contact: **Jim Busbin**

Contact Organization: **Southern Company Services, Inc.**

Contact Segment: **1**

Contact Telephone: **205-257-6357**

Contact E-mail: **jybusbin@southernco.com**

Additional Member Name	Additional Member Organization	Region*	Segment*
Marc Butts	Southern Company Services	**SERC**	1
J. T. Wood	Southern Company Services	**SERC**	1
Roman Carter	Southern Company Services	**SERC**	1
Raymond Vice	Southern Company Services	**SERC**	1
Jim Viikinsalo	Southern Company Services	**SERC**	1
Tom Higgins	Southern Company Services	**SERC**	5
Terry Crawley	Southern Company Services	**SERC**	5

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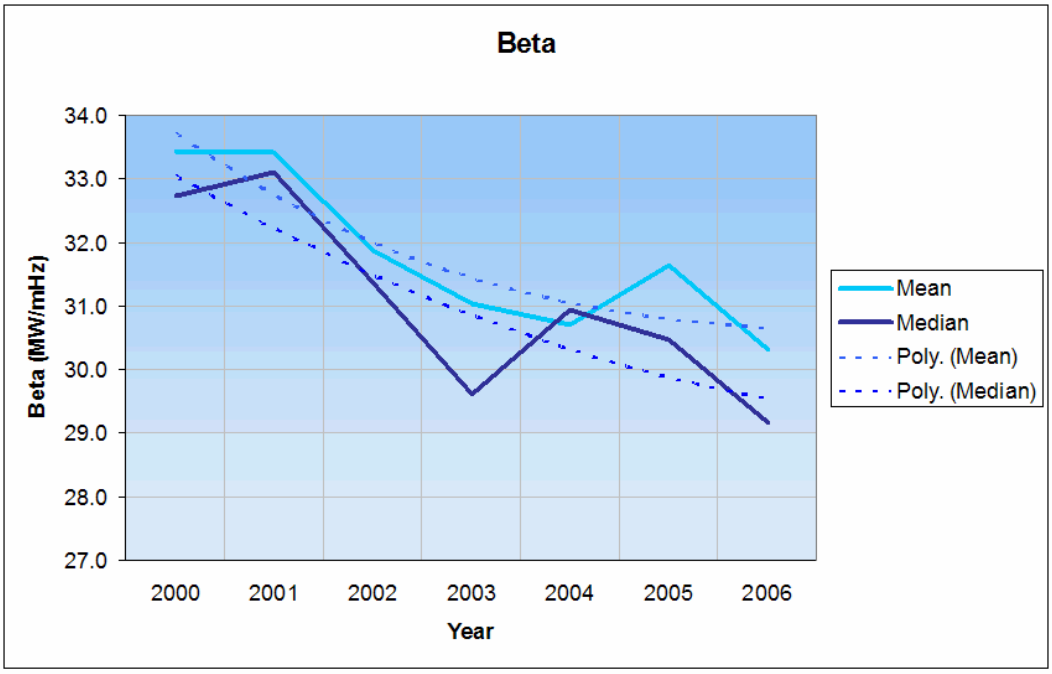

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Insert a "check" mark in the appropriate boxes by double-clicking the gray areas.

1. Do you agree with the reduced scope of this SAR — focusing only on the data collection needed to support the development of accurate models of Frequency Response in North America?

   ☒ Yes

   ☐ No

   Comments: Frequency response and its dynamic behavior is a complex issue that requires detailed analysis and study to understand. This in turn requires sufficient high quality data be obtained to support the development of models and concepts. The data could be collected voluntarily, but without the force of NERC standards behind it not many people are going to devote the resources required to collect the data. We strongly support this effort.

2. The proposed standard would have requirements for the following functional entities: Reliability Coordinator, Balancing Authority, Generator Owner, Generator Operator, and Load-serving Entity. Do you agree that these are the right functional entities for the proposed standard?

   ☒ Yes

   ☐ No

   Comments:

3. The SAR drafting team modified the SAR to clarify that data will be collected to model up to 5 minutes of frequency response. This should help identify the window of time where frequency response appears to be masked by AGC action. Do you agree with this clarification?

   ☒ Yes

   ☐ No

   Comments:

4. Should a field trial be initiated, whereby a set of events for each Interconnection is posted throughout the year, to be used by BAs to calculate their 2007 Frequency Response?

   ☒ Yes

   ☐ No

   Comments: Currently BAs in the Eastern Interconnection have little, if any, way to actually calculate their frequency responses. As a result, most default to the one percent minimum. A good database of disturbance events will provide the information to calculate BA frequency response more accurately while at the same time allowing the NERC OC/RS to determine if the one percent minimum is appropriate in the EI today.

5. Please provide any other comments (that you have not already provided in response to the first three questions on this form) that you have on the revised SAR.
   Comments: This SAR starts the process toward understanding frequency behavior, particularly in the Eastern Interconnection. In our opinion this is a necessary first step in determining whether we need frequency response allocations or other measures to ensure the sustained frequency performance that is required for reliable operations.

   Wherever possible, the scope and extent of data collection required for generators, their dynamic models including all associated control devices, and any other system data parameters covered under this SAR be limited such that it should not duplicate or exceed system modeling data requirements of any other NERC standard. One important system modeling parameter not emphasized in this SAR is the characteristic behavior of load at each substation (constant power, constant current, etc.), which would seem to have a significant effect on overall frequency response of the interconnected system. It is quite possible that advancements in consumer appliances and electronics, and their proliferation of use, have collectively changed the overall characteristics of system load to a composite state that is significantly different from modeling assumptions made within the previous few years.

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Individual Commenter Information **(Complete this page for comments from one organization or individual.)**		
Name:	Mike Pfeister	
Organization:	Salt River Project	
Telephone:	602-236-3970	
E-mail:	Mike.Pfeister@srpnet.com	
NERC Region		**Registered Ballot Body Segment**
☐ **ERCOT** ☐ **FRCC** ☐ **MRO** ☐ **NPCC** ☐ **RFC** ☐ **SERC** ☐ **SPP** ☒ **WECC** ☐ **NA – Not Applicable**	☒	1 — Transmission Owners
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Group Comments (Complete this page if comments are from a group.)

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Lead Contact:

Contact Organization:

Contact Segment:

Contact Telephone:

Contact E-mail:

Additional Member Name	Additional Member Organization	Region*	Segment*

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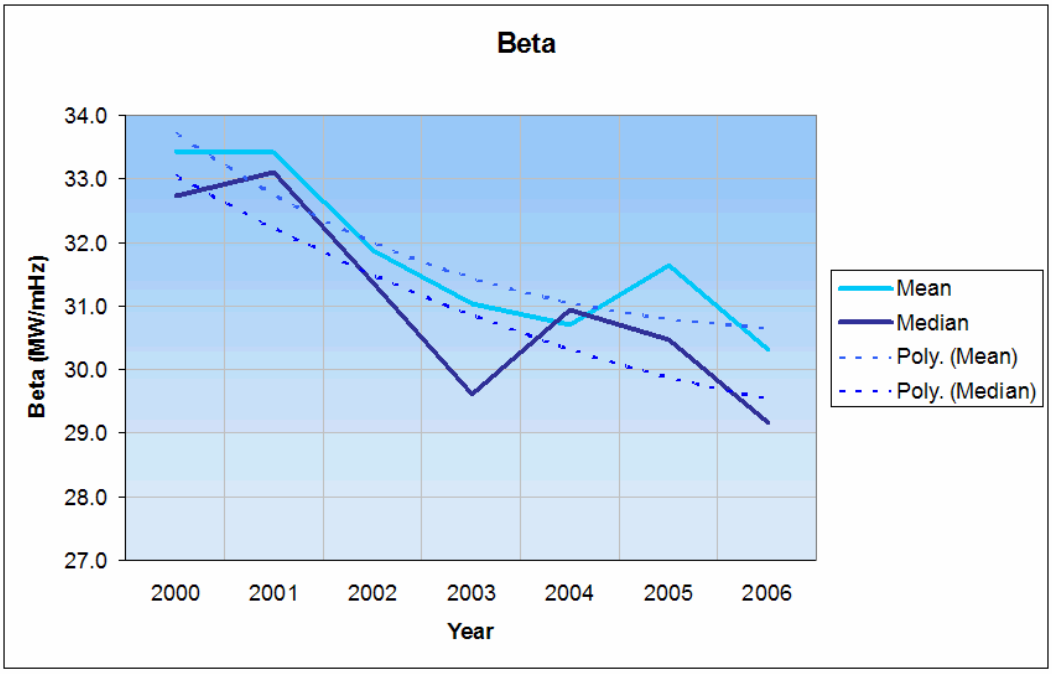

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   Comments:

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   ☒ Yes
   ☐ No
   Comments: Ultimately there may be some impact to the Planning Coordinator and/or Resource Planner if a frequency response requirement is specified. Could there be an extreme scenario where an entity would have to consider shedding load to meet some frequency reserve criteria?

3. The SAR drafting team modified the SAR to clarify that data will be collected to model up to 5 minutes of frequency response. This should help identify the window of time where frequency response appears to be masked by AGC action. Do you agree with this clarification?
   ☒ Yes
   ☐ No
   Comments:

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   ☒ Yes
   ☐ No
   Comments:

5. Please provide any other comments (that you have not already provided in response to the first three questions on this form) that you have on the revised SAR.
   Comments: The SAR includes some requirement language pertaining to generators greater than 10 MW. Old NERC Policy included language requiring frequency responsive governors "unless restricted by regulatory mandates". This makes sense for most nuclear facilities. Another type of restriction on governors involves small hydro units

that are dependent on water order. For this type of unit there truly is no governor response yet the unit capabilities may exceed 10 MWs. Please consider these types of exemptions as work progresses on this SAR and resulting standard.

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Individual Commenter Information **(Complete this page for comments from one organization or individual.)**		
Name:	Ron Beck	
Organization:	Southwestern Power Administration	
Telephone:	417-891-2639	
E-mail:	ron.beck@swpa.gov	
NERC Region		**Registered Ballot Body Segment**
☐ **ERCOT** ☐ **FRCC** ☐ **MRO** ☐ **NPCC** ☐ **RFC** ☐ **SERC** ☒ **SPP** ☐ **WECC** ☐ **NA – Not Applicable**	☒	1 — Transmission Owners
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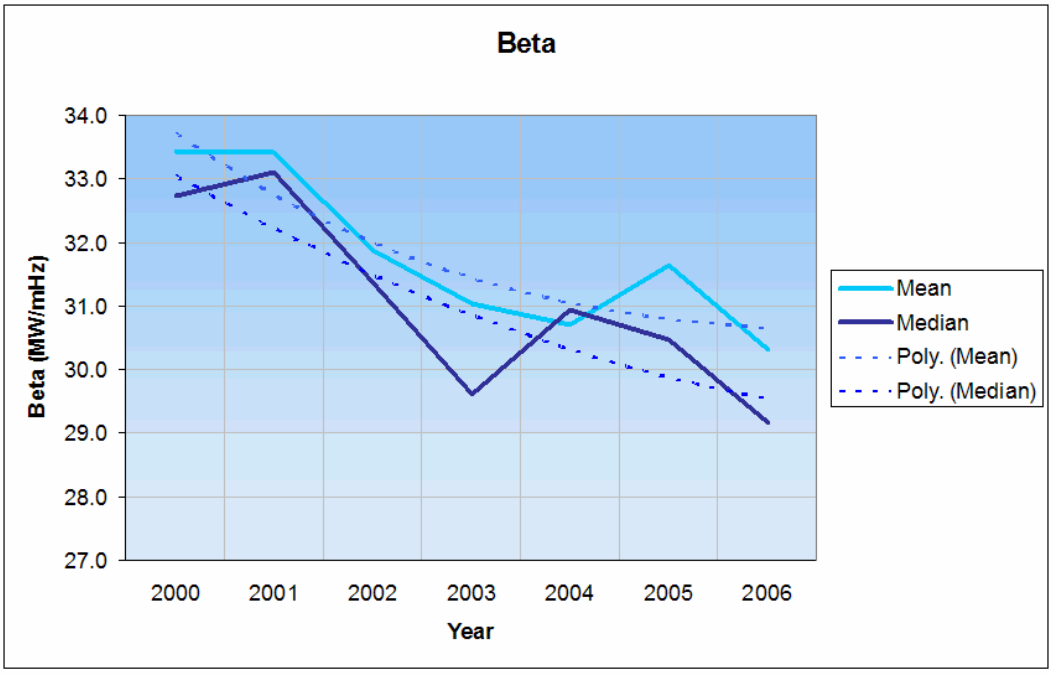

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1. Do you agree with the reduced scope of this SAR — focusing only on the data collection needed to support the development of accurate models of Frequency Response in North America?
   ☐ Yes
   ☒ No
   Comments: The scope of this SAR is for data collection, and should not include establishing a Target Frequency Response as stated in Paragraph #5.

2. The proposed standard would have requirements for the following functional entities: Reliability Coordinator, Balancing Authority, Generator Owner, Generator Operator, and Load-serving Entity. Do you agree that these are the right functional entities for the proposed standard?
   ☐ Yes
   ☒ No
   Comments: Load serving entities should not be included due to the characteristics of load and frequency. Load Serving Entities should contribute data to determine FRC.

3. The SAR drafting team modified the SAR to clarify that data will be collected to model up to 5 minutes of frequency response. This should help identify the window of time where frequency response appears to be masked by AGC action. Do you agree with this clarification?
   ☐ Yes
   ☒ No
   Comments: Need more specific information regarding sample rates. The 5-minutes of frequency response should identify time periods prior to and after the event.

4. Should a field trial be initiated, whereby a set of events for each Interconnection is posted throughout the year, to be used by BAs to calculate their 2007 Frequency Response?
   ☒ Yes
   ☐ No
   Comments:

5. Please provide any other comments (that you have not already provided in response to the first three questions on this form) that you have on the revised SAR.
   Comments: Data collection and FRC assessments should also take into account loss of load, not just loss of generation. If load is lost, causing a high frequency excursion, FRC should be observed on heavily loaded generators.

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Individual Commenter Information **(Complete this page for comments from one organization or individual.)**		
Name:	David Lemmons	
Organization:	Xcel Energy Services	
Telephone:	303-308-6120	
E-mail:	david.f.lemmons@xcelenergy.com	
NERC Region		**Registered Ballot Body Segment**
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Greg Pieper	Xcel Energy	**MRO**	1
Michael Ibold	Xcel Energy	**MRO**	3
Steve Beuning	Xcel Energy	**MRO**	5

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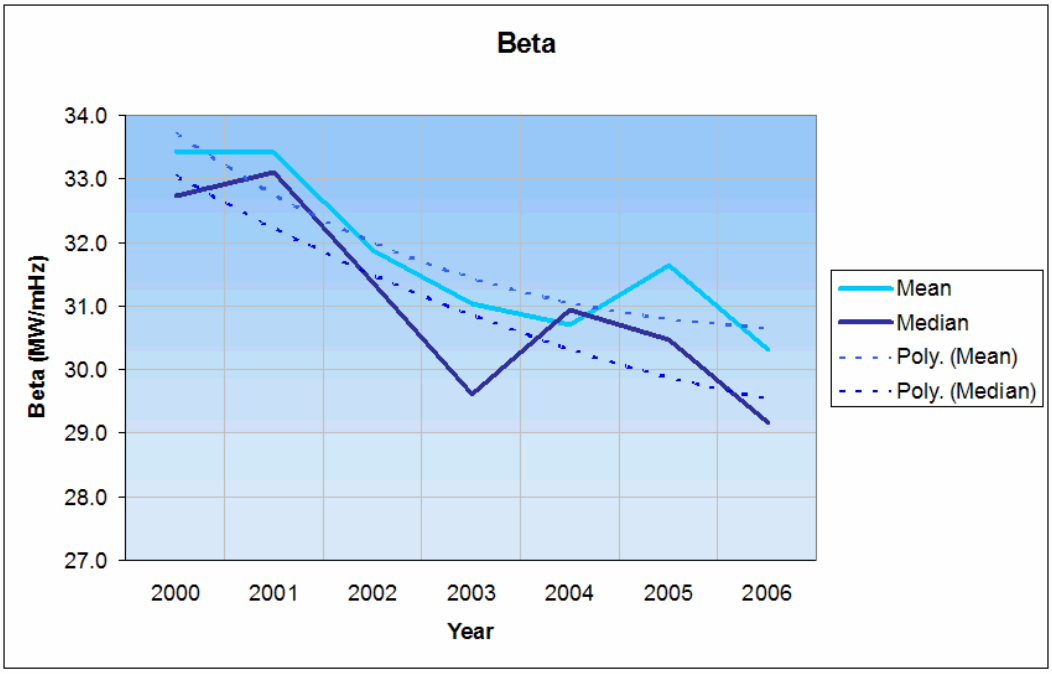

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The SAR drafting team has tried to meet the Standards Committee's directive with this third version of the SAR.

The Version 3 of the Frequency Response SAR represents the changes requested by the NERC Standards Committee, while still meeting the June 2006 direction of the NERC Operating Committee. Specifically, the Operating Committee endorsed developing a Frequency Response standard that includes the following goals and objectives:

- Improving Interconnection Frequency Response event cataloging and benchmarking.
- Calculating balancing authority Frequency Response and requiring balancing authorities to analyze those cases where the response is significantly below the norm.
- Establishing time limits to complete the analyses.
- Tabulating non-responsive generators.
- Measuring generator response (those units on line).
- Including regional participation and review.

This revised SAR was reviewed and supported by the NERC Resources Subcommittee on December 4, 2006. The major changes between Draft 2 and Draft 3 include:

- Clarification on the role of the Load-serving Entity and Generator Operator.
- Inclusion of the applicability of Reliability Principles 3, 5, and 6.
- Reduced the scope to address only the collection of data needed to model Frequency Response in North America.
- Clarified that the data collected to model frequency response over a period of up to 5 minutes per event to help identify the window of time where frequency response appears to be masked by AGC action.

Note that because the changes to the SAR were quite significant, no redline showing the changes from Version 2 to Version 3 will be posted.

Please review the revised SAR and then answer the questions on the following page. Comments must be submitted by **March 9, 2007**. You may submit the completed form by e-mail to sarcomm@nerc.com with the words “FR SAR Draft 3” in the subject line.

You do not have to answer all questions. Enter All Comments in Simple Text Format.

Insert a "check" mark in the appropriate boxes by double-clicking the gray areas.

1. Do you agree with the reduced scope of this SAR — focusing only on the data collection needed to support the development of accurate models of Frequency Response in North America?

   ☐ Yes

   ☒ No

   Comments: We agree with the proposed scope except that items 5 and 6 do not deal specifically with data collection and therefore are beyond the scope of the SAR. We are concerned over establishing a Target Frequency Response. This is presumptious in that it advances a proposed remedy before first meeting the intent of the SAR-determining the cause for the percieved decline in frequency response. We support Items 6a. and 6b. if referenced to item 4 as modified as follows: Modify 4 to require generator level reporting when the Frequency Response for a BA is less than [75]* percent of the Previous Years observed Frequency Response. Delete items 5 and 6.

2. The proposed standard would have requirements for the following functional entities: Reliability Coordinator, Balancing Authority, Generator Owner, Generator Operator, and Load-serving Entity. Do you agree that these are the right functional entities for the proposed standard?

   ☒ Yes

   ☐ No

   Comments: To the extent information is needed from these entities, they are appropriate to list. It is possible that the LSE is not required.

3. The SAR drafting team modified the SAR to clarify that data will be collected to model up to 5 minutes of frequency response. This should help identify the window of time where frequency response appears to be masked by AGC action. Do you agree with this clarification?

   ☐ Yes

   ☒ No

   Comments: Further clarification is needed around the time period for which data will be collected. It important to note that description of the 5 minutes data collection period should include 1 minute before and 4 minutes after the event.

4. Should a field trial be initiated, whereby a set of events for each Interconnection is posted throughout the year, to be used by BAs to calculate their 2007 Frequency Response?

   ☒ Yes

   ☐ No

   Comments:

5. Please provide any other comments (that you have not already provided in response to the first three questions on this form) that you have on the revised SAR.
   Comments: Establishing a Target Frequency Response is premature. It advances a proposed remedy in advance of first meeting the intent of the SAR-determining the cause for the percieved decline in frequency response. It is our view that the percieved decline of frequency response, if that turns out to be the confirmed as a true decline, of itself does not necessarily indicate an significantly increased threat to reliability. As long as generating reserve obligations are being met to meet Reliability Standards and the real time regulating reserves are being carried, also to meet Standards, there may not be a need to go further depending on the outcome of the study proposed by the SAR.

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Individual Commenter Information **(Complete this page for comments from one organization or individual.)**		
Name:	Brian Thumm	
Organization:	ITC Holdings	
Telephone:	248-374-7846	
E-mail:	bthumm@itctransco.com	
NERC Region		**Registered Ballot Body Segment**
☐ **ERCOT** ☐ **FRCC** ☐ **MRO** ☐ **NPCC** ☒ **RFC** ☐ **SERC** ☐ **SPP** ☐ **WECC** ☐ **NA – Not Applicable**	☒	1 — Transmission Owners
	☐	2 — RTOs, ISOs
	☐	3 — Load-serving Entities
	☐	4 — Transmission-dependent Utilities
	☐	5 — Electric Generators
	☐	6 — Electricity Brokers, Aggregators, and Marketers
	☐	7 — Large Electricity End Users
	☐	8 — Small Electricity End Users
	☐	9 — Federal, State, Provincial Regulatory or other Government Entities
	☐	10 — Regional Reliability Organizations, Regional Entities

Group Comments (Complete this page if comments are from a group.)

Group Name:

Lead Contact:

Contact Organization:

Contact Segment:

Contact Telephone:

Contact E-mail:

Additional Member Name	Additional Member Organization	Region*	Segment*

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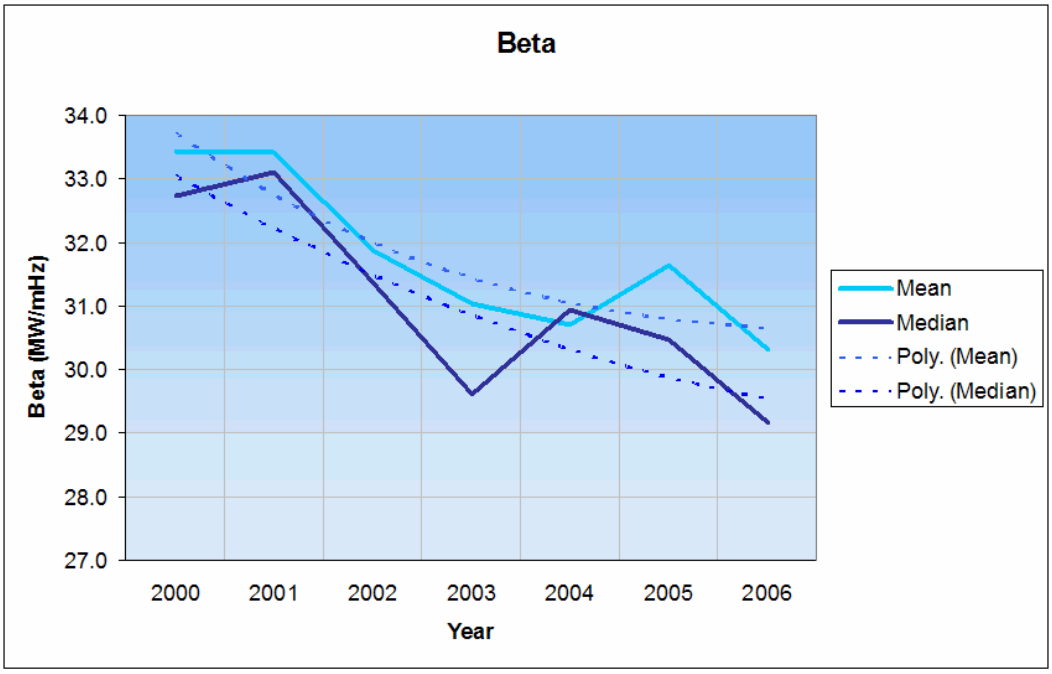
The NERC Resources Subcommittee recently updated their estimate of Eastern Interconnection Frequency Response and found it still trending downward. Response in 2006 was on the order of 2,800 MW/0.1Hz (compared to 3,750 MW/0.1Hz in 1994). Frequency Response for larger events (greater than 35 mHz) in 2006 may be as low as 2,600 MW/0.1Hz. Below is an independently calculated estimate of the trend in Eastern Interconnection Frequency Response provided by the New York ISO. Note: Response is stated in engineering terms (MW/mHz) as opposed to the traditional MW/01.Hz.



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1. Do you agree with the reduced scope of this SAR — focusing only on the data collection needed to support the development of accurate models of Frequency Response in North America?
   ☒ Yes
   ☐ No
   Comments:

2. The proposed standard would have requirements for the following functional entities: Reliability Coordinator, Balancing Authority, Generator Owner, Generator Operator, and Load-serving Entity. Do you agree that these are the right functional entities for the proposed standard?
   ☒ Yes
   ☐ No
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   ☐ Yes
   ☒ No
   Comments: Five minutes of data seems arbitrary. If the collection period were extended to 15 minutes, it would coincide with the Disturbance Control period.

4. Should a field trial be initiated, whereby a set of events for each Interconnection is posted throughout the year, to be used by BAs to calculate their 2007 Frequency Response?
   ☒ Yes
   ☐ No
   Comments:

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Individual Commenter Information **(Complete this page for comments from one organization or individual.)**		
Name:	James H. Sorrels, Jr.	
Organization:	American Electric Power	
Telephone:	(614) 716-2370	
E-mail:	jhsorrels@aep.com	
NERC Region		**Registered Ballot Body Segment**
☒ **ERCOT** ☐ **FRCC** ☐ **MRO** ☐ **NPCC** ☒ **RFC** ☐ **SERC** ☒ **SPP** ☐ **WECC** ☐ **NA – Not Applicable**	☒	1 — Transmission Owners
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Contact Organization:

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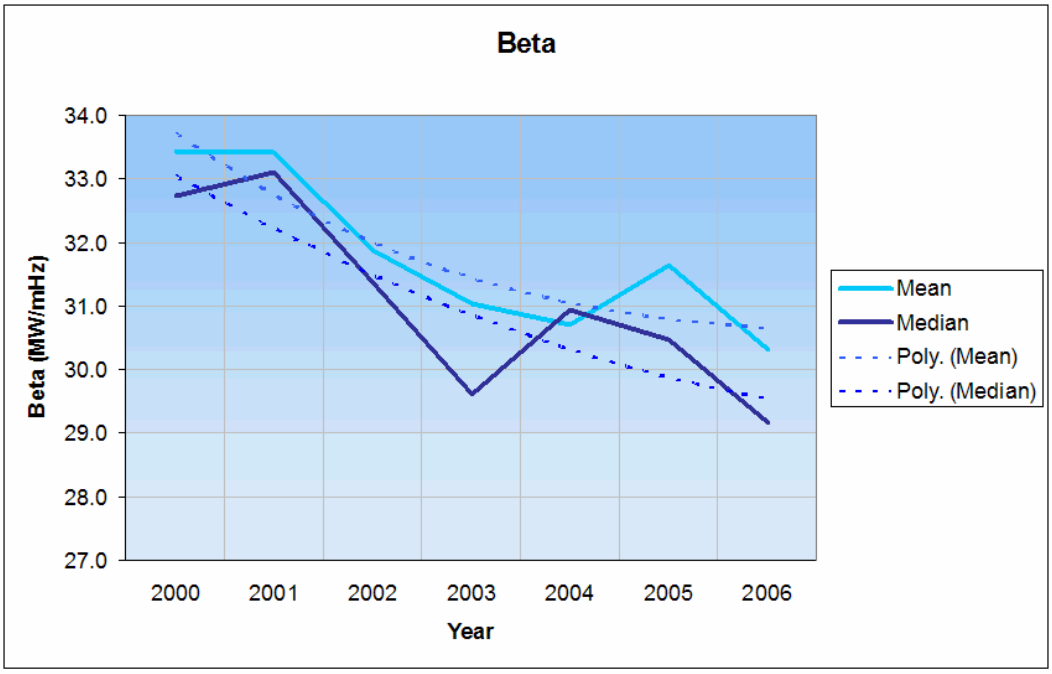

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   ☒ Yes
   ☐ No
   Comments: The role of the load serving entity in item 6b is unclear.

3. The SAR drafting team modified the SAR to clarify that data will be collected to model up to 5 minutes of frequency response. This should help identify the window of time where frequency response appears to be masked by AGC action. Do you agree with this clarification?
   ☒ Yes
   ☐ No
   Comments:

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Individual Commenter Information **(Complete this page for comments from one organization or individual.)**		
Name:	Richard Kafka	
Organization:	Pepco Holdings, Inc.	
Telephone:	301-469-5274	
E-mail:	rjkafka@pepcoholdings.com	
NERC Region		**Registered Ballot Body Segment**
☐ **ERCOT** ☐ **FRCC** ☐ **MRO** ☐ **NPCC** ☒ **RFC** ☐ **SERC** ☐ **SPP** ☐ **WECC** ☐ **NA – Not Applicable**	☒	1 — Transmission Owners
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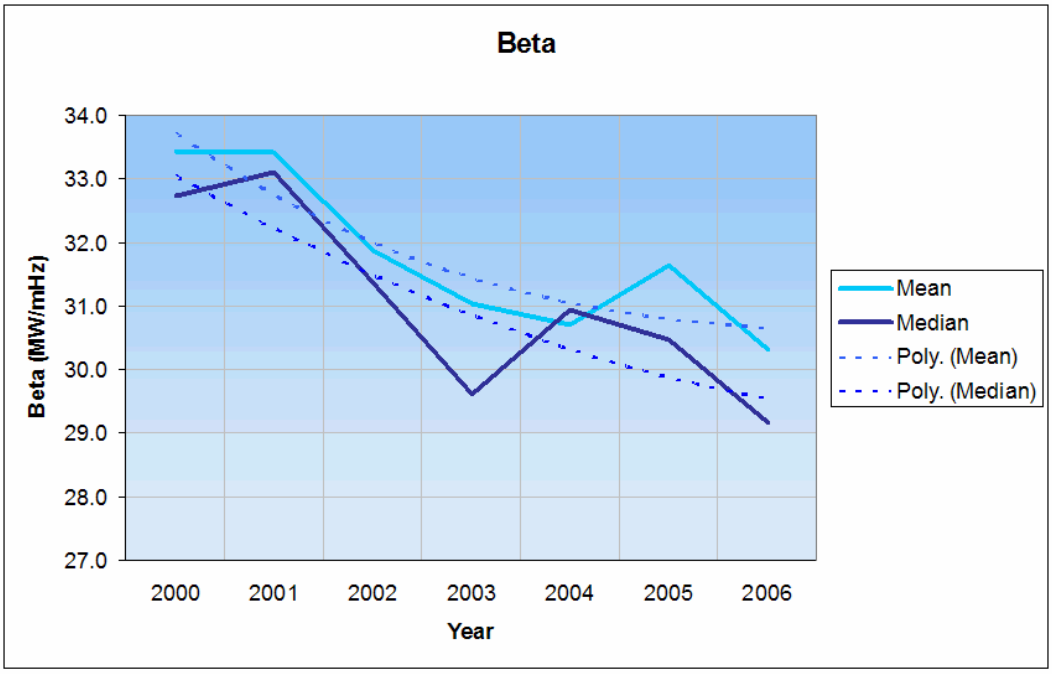

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1. Do you agree with the reduced scope of this SAR — focusing only on the data collection needed to support the development of accurate models of Frequency Response in North America?
   ☒ Yes
   ☐ No
   Comments: Data collection will provide the background for any new performance standard

2. The proposed standard would have requirements for the following functional entities: Reliability Coordinator, Balancing Authority, Generator Owner, Generator Operator, and Load-serving Entity. Do you agree that these are the right functional entities for the proposed standard?
   ☒ Yes
   ☐ No
   Comments: In some cases, it is likely that the BA and GOP will have all the information required.

3. The SAR drafting team modified the SAR to clarify that data will be collected to model up to 5 minutes of frequency response. This should help identify the window of time where frequency response appears to be masked by AGC action. Do you agree with this clarification?
   ☒ Yes
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   Comments:

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   Comments:

NERC
NORTH AMERICAN ELECTRIC RELIABILITY CORPORATION

Consideration of Comments on 3rd Posting of Frequency Response SAR

The Frequency Response SAR Requesters thank all commenters who submitted comments on Draft 3 of the Frequency Response SAR. This SAR was posted for a 30-day public comment period from February 8 through March 9, 2007. The requesters asked stakeholders to provide feedback on the standard through a special standard Comment Form. There were 26 sets of comments, including comments from more than 59 different people from 39 companies representing 9 of the 10 Industry Segments as shown in the table on the following pages.

Based on the comments received, the drafting team did not make any changes to the SAR (except to update the descriptions of the Reliability Functions to match the latest version of the Functional Model) and is recommending that the Standards Committee authorize moving this SAR forward to standard drafting.

In this "Consideration of Comments" document stakeholder comments have been organized so that it is easier to see the responses associated with each question. All comments received on the standards can be viewed in their original format at:

http://www.nerc.com/~filez/standards/Frequency_Response.html

If you feel that your comment has been overlooked, please let us know immediately. Our goal is to give every comment serious consideration in this process! If you feel there has been an error or omission, you can contact the Director of Standards, Gerry Adamski, at 609-452-8060 or at gerry.adamski@nerc.net. In addition, there is a NERC Reliability Standards Appeals Process.[1]

[1] The appeals process is in the Reliability Standards Development Procedures: http://www.nerc.com/standards/newstandardsprocess.html.

The Industry Segments are:

1 — Transmission Owners
2 — RTOs, ISOs
3 — Load-serving Entities
4 — Transmission-dependent Utilities
5 — Electric Generators
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7 — Large Electricity End Users
8 — Small Electricity End Users
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Commenter		Organization	Industry Segment									
			1	2	3	4	5	6	7	8	9	10
1.	Dan Boezio (G8)	AEP	✓									
2.	Jason Shaver	American Transmission Co.	✓									
3.	Bart McManus	Bonneville Power Administration	✓									
4.	James Murphy	Bonneville Power Administration	✓									
5.	John Anasis	Bonneville Power Administration	✓									
6.	Brenda Anderson	Bonneville Power Administration	✓									
7.	Brent Kingsford	California ISO		✓								
8.	Ed Thompson (G2)	ConEd	✓									
9.	Michael Gildea	Constellation Generation					✓					
10.	Doug Hils (G3)	Duke Energy	✓									
11.	Howard F. Illian	Energy Mark, Inc.								✓		
12.	Steve Myers (G1)	ERCOT		✓								
13.	Bruno Jesus (G2)	Hydro One Networks	✓									
14.	Roger Champagne (G1)	Hydro Québec TransÉnergie	✓									
15.	Ron Falsetti (G1)	IESO		✓								
16.	Kathleen Goodman (G1)	ISO-NE		✓								
17.	Bill Shemley (G2)	ISO-NE		✓								
18.	Brian Thumm (G3)	ITC Transmission	✓									
19.	Jim Cyrulewski (G3)	JDRJC Associates								✓		
20.	Michael Gammon	Kansas City Power & Light	✓									
21.	Jim Useldinger	KCPL	✓									

Commenter		Organization	Industry Segment									
			1	2	3	4	5	6	7	8	9	10
	(G8)											
22.	Jason Atwood (G8)	Kelson Energy				✓						
23.	Don Nelson (G2)	MA Dept. of Tele. And Energy									✓	
24.	Robert Coish	Manitoba Hydro	✓		✓		✓	✓				
25.	Alan R. Oneal	MidAmerican Energy Co.										
26.	Jason Marshall (G3)	Midwest ISO Stakeholders Standards Collaboration Participants		✓								
27.	Herb Schrayshuen	National Grid	✓									
28.	Randy McDonald (G2)	NBSO		✓								
29.	Guy V. Zito (G2)	NPCC										✓
30.	Sydney Niemeyer	NRG Texas, Qualified Scheduling Entity					✓					
31.	Jerad Barnhart	NStar	✓									
32.	Mike Calimano (G1)	NYISO		✓								
33.	Greg Campoli (G1)	NYISO		✓								
34.	Ralph Rufrano (G2)	NYPA	✓									
35.	Theodore Papaps	NYSRC										✓
36.	Al Adamson (G2)	NYSRC										✓
37.	Pete Kuebeck (G8)	OG&E	✓									
38.	Al DiCaprio	PJM		✓								
39.	Alicia Daughtery	PJM		✓								
40.	Joseph Willson	PJM		✓								
41.	Tom Bowe	PJM		✓								
42.	Mike Pfeister	Salt River Project	✓									
43.	Jim Busbin (G6)	Southern Company Services, Inc.	✓									
44.	Marc Butts (G6)	Southern Company Services, Inc.	✓									
45.	J.T. Wood (G6)	Southern Company Services, Inc.	✓									
46.	Roman Carter	Southern Company Services, Inc.	✓									
47.	Raymond Vice	Southern Company Services, Inc.	✓									

Commenter		Organization	Industry Segment									
			1	2	3	4	5	6	7	8	9	10
48.	Jim Viikinsalo	Southern Company Services, Inc.	✓									
49.	Tom Higgins	Southern Company Services, Inc.					✓					
50.	Terry Crawley	Southern Company Services, Inc.					✓					
51.	Ron Beck	Southwestern Power Administration	✓									
52.	Bill Grant (G8)	Southwestern Public Service	✓									
53.	Wayne Galli (G8)	SPP										✓
54.	Steve Massey (G8)	Westar Energy					✓					
55.	Mich Crouch (G8)	Western Farmers	✓									
56.	Greg Pieper	Xcel Energy Services	✓									
57.	Michael Ibold	Xcel Energy Services			✓							
58.	Steve Beuning	Xcel Energy Services					✓					
59.	David Lemmons	Xcel Energy Services						✓				

I – Indicates that individual comments were submitted in addition to comments submitted as part of a group
G1 - IRC Standards Review Committee
G2 – NPCC CP9 Reliability Standards Working Group (NPCC CP9)
G3 – Midwest ISO Stakeholders Standards Collaboration Participants (MISO SSC)
G4 – TVA
G5 – Public Service Commission of SC (PSC of SC)
G6 – Southern Company Transmission (Southern Co)
G7 – MRO
G8 – Southwest Power Pool Operating Reliability Working Group

Index to Questions, Comments, and Responses

1. **Do you agree with the reduced scope of this SAR — focusing only on the data collection needed to support the development of accurate models of Frequency Response in North America?**

Summary Consideration:

The majority of the comments agreed with the reduced scope of the SAR, which now focuses only on the data collection that is needed to support the development of accurate models of Frequency Response in North America. For most of the commenters that did not support the reduced scope, the SAR Drafting Team believes there may be a misunderstanding with respect to the use of the Target Frequency Response. The SAR Drafting Team explained to those commenters that the Target Frequency Response does not set a minimum for any particular Balancing Authority. Rather it sets a benchmark, beyond which additional data is needed from the Balancing Authority.

Question #1			
Commenter	**Yes**	**No**	**Comment**
SWPA		☑	The scope of this SAR is for data collection, and should not include establishing a Target Frequency Response as stated in Paragraph #5.
Response: The SAR Drafting Team appreciates your input, but disagrees with your conclusion. There should always be a purpose for going to the trouble and expense of capturing and analyzing data. The SAR Drafting Team considers the establishment of a Target Frequency Response for each Interconnection as vital for the reliability of the Interconnections and one of the two fundamental reasons why this SAR was initially drafted. The SAR Drafting Team believes there may be a misunderstanding with respect to Target Frequency Response, which does not set a minimum for any particular Balancing Authority. The Target Frequency Response sets a benchmark, beyond which additional data is needed from the Balancing Authority.			
Xcel Energy Services		☑	We agree with the proposed scope except that items 5 and 6 do not deal specifically with data collection and therefore are beyond the scope of the SAR. We are concerned over establishing a Target Frequency Response. This is presumptious in that it advances a proposed remedy before first meeting the intent of the SAR-determining the cause for the percieved decline in frequency response. We support Items 6a. and 6b. if referenced to item 4 as modified as follows: Modify 4 to require generator level reporting when the Frequency Response for a BA is less than [75]* percent of the Previous Years observed Frequency Response. Delete items 5 and 6.
Response: In response to your first comment on Paragraph 5, the SAR Drafting Team considers the establishment of a Target Frequency Response for each Interconnection as vital for the reliability of the Interconnections and one of the two fundamental reasons why this SAR was drafted initially. The reason for establishing the target frequency response is to determine the point at which additional data is needed from a given Balancing Authority. In response to your comment on Paragraph 6, the SAR Drafting Team does not view the provisions of Paragraph 6 as presumptive or proscriptive, but as a necessary step in identifying and understanding potential frequency response variations within a given Interconnection. No specific action is required by the Balancing Authority or the Generation Owner at this			

Question #1			
Commenter	**Yes**	**No**	**Comment**
point in the process beyond supplying the data needed for NERC to understand why variations in Frequency Response occur in different regions and to determine if further actions are required, via the NERC Reliability Standards Process, to address them.			
PJM		☑	The primary objective of this SAR is to collect data; to analyze the data; and only then to recommend a performance value. The SAR DT insists that collecting data is a Technical Standard. The RSDP states: "Technical standards…will contain Measures (not measuring - AMD) of physical parameters…" At this point this SAR proposal does not contain such a measure, it does not even assert that the measure is really needed (hence the need to analyze the data). Page 19 (of 43) of the RSPM states "The drafting team may recommend the scope of the standard be reduced to allow the effort to move forward, while still remaining within the scope of the SAR. Reducing the scope of the SAR is acceptable if the drafting team finds, for instance, THAT ADDITIONAL TECHNICAL RESEARCH IS NEEDED PRIOR TO DEVELOPING (emphasis added) a portion of the standard or issues need to be resolved before consensus can be achieved on a portion of the standard. "The highlighted section applies directly to the scope of this SAR. The SAR Team recognizes work is needed. There is no question about that. The Team should do that work BEFORE proposing a mandatory standard. PJM supports the concept of doing such a study, and would encourage NERC to assign a group to do such a study, but PJM does not agree that collecting data rises to the level of a valid NERC reliability standard.
Response: NERC's Reliability Standards Development Plan: 2007 - 2009 describes the characteristics of a Reliability Standard as follows: " Although reliability standards have a common format and process, several types of reliability standards may exist, each with a different approach to measurement: ▪ **Technical standards** related to the provision, maintenance, operation, or state of bulk power systems will likely contain measures of physical parameters and will often be technical in nature. ▪ **Performance standards** related to the actions of entities providing for or impacting the reliability of the bulk power systems will likely contain measures of the result of such actions, or the nature of the performance of such actions". Collecting, correlating and analyzing data on a continental scale is not a simple matter. The SAR Drafting Team believes that the scale of this project and the potential importance of the conclusions to be developed per the specifications in Paragraphs 5 and 6 more than warrant the use of the NERC Reliability Standards Process to address them. Directed research can be			

Question #1			
Commenter	**Yes**	**No**	**Comment**
investigated during the standard development effort.			
IESO		☑	We do not agree with the reduced scope of this SAR. It does not require a standard to enable a data collection task(s). Data collection procedures and processes, charged by a standing committee, e.g. the OC, or respective working groups, would be more than sufficient.
Response: The SAR Drafting Team believes that the scale of this project, the ongoing nature, and the potential importance of the conclusions to be developed per the specifications in Paragraphs 5 and 6 more than warrant the use of the NERC Reliability Standards Process to address them. We believe the Standing Committees would play a vital role in evaluating the initial results of the standard.			
SPP ORWG		☑	Do not agree with the notion in point 5 regarding the need for a Target Frequency Response for each interconnection at this time. It is beyond the scope of this technical SAR to propose anything other than collection of data to support the study. Do not agree with point 6 of the description. In order to get a handle on what is really going on, all Balancing Authorities should be required to produce data valid to the study. Also the language in point 6 is poorly worded compared to the right wording in 6a and 6b. 6a and 6b should be included in the SAR and 6 should be removed.
Response: The SAR Drafting Team appreciates your input, but disagrees with your conclusion. The SAR Drafting Team considers the establishment of a Target Frequency Response for each Interconnection as vital for the reliability of the Interconnections and one of the two fundamental reasons why this SAR was drafted initially. The reason for establishing the target frequency response is to determine the point at which additional data is needed from a given Balancing Authority. With respect to your comment on Paragraph 6, the SAR Drafting Team does not view the provisions of Paragraph 6 as presumptive or proscriptive, but as a necessary step in identifying and understanding potential frequency response variations within a given Interconnection. No specific action is required by the Balancing Authority or the Generation Owner at this point in the process beyond supplying the data needed for NERC to understand why variations in Frequency Response occur in different regions and to determine if further actions are required, via the NERC Reliability Standards Process, to address them. The intent of the Target Frequency Response is to determine the point where additional data is required. The SAR Drafting Team does not recognize the specific wording that you are referring to in Paragraph 6 and request clarification.			
KCP&L		☑	Do not agree with the notion in point 5 regarding the need for a Target Frequency Response for each interconnection at this time. It is presumptuous to advance a remedy prior to determining cause of the perceived decline in frequency response. Allow the techincal SAR to perform its function to determine cause. Any appropriate remedy in operating standards should become apparent. Do not agree with point 6 of the description. In order to get a handle on what is really

Question #1			
Commenter	**Yes**	**No**	**Comment**
			going on, all Balancing Authorities should be required to produce data valid to the study. Also the language in point 6 is poorly worded compared to the right wording in 6a and 6b. 6a and 6b should be included in the SAR and 6 should be removed.
Response: We appreciate your input, but disagree with your conclusion. The SAR Drafting Team considers the establishment of a Target Frequency Response for each Interconnection as vital for the reliability of the Interconnections and one of the two fundamental reasons why this SAR was drafted initially. The reason for establishing the target frequency response is to determine the point at which additional data is needed from a given Balancing Authority. In response to your comment on Paragraph 6, the SAR Drafting Team does not view the provisions of Paragraph 6 as presumptive or proscriptive, but as a necessary step in identifying and understanding potential frequency response variations within a given Interconnection. No specific action is required by the Balancing Authority or the Generation Owner at this point in the process beyond supplying the data needed for NERC to understand why variations in Frequency Response occur in different regions and to determine if further actions are required, via the NERC Reliability Standards Process, to address them. The intent of the Target Frequency Response is to determine the point where additional data is required. The SAR Drafting Team does not recognize the specific wording that you are referring to in Paragraph 6 and request clarification.			
Hydro Québec TransÉnergie	☑	☑	HQT believe there might be other means than Reliability Standards to accomplish this data collection.
Response: The SAR Drafting Team agrees that there may be methods other than the use of the NERC Reliability Standards Process to address this issue. However, due to the scale of this project and the potential importance of the conclusions to be developed per the specifications in Paragraphs 5 and 6, the SAR Drafting Team believes that the use of the NERC Reliability Standards Process is appropriate.			
NPCC CP9	☑	☑	Many of NPCC's participating members believe there are other means to accomplish this phase of the initiative and that appropriate revisions to existing standard(s) may address the issue determined by the data analysis could be proposed.
Response: The SAR Drafting Team agrees that there may be methods other than the use of the NERC Reliability Standards Process to address this issue. However, due to the scale of this project and the potential importance of the conclusions to be developed per the specifications in Paragraphs 5 and 6, the SAR Drafting Team believes that the use of the NERC Reliability Standards Process is appropriate.			
NYISO	☑	☑	The NYISO is uncertain if this is the appropriate means to require data collection for purposes of developing models. A review should be made to be certain that this proposed scope meets the criteria for a standard.
Response: The SAR Drafting Team agrees that there may be methods other than the use of the NERC Reliability Standards Process to address this issue. However, due to the scale of this project and the potential importance of the conclusions to be developed per the specifications in Paragraphs 5 and 6, the SAR Drafting Team believes that the use of the NERC Reliability Standards Process is appropriate. Note that the NERC Standards Committee and the industry as a whole are currently performing just such a review, as you request, by commenting on this draft SAR.			

Question #1			
Commenter	**Yes**	**No**	**Comment**
Energy Mark, Inc.	☑		At this time information is not available that would provide a sound technical basis for the development of a performance standard. However, with the recent increased interest in Frequency Response, new data and analysis could become available at any time that would change the focus from a technical standard to a performance standard. If new information and analysis becomes available during the development of the technical standard, consideration should be given to how the development of the technical standard could delay the development and implementation of a performance standard. Must the technical standard be completed and approved before work can start on a performance standard?
Response: The SAR Drafting Team agrees that there may be technical issues which may allow the Standard Drafting Team to accomplish the functional purpose of this SAR differently than anticipated by the SAR Drafting Team. This is allowed for in the NERC Reliability Standards Process Manual, page 19, as noted by PJM above. It is anticipated by the SAR Drafting Team that the work set forth in the SAR will aid in determining if a Performance Standard is required and, if so, how the standard should be structured. A SAR for a Frequency Response Performance Standard can be written and submitted to the NERC Standards Committee at any time.			
MidAmerican Energy Co.	☑		This standard would be a start, at least, at bringing to light where and why response is being lost. It may well be that exposure and peer pressure, as well as the tiered reporting requirements, will keep plant and operations personnel abreast of their obligations for providing reserves of all types.
Response: The SAR Drafting Team appreciates your support.			
Southern	☑		Frequency response and its dynamic behavior is a complex issue that requires detailed analysis and study to understand. This in turn requires sufficient high quality data be obtained to support the development of models and concepts. The data could be collected voluntarily, but without the force of NERC standards behind it not many people are going to devote the resources required to collect the data. We strongly support this effort.
Response: The SAR Drafting Team appreciates your support.			
ISO New England	☑		
Bonneville Power Administration	☑		
American Transmission Co.	☑		
CAISO	☑		
ERCOT	☑		

Question #1			
Commenter	**Yes**	**No**	**Comment**
Manitoba Hydro	☑		
MISO	☑		
NRG Texas	☑		
NYSRC	☑		
Salt River Project	☑		
American Electric Power	☑		
ITC Transco	☑		

2. The proposed standard would have requirements for the following functional entities: Reliability Coordinator, Balancing Authority, Generator Owner, Generator Operator, and Load-serving Entity. Do you agree that these are the right functional entities for the proposed standard?

Summary Consideration:

The majority of the commenters supported the functional entities for which the proposed standard would be applicable, specifically the Reliability Coordinator, Balancing Authority, Generator Owner, Generator Operator, and Load-Serving Entity. All commenters that responded that they did not agree to the proposed functional entities requested clarification on the applicability to a Load-serving Entity (LSE).

The SAR Drafting Team explained that the LSE functional entity was added in response to stakeholder comments received on the first draft of the SAR. The SAR Drafting Team also explained to commenters that various industry experts estimate that as much as 1/3 of the total Interconnection Frequency Response may be supplied by Load Frequency Response (the other 2/3 is supplied from Turbine Governor Support). Thus information from the LSE concerning the composition and variations of load served within the Interconnection can be critical in understanding total Interconnection Frequency Response.

One commenter suggested that if there is a future performance standard, it would be unreasonable to implement a technical standard that requires functional entities to provide data. The SAR Drafting Team does not see the linkage between requiring data from entities in order to qualify and quantify Frequency Response with the interconnections and NOT including all these entities in a Frequency Response Performance Standard.

Question #2			
Commenter	**Yes**	**No**	**Comment**
PJM		☑	The proposal as written appears to be headed towards mandating a given unit response. As such there would be an obligation on the Generator Operator - there does not seem to be any requirements that would apply to the Generator Owner - unless of course the requestor includes a requirement to install a governor (this has, to date, be an implied obligation just as having a turbine has been an implied obligation). If the requestor does intend to assert an obligation on the Generator Owner to install a governor then the question arises should that be a standard or should that be a part of the Certification of a GO? It is not clear what the LSE requirements are in this proposal.
Response: The stated purpose of this SAR is to collect and analyze data in order to determine the Frequency Response for each Interconnection, recommend a target Frequency Response for each Interconnection and determine the cause of any significant variations in Frequency Response within each of the Interconnections. In response to your comment on applicability to LSEs, various industry experts estimate that as much as 1/3 of the total Interconnection Frequency Response may be supplied by Load Frequency Response (the other 2/3 is supplied from Turbine			

Question #2			
Commenter	**Yes**	**No**	**Comment**
Governor Support). Thus information from the LSE concerning the composition and variations of load served within the Interconnection can be critical in understanding total Interconnection Frequency Response. The applicability to LSEs was added at the specific request of commenters in a previous version of the SAR.			
SWPA		☑	Load serving entities should not be included due to the characteristics of load and frequency. Load Serving Entities should contribute data to determine FRC.
Response: Various industry experts estimate that as much as 1/3 of the total Interconnection Frequency Response may be supplied by Load Frequency Response (the other 2/3 is supplied from Turbine Governor Support). Thus information from the LSE concerning the composition and variations of load served within the Interconnection can be critical in understanding total Interconnection Frequency Response. The applicability to LSEs was added at the specific request of commenters in a previous version of the SAR. Note that your two statements seem to contradict each other.			
NPCC CP9		☑	NPCC participating members question the need to include the applicability to the LSEs in this SAR and requests the drafting team to explain this.
Response: Various industry experts estimate that as much as 1/3 of the total Interconnection Frequency Response may be supplied by Load Frequency Response (the other 2/3 is supplied from Turbine Governor Support). Thus information from the LSE concerning the composition and variations of load served within the Interconnection can be critical in understanding total Interconnection Frequency Response. The applicability to LSEs was added at the specific request of commenters in a previous version of the SAR.			
NYSRC		☑	Explain the applicability of the SAR to LSEs.
Response: Various industry experts estimate that as much as 1/3 of the total Interconnection Frequency Response may be supplied by Load Frequency Response (the other 2/3 is supplied from Turbine Governor Support). Thus information from the LSE concerning the composition and variations of load served within the Interconnection can be critical in understanding total Interconnection Frequency Response. The applicability to LSEs was added at the specific request of commenters in a previous version of the SAR.			
SPP ORWG		☑	A standard can not be imposed on the response of load to frequency. Load Serving Entities can only provide data.
Response: The SAR Drafting Team agrees that the role of the LSE will primarily be to supply data concerning the composition and variations of load served within the Interconnection. There is nothing in the SAR imposing a response requirement on any of the functional entities.			
Hydro Québec TransÉnergie		☑	We question the need to include the applicability to the LSEs in this SAR and requests the drafting team to explain the purpose.
Response: Various industry experts estimate that as much as 1/3 of the total Interconnection Frequency Response may be supplied by Load Frequency Response (the other 2/3 is supplied from Turbine Governor Support). Thus information from the LSE concerning the composition and variations of load served within the Interconnection can be critical in understanding total Interconnection Frequency Response. The applicability to LSEs was added at the specific request of commenters in a previous version of the SAR.			

Question #2			
Commenter	**Yes**	**No**	**Comment**
IESO		☑	For the purpose of data collection, assigning responsibility to the Balancing Authority, Generator Operator and Load-serving Entity would suffice.
Response: Most of the data will be collected from the entities you list. However, the SAR Drafting Team believes the other entities included in the SAR have some of the data that is needed for this standard. For example the Generator Owner might have relevant data that may not be available from the Generator Operator.			
ISO New England		☑	ISO New England does not see a need to include the applicability to the LSEs in this SAR and requests the drafting team to explain this.
Response: Various industry experts estimate that as much as 1/3 of the total Interconnection Frequency Response may be supplied by Load Frequency Response (the other 2/3 is supplied from Turbine Governor Support). Thus information from the LSE concerning the composition and variations of load served within the Interconnection can be critical in understanding total Interconnection Frequency Response. The applicability to LSEs was added at the specific request of commenters in a previous version of the SAR.			
American Transmission Co.		☑	ATC does not see the need to identify the Load Serving Entity in the Applicability section. The SDT should provide an explanation as to the reasoning behind the selection of Load Serving Entities.
Response: Various industry experts estimate that as much as 1/3 of the total Interconnection Frequency Response may be supplied by Load Frequency Response (the other 2/3 is supplied from Turbine Governor Support). Thus information from the LSE concerning the composition and variations of load served within the Interconnection can be critical in understanding total Interconnection Frequency Response. The applicability to LSEs was added at the specific request of commenters in a previous version of the SAR.			
Energy Mark, Inc.	☑	☑	I agree that the proposed list includes those entities that would be affected by a technical standard. However, there are many questions that must be resolved before any standard that affects the Generation Owner, Generation Operator or Load-serving Entity can be implemented. These questions relate to how a performance standard can or should be implemented. If there is no reasonable expectation that they would be included in a future performance standard, it would be unreasonable to implement a technical standard that requires these three functional entities to provide data. In a fair market that allows voluntary participation by Generation Owners, Generation Operators and Load-serving Entities, the direct application of a Frequency Response Performance Standard to these entities is not currently possible without creating unreasonable inequities in the market. Any standard applied directly to one generator but not another will create unreasonble inequities in a market. Since each generation technology has different Frequency Response capabilities, only a solution that provides Frequency Response through a market based mechanism can be fairly implimented in a market. Under these conditions, the measurement methods and data collection for a technical standard should only be applied to those entities that would have resposibilities under a

Question #2			
Commenter	**Yes**	**No**	**Comment**
			performance standard. The correct alternative for collecting data from these entities is to collect it indirectly through the Balancing Authority or Reliability Coordinator that would be directly affected by a performance standard. The inclusion of Generation Owner, Generation Operator, and Load-serving Entity directly in the data collection will lead to the development of data collection systems that will need to be replaced, if and when, a performance standard is developed. This is an inefficient way to develop the technology for a new standard.
Response: The SAR Drafting Team appreciates your input, but disagrees with some of your conclusions. The SAR Drafting team does not see the linkage between requiring data from entities in order to qualify and quantify Frequency Response with the interconnections and NOT including all these entities in a Frequency Response Performance Standard. Available Frequency Response and its distribution within an Interconnection may require that certain generators be treated differently than others due to their location and electrical characteristics. How this difference is compensated is neither within the scope of this SAR nor within NERC's authority. The SAR drafting team agrees with your statement about the data collection being performed in the most efficient manner.			
Salt River Project	☑		Ultimately there may be some impact to the Planning Coordinator and/or Resource Planner if a frequency response requirement is specified. Could there be an extreme scenario where an entity would have to consider shedding load to meet some frequency reserve criteria?
Response: The SAR Drafting Team does not anticipate that the standard resulting from this SAR will contain any requirement for specific Frequency Responses from the Interconnections or the Balancing Authorities. Future standards are beyond the scope of this SAR. The SAR Drafting Team would expect that in any standard (whether dealing with transmission, dynamics or reserves) load shedding only makes sense if the entity cannot withstand the next contingency.			
Xcel Energy Services	☑		To the extent information is needed from these entities, they are appropriate to list. It is possible that the LSE is not required.
Response: Various industry experts estimate that as much as 1/3 of the total Interconnection Frequency Response may be supplied by Load Frequency Response (the other 2/3 is supplied from Turbine Governor Support). Thus information from the LSE concerning the composition and variations of load served within the Interconnection can be critical in understanding total Interconnection Frequency Response. The applicability to LSEs was added at the specific request of commenters in a previous version of the SAR.			
American Electric Power	☑		The role of the load serving entity in item 6b is unclear.
Response: Various industry experts estimate that as much as 1/3 of the total Interconnection Frequency Response may be supplied by Load Frequency Response (the other 2/3 is supplied from Turbine Governor Support). Thus information from the			

Question #2			
Commenter	**Yes**	**No**	**Comment**
LSE concerning the composition and variations of load served within the Interconnection can be critical in understanding total Interconnection Frequency Response. The applicability to LSEs was added at the specific request of commenters in a previous version of the SAR.			
ERCOT	☑		
CAISO	☑		
Bonneville Power Administration	☑		
KCP&L	☑		
Manitoba Hydro	☑		
MidAmerican Energy Co.	☑		
MISO	☑		
NRG Texas	☑		
NYISO	☑		
Southern	☑		
ITC Transco	☑		

3. The SAR drafting team modified the SAR to clarify that data will be collected to model up to 5 minutes of frequency response. This should help identify the window of time where frequency response appears to be masked by AGC action. Do you agree with this clarification?

Summary Consideration:

Most comments agreed that the clarification helped to identify the window of time when frequency response appears to be masked by AGC action. Several commenters requested more specific information on the sample rates and the specific data that would be collected. The SAR Drafting Team explained that this type of information will be developed in the standard development process and not captured in the SAR. The SAR drafting team agreed to forward these comments to the Director of Standards Development so that they can be addressed by the Frequency Response Standard Drafting Team.

Question #3			
Commenter	**Yes**	**No**	**Comment**
SWPA		☑	Need more specific information regarding sample rates. The 5-minutes of frequency response should identify time periods prior to and after the event.
Response: The SAR Drafting Team agrees with the comment. Specific information, such as sampling rate and specific data requirements, will be developed in the standard development process and not captured in the SAR. The five minute period was proposed based on comments to a prior version of the SAR. Some commenters were concerned that governors were withdrawing response shortly after the initial excursion. The SAR drafting team will forward these comments to the Director of Standards so that they can be addressed by the Frequency Response Standard Drafting Team. We expect the data sampling rate to be on existing SCADA periodicity.			
SPP ORWG		☑	The 5 minute time is adequate, but it lacks substance. Small changes in load and generation due to frequency response are very difficult to separate from normal load changes and AGC action on generation units (as was pointed out). It is important to include in the description of data collection that the 5 minutes should include 1 minute of data prior to a study event and 4 minutes after a study event. It is also important to include a sample rate, such as 4 seconds (obviously, faster samples are better, but may not be practical). The SAR, as written, lacks specifics on what data is required to perform a valid study. Some examples of necessary data may include, but are not limited to, AGC pulses, special protection systems, generator MW, tie line MW, frequency, etc.
Response: The SAR Drafting Team agrees with the comment. Specific information, such as sampling rate and specific data requirements, will be developed in the standard development process and not captured in the SAR. The five minute period was proposed based on comments to a prior version of the SAR. Some commenters were concerned that governors were withdrawing response shortly after the initial excursion. The SAR drafting team will forward these comments to the Director of Standards so that they can be addressed by the Frequency Response Drafting Team. We expect the data sampling rate to			

Question #3			
Commenter	**Yes**	**No**	**Comment**
be on existing SCADA periodicity.			
Xcel Energy Services		☑	Further clarification is needed around the time period for which data will be collected. It important to note that description of the 5 minutes data collection period should include 1 minute before and 4 minutes after the event.
Response: In response to your first comment, the SAR Drafting Team agrees with the comment. Specific information, such as sampling rate and specific data requirements, will be developed in the standard development process and not captured in the SAR. The five minute period was proposed based on comments to a prior version of the SAR. Some commenters were concerned that governors were withdrawing response shortly after the initial excursion. The SAR drafting team will forward these comments to the Director of Standards so that they can be addressed by the Frequency Response Standard Drafting Team. We expect the data sampling rate to be on existing SCADA periodicity. In response to your second comment, the SAR Drafting team agrees that data is required both before and after the contingency to be analyzed.			
ITC Transco		☑	Five minutes of data seems arbitrary. If the collection period were extended to 15 minutes, it would coincide with the Disturbance Control period.
Response: Thank you for your comment. The SAR Drafting Team agrees with the comment. Specific information, such as sampling rate and specific data requirements, will be developed in the standard development process and not in the SAR. The five minute period was proposed based on comments to a prior version of the SAR. Some commenters were concerned that governors were withdrawing response shortly after the initial excursion. The SAR drafting team will forward these comments to the Director of Standards so that they can be addressed by the Frequency Response Drafting Team. We expect the data sampling rate to be on existing SCADA periodicity.			
PJM		☑	As noted above PJM does not consider collecting data in order to decide what a requirement should be as grounds for a standard. Thus the sampling period which is outside of a NERC standard, can be defined in whatever way the group doing the sampling desires.
Response: Specific information, such as sampling rate and specific data requirements, will be developed in the standard development process and not captured in the SAR. The five minute period was proposed based on comments to a prior version of the SAR.			
NYSRC		☑	It is not clear what type of data is going to be collected from this requirement. AGC response is continuous. What is the justification for the specific "five minutes" reffered to? Since AGC control is every 4 seconds, five minutes appears to be too long a period to collect this data. Imposing this requirement will require the installation of local data storage retention facilities & telemetering equipment that may not be necessary.
Response: The SAR Drafting Team agrees with the comment. Specific information, such as sampling rate and specific data requirements, will be developed in the standard development process and not captured in the SAR. The five minute period was proposed based on comments to a prior version of the SAR. Some commenters were concerned that governors were			

Question #3			
Commenter	**Yes**	**No**	**Comment**
withdrawing response shortly after the initial excursion. The SAR drafting team will forward these comments to the Director of Standards so that they can be addressed by the Frequency Response Standard Drafting Team. We expect the data sampling rate to be on existing SCADA periodicity.			
NPCC CP9		☑	It is not clear what type of data is going to be collected from this requirement. AGC response is continuous. What is the justification for the specific "five minutes" referred to? Since AGC control is every 4 seconds, five minutes appears to be too long a period to collect this data. Imposing this requirement will require the installation of local data storage retention facilities & telemetering equipment that may not be necessary and NPCC participating members would like the drafting team to explain why 5 minutes is necessary. Also, when requesting data from a generator what is expected scan-rate/exception reporting clarity of the data?
Response: The SAR Drafting Team agrees with the comment. Specific information, such as sampling rate and specific data requirements, will be developed in the standard development process and not in the SAR. The five minute period was proposed based on comments to a prior version of the SAR. Some commenters were concerned that governors were withdrawing response shortly after the initial excursion. The SAR drafting team will forward these comments to the Director of Standards so that they can be addressed by the Frequency Response Standard Drafting Team. We expect the data sampling rate to be on existing SCADA periodicity.			
KCP&L		☑	The 5 minute time is adequate, but it lacks substance. Small changes in load and generation due to frequency response are very difficult to separate from normal load changes and AGC action on generation units (as was pointed out). It is important to include in the description of data collection that the 5 minutes should include 1 minute of data prior to a study event and 4 minutes after a study event. It is also important to include a sample rate, such as 4 seconds (obviously, faster samples are better, but may not be practical).
Response: The SAR Drafting Team agrees with the comment. Specific information, such as sampling rate and specific data requirements, will be developed in the standard development process and not captured in the SAR. The five minute period was proposed based on comments to a prior version of the SAR. Some commenters were concerned that governors were withdrawing response shortly after the initial excursion. The SAR drafting team will forward these comments to the Director of Standards so that they can be addressed by the Frequency Response Standard Drafting Team. We expect the data sampling rate to be on existing SCADA periodicity.			
Energy Mark, Inc.	☑	☑	I agree with the concept of measuring Frequency Response for an extended period after a disturbance, but I do not agree that the reason is related to masking by AGC action. If the Frequency Bias for a Balancing Authority is set to a value that approximates the actual Frequency Response, the AGC action will always provide the correct response for

Question #3			
Commenter	**Yes**	**No**	**Comment**
			reliable interconnection performance. The Frequency Response should be measured for an extended period after a disturbance to identify entities that are prematurely withdrawing their expected frequency response support from the interconnection. This has been demonstrated for entities that have outer loop control that only includes scheduled deliveries without adjustment for frequency response.
Response: The SAR Drafting Team agrees with the comment. Specific information, such as sampling rate and specific data requirements, will be developed in the standard development process and not captured in the SAR. The five minute period was proposed based on comments to a prior version of the SAR. Some commenters were concerned that governors were withdrawing response shortly after the initial excursion. The SAR drafting team will forward these comments to the Director of Standards so that they can be addressed by the Frequency Response Standard Drafting Team. We expect the data sampling rate to be on existing SCADA periodicity.			
Hydro Québec TransÉnergie	☑	☑	We requests clarification as to what data and at what periodicity will be collected from the identified entities.
Response: The SAR Drafting Team agrees with the comment. Specific information, such as sampling rate and specific data requirements, will be developed in the standard development process and not captured in the SAR. The five minute period was proposed based on comments to a prior version of the SAR. Some commenters were concerned that governors were withdrawing response shortly after the initial excursion. The SAR drafting team will forward these comments to the Director of Standards so that they can be addressed by the Frequency Response Standard Drafting Team. We expect the data sampling rate to be on existing SCADA periodicity.			
ISO New England	☑	☑	ISO New England requests clarification as to what data and at what periodicity will be collected.
Response: The SAR Drafting Team agrees with the comment. Specific information, such as sampling rate and specific data requirements, will be developed in the standard development process and not captured in the SAR. The five minute period was proposed based on comments to a prior version of the SAR. Some commenters were concerned that governors were withdrawing response shortly after the initial excursion. The SAR drafting team will forward these comments to the Director of Standards so that they can be addressed by the Frequency Response Standard Drafting Team. We expect the data sampling rate to be on existing SCADA periodicity.			
MISO	☑	☑	Five minutes is acceptable. There may be merit in collecting 15 minutes of data to cover the DCS window. The data should be readily available since the BAs are already examining this data to determine their compliance with the DCS standard. The final decision can be made during the standards drafting phase.
Response: The SAR Drafting Team agrees with the comment. Specific information, such as sampling rate and specific data requirements, will be developed in the standard development process and not captured in the SAR. The five minute period was proposed based on comments to a prior version of the SAR. Some commenters were concerned that governors were withdrawing response shortly after the initial excursion. The SAR drafting team will forward these comments to the Director of Standards so that they can be addressed by the Frequency Response Standard Drafting Team. We expect the data			

Question #3			
Commenter	**Yes**	**No**	**Comment**
sampling rate to be on existing SCADA periodicity.			
NYISO	☑	☑	It is not clear what type of data is going to be collected from this requirement. AGC response is continuous. What is the justification for the specific "five minutes" reffered to? Since AGC control is every 4 seconds, five minutes appears to be too long a period to collect this data. Imposing this requirement will require the installation of local data storage retention facilities & telemetering equipment that may not be necessary and NPCC participating members would like the drafting team to explain why 5 minutes is necessary. Also, when requesting data from a generator what is expected scan-rate/exception reporting clarity of the data?
Response: The SAR Drafting Team agrees with the comment. Specific information, such as sampling rate and specific data requirements, will be developed in the standard development process and not captured in the SAR. The five minute period was proposed based on comments to a prior version of the SAR. Some commenters were concerned that governors were withdrawing response shortly after the initial excursion. The SAR drafting team will forward these comments to the Director of Standards so that they can be addressed by the Frequency Response Standard Drafting Team. We expect the data sampling rate to be on existing SCADA periodicity.			
ERCOT	☑		This time frame should be sufficient for determination of frequency response. If it is intended that this data should also be useful for evaluating generating unit governor functioning, a longer time may be appropriate.
Response: The SAR Drafting Team agrees with the comment. Specific information, such as sampling rate and specific data requirements, will be developed in the standard development process and not captured in the SAR. The five minute period was proposed based on comments to a prior version of the SAR. Some commenters were concerned that governors were withdrawing response shortly after the initial excursion. The SAR drafting team will forward these comments to the Director of Standards so that they can be addressed by the Frequency Response Standard Drafting Team. We expect the data sampling rate to be on existing SCADA periodicity.			
Manitoba Hydro	☑		Ten minutes might be more useful, especially in any areas where it appears to take a long time to settle down after a frequency deviation event. This could be left up to the discretion of operators and balancing authorities in any areas where slow or bumpy returns to normal frequency levels are experienced.
Response: The SAR Drafting Team agrees with the comment. Specific information, such as sampling rate and specific data requirements, will be developed in the standard development process and not in the SAR. The five minute period was proposed based on comments to a prior version of the SAR. Some commenters were concerned that governors were withdrawing response shortly after the initial excursion. The SAR drafting team will forward these comments to the Director of Standards Development so that they can be addressed by the Frequency Response Drafting Team. We expect the data sampling rate to be on existing SCADA periodicity.			

Question #3			
Commenter	**Yes**	**No**	**Comment**
Salt River Project	☑		
Southern	☑		
NRG Texas	☑		
MidAmerican Energy Co.	☑		
IESO	☑		
Bonneville Power Administration	☑		
CAISO	☑		
American Electric Power	☑		

4. Should a field trial be initiated, whereby a set of events for each Interconnection is posted throughout the year, to be used by BAs to calculate their 2007 Frequency Response?

Summary Consideration:

Most commenters indicated that a field trial should be initiated whereby a set of events for each Interconnection is posted throughout the year, to be used by Bias to calculate their 2007 Frequency Response.

Question #4			
Commenter	**Yes**	**No**	**Comment**
Manitoba Hydro			Only if field trials are deemed to have very high probability of not causing significant difficulties on overly sensitive network area.
Response: The SAR Drafting Team agrees that no field trial should adversely impact the reliability of the Bulk Power System.			
MidAmerican Energy Co.		☑	This is not a new concept. I support institution of the standard as written so a start can be made to identify and, with luck, remediate the decline in frequency response.
Response: Thank you for your support.			
Bonneville Power Administration		☑	BPA does not believe a field trial is needed for this standard. The standard should be written and implemented with the levels of noncompliance structured around data submittal.
Response: Thank you for your support.			
PJM		☑	There are field trials for standards (which this question is directed) and there are field trials for good ideas. This proposed SAR would seem to fall into the second category; and while posting events is interesting, it does not rate being a NERC standard. Collecting and posting data can be effected without a standard.
Response: Thank you for your comment.			
NYSRC		☑	
Energy Mark, Inc.	☑	☑	This would be a good way to insure that every entity select a similar set of events for calculation of their Frequency Response, but it will not insure conformity of the results. The difficulty with any method for selecting a common set of events is that each of those events is caused by a disturbance within one or more of the Balancing Authorities on the interconnection. Those entities that cause the disturbance will experience a different frequency response than those entities that are responding. The net effect is that the sum of the responses for all of the entities on the interconnection must sum to zero. This means that each entity must eliminate those disturbances for which they are the cause, from the set of disturbances they use to estimate their response. The real advantage is an entity cannot influence the results of the measurement through selection of the events they choose to include in the calculation.

Question #4			
Commenter	**Yes**	**No**	**Comment**
Response: Thank you for your comment. The SAR drafting team will forward these comments to the Director of Standards so that they can be addressed by the Frequency Response Standard Drafting Team.			
MISO	☑		This should not be a problem as BAs should already be performing this calculation in the annual determination of their frequency bias.
Response: Thank you for your comment.			
NRG Texas	☑		A field trial may indicate the need for more or different data for the proper calculation of a BAs Frequency Response.
Response: Thank you for your comment.			
ERCOT	☑		A field trial would be beneficial to ensure that no gaps in the need for data exist. This could relate to whether other data is needed or whether data for a longer time is needed.
Response: Thank you for your comment.			
IESO	☑		A field test is a must and would definitely provide useful information on the types of event that would necessiate such data collection (The threshold needs to be clarified though - e.g. should it be >10MW loss of generator or some other threshold?), and any specific areas that need to be worked on in order to ensure that all relevant and required data is collected.
Response: Thank you for your comment. The SAR Drafting Team agrees with the comment. Specific information, such as sampling rate and specific data requirements, will be developed in the standard development process and not in the SAR. The SAR drafting team will forward these comments to the Director of Standards so that they can be addressed by the Frequency Response Standard Drafting Team. We expect the data sampling rate to be on existing SCADA periodicity.			
Southern	☑		Currently BAs in the Eastern Interconnection have little, if any, way to actually calculate their frequency responses. As a result, most default to the one percent minimum. A good database of disturbance events will provide the information to calculate BA frequency response more accurately while at the same time allowing the NERC OC/RS to determine if the one percent minimum is appropriate in the EI today.
Response: Thank you for your comment.			
Hydro Québec TransÉnergie	☑		
CAISO	☑		
ISO New England	☑		
KCP&L	☑		
NPCC CP9	☑		

Question #4			
Commenter	**Yes**	**No**	**Comment**
NYISO	☑		
SPP ORWG	☑		
Salt River Project	☑		
Xcel Energy Services	☑		
American Electric Power	☑		
ITC Transco	☑		
SWPA	☑		

5. Please provide any other comments (that you have not already provided in response to the first three questions on this form) that you have on the revised SAR.

Question #5	
Commenter	**Comment**
Bonneville Power Administration	BPA agrees with the necessity of a frequency response standard. BPA highly encourages that this effort be implemented as soon as possible.
Response: Thank you for your support.	
Constellation	Specific to the Requirement 6 a which states: Each Generator Operator that operates a generator larger than [10 MW]*, shall provide data to its Balancing Authority, as required in item 6, to support this standard and for use in developing models of Frequency Response in the associated Interconnection. Balancing Authorities may seek Speed Droop characteristics for our generators. Speed Droop is a design characteristic of the steam turbine (or the prime mover's governor response in the case of a combustion turbine or diesel) . Our concern is the only data we may be able to provide would be turbine manufacturer design data. For our older units where turbine control systems have been retrofitted and upgraded with more modern controls, we may not really know the speed droop characteristic of the unit. Collecting performance data to demonstrate the speed droop is extremely difficult if not impossible on a large unit. (Requires the grid connection frequency be allowed to "droop" as the generator is loaded). Hence, as now written, Constellation Generation is not clear how we could comply.
Response: The SAR Drafting Team anticipates that Frequency Response information will be collected directly from measured quantities on the grid or the generator bus. We do not anticipate using design curves or other archival data.	
Energy Mark, Inc.	One of my concerns is a majority of entities in NERC must agree that there is a need for a standard before the standard process moves forward. This could have undesirable long-term results with respect to the quality of the standards that are developed. This standard provides a good example of this problem. From what I have observed, both the Texas and Western Interconnections have concluded that there is a reliability need for a Frequency Response Standard on their interconnections. Unfortunately, reasonable opposition from the Eastern Interconnection will prevent the development of a common standard for those two interconnections. The only alternative will be for the Texas and Western Interconnections to each develop their own standards for Frequency Response without considering ways of making those two standards similar to each other. If the Eastern Interconnection, after a few years, finds that it needs a Frequency Response Standard, it will then become necessary for a new standard to be developed that applies to all three interconnections.

Question #5	
Commenter	**Comment**
	If each interconnection has a different Frequency Response Standard, it means there is no standard at all, but three different rules for NERC. The next logical step is to develop a common standard for all three interconnections requiring the first two standards developed by the Texas and Western Interconnections separately be modified to conform to a North American Standard on Frequency Response. Combining these three separate needs into a single standard will result in a natural opposition to change by those interconnections that have already implemented an interconnection standard that meets their individual needs. This will make it very difficult to gain the support necessary to enact a common standard for NERC. This multi-step development can only be avoided by having all three interconnections participate and contribute to standards identified and developed by individual interconnections. I believe that NERC needs to find a way to address this problem. If they do not, the standard development and approval process will lead to fractured standards and an unacceptable fractured standard process for NERC. One alternative might be to find a way for all interconnections to participate in the solution of individual interconnection problems as part of the standard development process.
Response: Thank you for your comment. We believe the Standards Development Procedure provides the solution you are seeking. The proposed SAR sets the foundation for a technical standard for a common way to measure and evaluate frequency response. Should a Region or Interconnection determine they need a more stringent, performance-based standard, there is a means to pursue a difference.	
Hydro Québec TransÉnergie	Being a single Balancing Authority Interconnection, there might be a need for a «regional» difference for the Québec Interconnection when specific value will be established. Same as ERCOT, frequency response will be based on the change in generation (or load) rather than Tie-Line deviation.
Response: We agree with this comment. The SAR Drafting Team anticipates that specific regional differences will be addressed in the Standard and not in the SAR.	
IESO	While we felt that the previous SAR was unclear on the intent, this SAR has such a reduced scope that the intended task does not require a reliability standard to achieve . A task team charged by a standing committee (the OC), would suffice. The requirements proposed in the SAR can be set as conditions for completing the data collection effort by the task team.
Response: The SAR Drafting Team disagrees and believes that the scale of this project, the ongoing nature, and the potential importance of the conclusions to be developed per the specifications in Paragraphs 5 and 6 are sufficiently important to warrant the use of the NERC Reliability Standards Process.	
KCP&L	The reasoning for this technical standard is based on the perception that the frequency response of the electrical system is declining and a concern that the interconnect's ability to arrest significant system disturbances is slowly being compromised. Although it is not disagreeable that a study be conducted to determine if an actual decline in frequency response is occuring and then to determine cause, it is diagreeable to propose a potential remedy for a problem that may not exist or, dependent on the findings, in inappropriate remedy.

Question #5	
Commenter	**Comment**
	One reason a decline in frequency response may be perceived occuring is a result of more on-line generating units being fully loaded. That means when a frequency decline occurs there are less units able to respond because they are already loaded. That does not mean the interconnection is at risk. As long as Balancing Authorities are maintaining their reserve obligations, even large contingencies should be manageable. However, over the years because of the trend to get more out of invested generation resources, it would give the appearance of a decline in frequency response since most frequency degradations are a result of losses of generation and a resultant decline in system frequency and those are what is studied and scrutinized. The August 14, 2003 disturbance was an opportunity to study the frequency response of all on-line generating units due to the frequency event resulting in a high frequency. High frequency is the only event where all on-line generating units will respond. Proposing the establishment of a Target Frequency Response for the interconnect before concluding if an actual decline in frequency response is occuring and the subsequent cause(s) for the decline is finding a solution before defining the problem. Any standards involving frequency response needs to also consider the role system reserves play in the interconnect as well as the frequency response of generators and system load to frequency. As long as generating reserve obligations are being met to meet current Reliability Standards and Regional Operating Criteria there may not be a need to go further dependent on the outcome of the study proposed by this SAR.
Response: The SAR Drafting Team agrees with you speculations, but strongly believes that actual field data must be collected and analyzed to determine the specific processes impacting Frequency Response. It may well be that no further action will be required, but that is beyond the scope of this SAR.	
MidAmerican Energy Co.	I have concern about the "shall"s in the standard, in that there is no apparent enforcement behind the requirements for data submittals. If I'm wrong in this, then I would be comfortable with the effectiveness possible. If I'm right, what is to be done with an entity which finds it convenient not to report?
Response: The SAR Drafting Team anticipates that the Standard that evolves from this SAR will have measures for such things as failure to report and other practical details.	
NRG Texas	Frequency Response of Resources is vital to the reliability of an interconnection. Large differences between the measured Frequency Response of a BA, its Bias setting and the models of Frequency Response may indicate a reliability risk. Updating the models with accurate Frequency Response data will improve the evaluation of this reliability risk. Please implement this process as soon as possible.
Response: The SAR Drafting Team agrees and thanks you for your support.	
NYSRC	The results of the data collection efforts should be used to develop a standard governing frequency response.

Question #5	
Commenter	**Comment**
Response: The SAR Drafting Team agrees and thanks you for your support.	
Southern	This SAR starts the process toward understanding frequency behavior, particularly in the Eastern Interconnection. In our opinion this is a necessary first step in determining whether we need frequency response allocations or other measures to ensure the sustained frequency performance that is required for reliable operations. Wherever possible, the scope and extent of data collection required for generators, their dynamic models including all associated control devices, and any other system data parameters covered under this SAR be limited such that it should not duplicate or exceed system modeling data requirements of any other NERC standard. One important system modeling parameter not emphasized in this SAR is the characteristic behavior of load at each substation (constant power, constant current, etc.), which would seem to have a significant effect on overall frequency response of the interconnected system. It is quite possible that advancements in consumer appliances and electronics, and their proliferation of use, have collectively changed the overall characteristics of system load to a composite state that is significantly different from modeling assumptions made within the previous few years.
Response: The SAR Drafting Team agrees and thanks you for your support.	
SPP ORWG	The reasoning for this technical standard is based on the perception that the frequency response of the electrical system is declining and a concern that the interconnect's ability to arrest significant system disturbances is slowly being compromised. Although it is not disagreeable that a study be conducted to determine if an actual decline in frequency response is occuring and then to determine cause, it is diagreeable to propose a potential remedy for a problem that may not exist or, dependent on the findings, in inappropriate remedy. Types of generating units online (e.g., wind generation, combined cycle, etc) and their subsequent loading will have an influence on the frequency response of the system. As long as Balancing Authorities are maintaining their reserve obligations, even large contingencies should be manageable. However, over the years because of the trend to get more out of invested generation resources, it would give the appearance of a decline in frequency response since most frequency degradations are a result of losses of generation and a resultant decline in system frequency and those are what is studied and scrutinized. The August 14, 2003 disturbance was an opportunity to study the frequency response of all on-line generating units due to the frequency event resulting in a high frequency. High frequency is the only event where all on-line generating units will respond. Proposing the establishment of a Target Frequency Response for the interconnect before concluding if an actual decline in frequency response is occuring and the cause(s) for the decline is finding a solution before defining the problem. Any standards involving frequency response need to also

Question #5	
Commenter	**Comment**
	consider the role system reserves play in the interconnect as well as the frequency response of generators and system load to frequency. As long as generating reserve obligations are being met in accordance with current Reliability Standards and Regional Operating Criteria there may not be a need to go further dependent on the outcome of the study proposed by this SAR.
Response: The SAR Drafting Team disagrees and believes that a fundamental understanding of frequency response in each of the Interconnections is necessary to ensure reliability of the Bulk Power System. This is particularly important as new, untested technologies are integrated into the Bulk Power System with potentially unanticipated outcomes. Although no follow up Standards may be required after the Frequency Response Standard is developed, there is a potential risk to Interconnection reliability unless we do implement this SAR and Standard and develop a firm understanding of specifically how Frequency Response operates. It appears that there is a misunderstanding of the Target Frequency Response in that this does not set a minimum for any particular Balancing Authority. The Target Frequency Response sets a benchmark, beyond which additional data is needed from the Balancing Authority.	
Salt River Project	The SAR includes some requirement language pertaining to generators greater than 10 MW. Old NERC Policy included language requiring frequency responsive governors "unless restricted by regulatory mandates". This makes sense for most nuclear facilities. Another type of restriction on governors involves small hydro units that are dependent on water order. For this type of unit there truly is no governor response yet the unit capabilities may exceed 10 MWs. Please consider these types of exemptions as work progresses on this SAR and resulting standard.
Response: Your comments are good and will be provided to the Standard Drafting Team as it wrestles with the specific details of this project. The SAR does not propose to set a mandatory level of governor response for each generator. The proposed standard requires data and an identification of which generators are not providing response should the Balancing Authority be below the Target Response.	
Xcel Energy Services	Establishing a Target Frequency Response is premature. It advances a proposed remedy in advance of first meeting the intent of the SAR-determining the cause for the percieved decline in frequency response. It is our view that the percieved decline of frequency response, if that turns out to be the confirmed as a true decline, of itself does not necessarily indicate an significantly increased threat to reliability. As long as generating reserve obligations are being met to meet Reliability Standards and the real time regulating reserves are being carried, also to meet Standards, there may not be a need to go further depending on the outcome of the study proposed by the SAR.
Response: The SAR Drafting Team does not anticipate that a Target Frequency Response will be developed until such time that it can be technically supported as required by the NERC Reliability Standards Process.	
PJM	PJM would also note that the proposal references two distinct parameters - the Natural response of a BA; and the natural response of a unit. It is not clear how the requestor intends to link the two parameters. The sum of the units' natural responses will not equal the natural response of the BA.

Question #5	
Commenter	**Comment**
	Does the requestor intend to link the two, or to keep them separate? As written it appears that the requestor intends for the BA to be held responsible for an annual measured value. The SAR DT does not recognize that during different times there are different number of units opperating and available to respond. The SAR DT makes no mention of whether or not a BA(?) would have to shed load to maintain such frequency response (for those periods when all units are at full load). The SAR DT makes no mention of distance from an event. An event in NE will effect more response in NE then in Florida - how will that be addressed? PJM would ask for clarification on what the requestor would intend to mandate. FERC has recognized the need to include suppliers that use load control - how does this SAR intend to address such 'natural response suppliers'? As written this proposal becomes an ambiguous standard as it obligates a BA to get data from a generator (as opposed to directly obligating generators to supply the data to the analysis team - this is important from the perspective of who would be non-compliant if the data were not supplied - the BA or the GO?). PJM would suggest that NERC create a Frequency Project, budget the project through its members rather then create a standard and risk imposing non-compliance penalities for what potentially could be a non-issue. Deal with this for what it is - a research activity.
Response: The SAR Drafting Team appreciates your thoughtful comments but does not agree with your conclusions. Many of the details you are concerned about will be worked out as part of the details addressed by the Standards Drafting Team. The SAR Drafting Team does not anticipate that this SAR will mandate any specific frequency response. The stated purpose of this SAR is to collect and analyze data in order to determine the Frequency Response for each Interconnection, recommend a target Frequency Response for each Interconnection and determine the cause of any significant variations in Frequency Response within each of the Interconnections. In response to your suggestion to create a Frequency Project, the NERC Standards Development Procedure Manual allows for the development of SAR/Standard to collect and analyze data as needed to ensure the reliability of Interconnections.	
SWPA	Data collection and FRC assessments should also take into account loss of load, not just loss of generation. If load is lost, causing a high frequency excursion, FRC should be observed on heavily loaded generators.
Response: You are correct; however the collection of statistically significant load loss data has proven to be very difficult, if not impossible, in the past. The SAR Drafting Team will forward your comments to the Director of Standards so that they can be addressed by the Frequency Response Standard Drafting Team.	

NERC
NORTH AMERICAN ELECTRIC RELIABILITY CORPORATION

Standard Authorization Request Form

Title of Proposed Standard	Frequency Response
Request Date	11/25/06
Revised Date	06/30/07

SAR Requestor Information		**SAR Type** (Put an 'x' in front of one of these selections)	
Name	Terry Bilke	x	New Standard
Primary Contact	Terry Bilke	☐	Revision to existing Standard
Telephone	(317) 249-5463	☐	Withdrawal of existing Standard
Fax	(317) 249-5994		
E-mail	tbilke@midwestiso.org	☐	Urgent Action

Purpose/Industry Need

Frequency Response, a measure of an Interconnection's ability to stabilize frequency immediately following the sudden loss of generation or load, is a critical component to the reliable operation of the bulk power system, particularly during disturbances and restoration. The proposed standard's intent is to collect data needed to accurately model existing Frequency Response. There is evidence of continuing decline in Frequency Response in the three Interconnections over the past 10 years, but no confirmed reason for the apparent decline. The proposed standard requires entities to provide data so that Frequency Response in each of the Interconnections can be modeled, and the reasons for the decline in Frequency Response can be identified. Once the reasons for the decline in Frequency Response are confirmed, requirements can be written to control Frequency Response to within defined reliability parameters.

Reliability Functions

The Standard will Apply to the Following Functions *(Check box for each one that applies by double clicking the grey boxes.)*		
☒	Reliability Authority	Responsible for the real-time operating reliability of its Reliability Coordinator Area in coordination with its neighboring Reliability Coordinator's wide area view.
☒	Balancing Authority	Integrates resource plans ahead of time, and maintains load-interchange-resource balance within a Balancing Authority Area and supports interconnection frequency in real time
☐	Interchange Authority	Ensures communication of interchange transactions for reliability evaluation purposes and coordinates implementation valid and balanced Interchange Schedules between Balancing Authority Areas.
☐	Planning Coordinator	Assesses the longer-term reliability of its Planning Coordinator Area.
☐	Resource Planner	Develops a >1year plan for the resource adequacy of its specific loads within a Planning Authority area.
☐	Transmission Planner	Develops a >1 year plan for the reliability of the interconnected Bulk Electric System within its portion of the Planning Coordinator Area.
☐	Transmission Service Provider	Administers the transmission tariff and provides transmission services under applicable transmission service agreements (e.g., the pro forma tariff).
☐	Transmission Owner	Owns and maintains transmission facilities
☐	Transmission Operator	Ensures the real-time operating reliability of the transmission assets within a Transmission Operator Area.
☐	Distribution Provider	Delivers electrical energy to the End-use customer.
☒	Generator Owner	Owns and maintains generation facilities.
☒	Generator Operator	Operates generation unit(s) to provide real and reactive power.
☐	Purchasing-Selling Entity	Purchases or sells energy, capacity and necessary reliability-related services as required.
☐	Market Operator	Interface point for reliability functions with commercial functions.
☒	Load-Serving Entity	Secures energy and transmission service (and reliability-related services) to serve the End-use Customer.

Reliability and Market Interface Principles

Applicable Reliability Principles *(Check boxes for all that apply by double clicking the grey boxes.)*	
☒	1. Interconnected bulk electric systems shall be planned and operated in a coordinated manner to perform reliably under normal and abnormal conditions as defined in the NERC Standards.
☒	2. The frequency and voltage of interconnected bulk electric systems shall be controlled within defined limits through the balancing of real and reactive power supply and demand.
☒	3. Information necessary for the planning and operation of interconnected bulk electric systems shall be made available to those entities responsible for planning and operating the systems reliably.
☐	4. Plans for emergency operation and system restoration of interconnected bulk electric systems shall be developed, coordinated, maintained and implemented.
☒	5. Facilities for communication, monitoring and control shall be provided, used and maintained for the reliability of interconnected bulk electric systems.
☒	6. Personnel responsible for planning and operating interconnected bulk electric systems shall be trained, qualified and have the responsibility and authority to implement actions.
☒	7. The security of the interconnected bulk electric systems shall be assessed, monitored and maintained on a wide area basis.
☐	8. Bulk power systems shall be protected from malicious physical or cyber attacks.

Does the proposed Standard comply with all of the following Market Interface Principles? *(Select 'yes' or 'no' from the drop-down box by double clicking the grey area.)*
1. The planning and operation of bulk electric systems shall recognize that reliability is an essential requirement of a robust North American economy. Yes
2. An Organization Standard shall not give any market participant an unfair competitive advantage.Yes
3. An Organization Standard shall neither mandate nor prohibit any specific market structure. Yes
4. An Organization Standard shall not preclude market solutions to achieving compliance with that Standard. Yes
5. An Organization Standard shall not require the public disclosure of commercially sensitive information. All market participants shall have equal opportunity to access commercially non-sensitive information that is required for compliance with reliability standards. Yes

Detailed Description (Provide enough detail so that an independent entity familiar with the industry could draft, modify, or withdraw a Standard based on this description.)

The proposed technical/preparedness standard will require or provide the following:

1. Each Balancing Authority shall collect and provide data [scan rate tie deviation and frequency for up to 5* minutes per event] needed to model its sub-minute Frequency Response to loss of large generating units and load.

2. Each Balancing Authority shall report each loss of generation or load greater than the respective Interconnection reporting threshold to its Reliability Coordinator.

3. Each Reliability Coordinator will relay Frequency Response Standard (FRS) event information to other Reliability Coordinators in its Interconnection. The Interconnection Time Monitor will maintain a log of FRS events.

4. NERC will annually post a list of FRS events. These events will be used by Balancing Authorities to calculate and report their annual Frequency Response and Bias.

5. NERC, in conjunction with the respective Regions, will establish a Target Frequency Response for each Interconnection. Absent an agreement, the observed Frequency Response in the first year of the FRS will be used as a target.

6. Balancing Authorities with less than [75%]* of their share of Target Frequency Response shall provide generation-level data to their Region for use by Transmission Planners and Planning Coordinators.

    a. Each Generator Operator that operates a generator larger than [10 MW]*, shall provide data to its Balancing Authority, as required in item 6, to support this standard and for use in developing models of Frequency Response in the associated Interconnection.

    b. Load Serving Entities shall provide data, as required in item 6, to their BA and Region to support the standard.

*These values are representative and will be refined based on stakeholder input during the standard drafting phase.

Related Standards

Standard No.	Explanation
BAL-001-0 through BAL-006-0	Balancing Standards, version 0
Balance Resources and Demand draft standards	Balancing Resources and Demand BAL-007 through BAL-012 draft standards, are in standards development process

Related SARs

SAR ID	Explanation
Frequency Response SAR, version 0	Original Frequency Response SAR
MOD-027	Verification and Status of Generator Frequency Response. The proposed standard would provide a mechanism to validate compliance with MOD-027. The proposed standard could also provide a means to achieve MOD-027 (if the Balancing Authority implements on on-line measurement of generator frequency using SCADA data).

Regional Variances

Region	Explanation
ECAR	
ERCOT	Single Balancing Authority Interconnections calculate Frequency Response based on the change in generation (or load) rather than Tie-Line deviation (ERCOT).
FRCC	
MAAC	
MAIN	
MAPP	
NPCC	
SERC	
SPP	
WECC	

Related NERC Operating Policies or Planning Standards

ID	Explanation
MOD-013-0	The proposed standard would enable better input data to the modeling standards.

Maureen E. Long
Standards Process Manager

NERC
NORTH AMERICAN ELECTRIC RELIABILITY CORPORATION

July 17, 2007

TO: REGISTERED BALLOT BODY

Ladies and Gentlemen:

Announcement: Nomination Periods Open for Five New Drafting Teams

The Standards Committee announces the following standards actions:

Project 2007-04 — Certifying System Operators SAR Drafting Team (July 17–30, 2007)

The Standards Committee is seeking industry experts to serve on the Certifying System Operators SAR Drafting Team. The drafting team will work on the modification of the following standard:

PER-003 — Operating Personnel Credentials

If you are interested in serving on this SAR drafting team, please complete this nomination form and return it to sarcomm@nerc.net by July 30, 2007 with "SO Certification SAR DT" in the subject line. For questions, please contact Linda Clarke at 610-310-7210 or linclrke@msn.com.

Project 2007-05 — Balancing Authority Controls SAR Drafting Team (July 17–30, 2007)

The Standards Committee is seeking industry experts to serve on the Balancing Authority Controls SAR Drafting Team. The drafting team will work on modifications to the following standards:

- BAL-002 — Disturbance Control Performance
- BAL-004 — Time Error Correction
- BAL-005 — Automatic Generation Control
- BAL-006 — Inadvertent Interchange

If you are interested in serving on this SAR drafting team, please complete this nomination form and return it to sarcomm@nerc.net by July 30, 2007 with "BA Controls SAR DT" in the subject line. For questions, please contact Linda Clarke at 610-310-7210 or linclrke@msn.com.

Project 2007-09 — Generator Verification Standard Drafting Team (July 17–30, 2007)

The Standards Committee is seeking industry experts to serve on the Generator Verification Standard Drafting Team. If you are interested in serving on this team, please complete this nomination form and return it to sarcomm@nerc.net with "Gen Verification SDT" in the subject line by July 30, 2007. For questions, please contact David Taylor at 609-651-5089 or david.taylor@nerc.net.

The drafting team will work on finalizing the following Phase III & IV standards:

- PRC-019 — Coordination of Generator Voltage Regulator Controls with Unit Capabilities and Protection
- PRC-024 — Generator Performance during Frequency and Voltage Excursions
- MOD-026 — Verification of Models and Data for Generator Excitation System Functions
- MOD-027 — Verification of Generator Unit Frequency Response

The drafting team will also work on revising two existing standards that were not approved by the FERC because of their "fill-in-the-blank" elements:

- MOD-024 — Verification of Generator Gross and Net Real Power Capability
- MOD-025 — Verification of Generator Gross and Net Reactive Power Capability

Project 2007-12 — Frequency Response Standard Drafting Team (July 17–30, 2007)

The Standards Committee is seeking industry experts to serve on the Frequency Response Standard Drafting Team. The drafting team will work to develop a standard that requires entities to provide data so that Frequency Response in each of the Interconnections can be modeled, and the reasons for the decline in Frequency Response can be identified.

If you are interested in serving on this standard drafting team, please complete this nomination form and return it to sarcomm@nerc.net by July 30, 2007 with "FR SDT" in the subject line. For questions, please contact Linda Clarke at 610-310-7210 or linclrke@msn.com.

Project 2007-23 — Violation Severity Levels Drafting Team (July 17–30, 2007)

The Standards Committee is seeking industry experts to serve on the Violation Severity Levels SAR Drafting Team. The drafting team will work to achieve consensus on a set of criteria for assigning Violation Severity Levels, and will work (with other existing drafting teams) to replace "Levels of Non-compliance" with "Violation Severity Levels" in the 83 standards approved by the FERC. FERC directed NERC to replace "Levels of Non-compliance" with "Violation Severity Levels' so that the ERO's Sanctions Guidelines can be used as intended.

If you are interested in serving on this standard drafting team, please complete this nomination form and return it to sarcomm@nerc.net by July 30, 2007 with "VSL DT" in the subject line. For questions please contact Al Calafiore at 678-524-1188 or al.calafiore@nerc.net or Stephen Crutchfield at 609-651-9455 or stephen.crutchfield@nerc.net.

Standards Development Process

The *Reliability Standards Development Procedure* contains all the procedures governing the standards development process. The success of the NERC standards development process depends on stakeholder participation. We extend our thanks to all those who participate. If you have any questions, please contact me at 813-468-5998 or maureen.long@nerc.net.

Sincerely,

Maureen E. Long

cc: Registered Ballot Body Registered Users
Standards Mailing List
NERC Roster

Definitions of Terms Used in Standard

This section includes all newly defined or revised terms used in the proposed standard. Terms already defined in the Reliability Standards Glossary of Terms are not repeated here. New or revised definitions listed below become approved when the proposed standard is approved. When the standard becomes effective, these defined terms will be removed from the individual standard and added to the Glossary.

Single Event Frequency Response Data (SEFRD)

The individual sample of event data from a Balancing Authority which represents the change in Net Actual Interchange (NI_A), divided by the change in frequency, expressed in MW/0.1Hz.

Frequency Response Measure (FRM)

The median of all Single Event Frequency Response Data observations reported annually on FRS Form 1.

Frequency Response Obligation (FRO)

The Balancing Authority's contribution to the total aggregate Frequency Response needed for reliable operation of an Interconnection assigned by the ERO.

Frequency Bias Setting (redline showing proposed changes to approved definition)

A value, (either a fixed or variable Frequency Bias), usually expressed in MW/0.1 Hz, set into a Balancing Authority Area Control Error ~~algorithm~~ equation that allows the Balancing Authority to contribute its ~~frequency~~ Frequency ~~r~~Response to the Interconnection.

A. Introduction

Title: Frequency Response and Frequency Bias Setting

Number: BAL-003-1

Purpose: To require sufficient Frequency Response from the Balancing Authority to maintain Interconnection Frequency within predefined bounds by arresting frequency deviations and supporting frequency until the frequency is restored. To schedule and provide consistent methods for measuring Frequency Response and determining the Frequency Bias Setting.

Applicability:

1.1. Balancing Authority

1.2. Reserve Sharing Group (where applicable)

Effective Date:

1.3. In those jurisdictions where regulatory approval is required, Requirements R2, R3 and R4 of this standard shall become effective the first calendar day of the first calendar quarter 12 months after applicable regulatory approval. In those jurisdictions where no regulatory approval is required, Requirements R2 and R3 of this standard shall become effective the first calendar day of the first calendar quarter 12 months after Board of Trustees adoption.

1.4. In those jurisdictions where regulatory approval is required, Requirements R1 of this standard shall become effective the first calendar day of the first calendar quarter 24 months after applicable regulatory approval. In those jurisdictions where no regulatory approval is required, Requirements R1 of this standard shall become effective the first calendar day of the first calendar quarter 24 months after Board of Trustees adoption.

B. Requirements

R1. Each Balancing Authority shall achieve a Frequency Response Measure (FRM) (as detailed in Attachment A and calculated on FRS Form 1) that is equal to or more negative than its Frequency Response Obligation (FRO). *[Risk Factor:][Time Horizon: Operations Assessment]*

R2. Each Balancing Authority shall implement the Frequency Bias Setting (fixed or variable) provided by the ERO into its Area Control Error (ACE) calculation beginning on the date specified by the ERO to ensure effective coordinated secondary control, using the results from the calculation methodology detailed in Attachment A. *[Risk Factor:][Time Horizon: Operations Planning]*

R3. Each Balancing Authority shall operate its Automatic Generation Control (AGC) on Tie Line Bias, unless such operation would have an Adverse Reliability Impact on the Balancing Authority's Area. *[Risk Factor:][Time Horizon: Real-time Operations]*

R4. Each Balancing Authority that is performing Overlap Regulation Service shall increase its Frequency Bias Setting in its ACE calculation by combining the Frequency Bias

Settings for the entire Balancing Authority Area being controlled. *[Risk Factor: }{Time Horizon: Operations Planning}*

C. Measures

Measures for each Requirement will be provided in the second posting of the proposed standard.

D. Compliance

1. Compliance Monitoring Process

1.1. Compliance Enforcement Authority

The Regional Entity shall serve as the Compliance Enforcement Authority.

1.2. Compliance Monitoring and Assessment Processes:

Compliance Audits

Self-Certifications

Spot Checking

Compliance Violation Investigations

Self-Reporting

Complaints

Periodic Data Submittals

1.3. Data Retention

Data Retention periods for Requirement R1 through Requirement R4 will be defined in the second posting of the proposed standard.

If a Balancing Authority is found non-compliant, it shall keep information related to the non-compliance until found compliant or for the time period specified above, whichever is longer.

The Compliance Enforcement Authority shall keep the last audit records and all subsequent requested and submitted records.

1.4. Additional Compliance Information

R1 Supplemental Information

Each Balancing Authority shall report its previous year's Frequency Response Measure (FRM) to the ERO on Form 1 by January 10 each year. If the ERO posts the official list of events after December 10, Balancing Authorities will be given 45 days from the date the ERO posts the official list of events to submit their FRS Form 1.

A Balancing Authority may elect to fulfill its Frequency Response Obligation by participating as a member of a Reserve Sharing Group (RSG). If a Balancing

Authority elects to report as an RSG, the total of the participating Balancing Authorities' FRO will be compared to the total of the participating Balancing Authorities' FRM.

R2 Supplemental Information.

Each Balancing Authority shall report its current year requested Frequency Bias Setting and Frequency Bias type (fixed or variable) to the ERO on FRS-Form 1 by January 10 each year. If the ERO posts the official list of events after December 10, Balancing Authorities will be given 45 days from the date NERC posts the official list of events to submit their FRS Form 1. Once the FRM and Frequency Bias Settings have been validated by the ERO, the ERO will disseminate the Frequency Bias Settings Report for all Balancing Authorities in each Interconnection along with the implementation date.

Balancing Authorities with variable Frequency Bias Settings shall calculate monthly average Frequency Bias Settings. The previous year's monthly averages will be reported annually on FRS Form 1.

2.0 Violation Severity Levels (To be added later)

R#	Lower VSL	Medium VSL	High VSL	Severe VSL
R1				
R2				
R3				
R4				

E. Regional Variance

None

F. Associated Documents

Attachment A - Frequency Response Standard Background Document

FRS Form 1

FRS Form 1 Instructions

Field Test Document

G. Version History

Version	Date	Action	Change Tracking
0	April 1, 2005	Effective Date	New
1		Complete Revision under Project 2007-12	Revision

BAL-003 - Attachment A
Background Document

Introduction

This draft document provides background to explain the requirements in the draft Frequency Response Standard (BAL-003-1). This document will evolve on the basis of Industry comments on the standard and is expected to become Attachment A to the standard.

Requirement 1

R1. Each Balancing Authority shall achieve a Frequency Response Measure (FRM) (as detailed in Attachment A and calculated on FRS Form 1) that is equal to or more negative than its Frequency Response Obligation (FRO).

Frequency Bias Setting vs. Frequency Response

The Frequency Response Measure (FRM) for the upcoming year is based on the same data collected for the Balancing Authorities' annual Frequency Bias Setting calculation. A final listing of official events to be used in the calculation will be available from NERC by December 10 each year. Once a list is distributed to Balancing Authorities, each BA has one month to assemble its data and calculate the FRM.

The ERO will use the following criteria for the selection of events to be analyzed.

1. At least 25 events will be used for the calculation of FRM. If a year occurs in which there are not 25 events that meet the remaining criteria below, then the most recent 25 events (as defined below) will be used for determination of an entity's compliance with the FRM requirement and storage of SEFRD.
2. Two limits will be used to determine if a frequency event has occurred for the purposes of determining FRM:
    a. The frequency at the arresting frequency (Point C) must exceed the frequency deviation event threshold specified for the Interconnection. (As of 2010, the governor deadband setting for the Eastern and Western Interconnections will be assumed to be near or greater than 36 MHz, although there is no stated requirement defined in NERC standards). The Point C value is the minimum of frequency samples within 8 seconds after the start of the rapid change in frequency.
    b. The time from the start of the rapid change in frequency until the point at which Frequency has largely stabilized should be less than 18 seconds.
3. Typically, the Point A frequency should be relatively steady and near 60.000 Hz. Point A is computed as an average over the period from -16 seconds to 0 seconds before initial frequency decline.

4. Any indication or evidence of a secondary event occurrence after Point C should be reviewed for inclusion based on having sufficient information to perform a full analysis of the event.
5. Events occurring during periods in which either significant interchange schedule ramping or load ramping is likely, should be excluded if other events are available for measurement purposes.

Additional events included in Frequency Response survey for interconnection analysis: The ERO has the discretion to request a frequency survey for events that differ significantly from criteria 3, 4, or 5. These events will not be included on FRS Form 1 used for calculation of frequency response.

The report will be done via FRS Form 1.

Sliding of the reporting deadline from that found in previous versions of BAL-003 is due to the increased number of samples required and is intended to avoid burdening NERC and the Balancing Authorities with working over holiday periods for no added value to reliability.

Frequency Bias Settings and acceptable Frequency Response are negative numbers by definition. In other words, as frequency drops, the Balancing Authority is expected to contribute MWs to the Interconnection (or take fewer MWs in).

The current BAL-003 has a minimum Frequency Bias Setting (in MW/0.1Hz) that is in absolute terms equal to 1% of the Balancing Authority's projected peak. An early researcher[1] noted that the ideal state is where the Frequency Bias Setting is exactly equal to natural Frequency Response. Researchers have also noted that over-bias is preferable to under-bias. The current – (1% of peak) /0.1Hz floor for the Frequency Bias Setting is significantly more negative than most Balancing Authorities' natural Frequency Response. This can lead to over-control , particularly in the Eastern Interconnection, and force the industry to require too much secondary control resulting in degraded performance and increased operating cost compared to requiring an appropriate balance of primary and secondary control.

Changes to the Frequency Bias Setting that move it closer to the natural Frequency Response will improve the quality and accuracy of ACE and all ACE based systems and measures, including: the CERTS Automatic Frequency Events Identification and Frequency Response Evaluation System; the CPS1 measure; the CPS2 measure; the DCS measure; the BAAL measure; and, AGC Systems in general.

[1] Cohn, Nathan. *Control of Generation and Power Flow on Interconnected Systems*. (New York: John Wiley & Sons, 1966)

Frequency Bias Setting Floor
The FR SDT is proposing a gradual transition to bring Frequency Bias Settings and natural Frequency Response closer. The Frequency Response Field Test Document describes the gradual replacement of a floor by natural Frequency Response for Frequency Bias Setting.

Frequency Response Obligation and Allocation
The SDT is initially proposing that the Interconnection Frequency Response Obligation (FRO) be a discretely administered determination.

For this administered approach each Interconnection will have a target contingency protection criteria based on the largest category C event (N-2). The protection criteria will assure that Point C will not encroach on the first step UFLS.

Under development – The SDT is evaluating a risk based approach to establishing an Interconnection Frequency Response Obligation which can be based on a probability function.

The ERO and the NERC RS will manage the administrative procedure to assign an FRO to each BA for the upcoming year.

Each Balancing Authority will receive a proportional slice of the Interconnection's Frequency Response Obligation based on (peak generation + peak load)/2. The reasoning for this allocation method is that Balancing Authorities carry differing proportions of load and generation. In fact, some Balancing Authorities have only load with no native generation, while others have only generation with no native load. One of the reasons for using 2010 event data as part of a field trial of the standard is to evaluate the allocation methodology.

Methods of Obtaining Response
A Balancing Authority may elect to fulfill its Frequency Response Obligation by participating as a member of a Reserve Sharing Group.

There are two considerations under the option of meeting compliance by participation in a Reserve Sharing Group (RSG). First, although spinning reserve is not a part of this standard, it should be noted that RSGs typically define the amount of spinning reserve carried by Balancing Authorities. Second, allowing the RSG option addresses the FERC Order No. 693 directive to define methods of obtaining frequency response.

As long as all BAs within the RSG use the same events for calculating FRM, BAs within the RSG may allocate a portion of their FRM to another RSG participant.

The SDT is soliciting comments on methods of obtaining Frequency Response to meet the Order 693 directive (markets, incentive programs, tariff changes, interconnection agreements, innovative technology, resource standard).

Measure and Compliance Information
This will be added in the second posting.

Requirement 2

R2. Each Balancing Authority shall implement the Frequency Bias Setting (fixed or variable) provided by the ERO into its Area Control Error (ACE) calculation beginning on the date specified by the ERO to ensure effective coordinated secondary control, using the results from the calculation methodology detailed in Attachment A.

Background and Rationale
The traditional process for implementing new Frequency Bias Settings is for Balancing Authorities to submit their upcoming annual Frequency Bias Setting value by January 1. NERC and the Resources Subcommittee validate Frequency Bias Setting values, perform error checking and use these values to calculate L10 values for CPS2. Once the L10 values are validated, NERC posts the L10 values and sends a letter to Balancing Authorities giving a date on which to implement the new Frequency Bias Settings. This data collection and validation process can take up to two months. It is expected NERC will send out the L10 and Frequency Bias Setting notification generally in February for March 1 implementation.

Measure and Compliance Information
This will be added in the second posting.

Requirement 3

R3. Each Balancing Authority shall operate its Automatic Generation Control (AGC) on Tie Line Bias, unless such operation would have an Adverse Reliability Impact on the Balancing Authority's Area.

Background and Rationale
This requirement has existed in NERC Policy 1 and BAL-003 for years. Operating out of Tie Line Bias control can lead to uncoordinated control that may result in unreliable operations.

Measure and Compliance Information
This will be added in the second posting.

Requirement 4

R4. Each Balancing Authority that is performing Overlap Regulation Service shall increase its Frequency Bias Setting in its ACE calculation by combining the Frequency Bias Settings for the entire Balancing Authority Area being controlled.

Background and Rationale

This requirement has existed in NERC Policy 1 and BAL-003 for years. Overlap regulation service provides ACE control for compliance from another BA authority performing the overlap service thus the frequency bias used by the BA purchasing the service needs to be added to the providers frequency bias which will provide the ACE control for the Balancing Authority. Supplemental service is a schedule to provide a portion of the control for another BA using a portion of the ACE which does not require changing the frequency bias.

Measure and Compliance Information

This will be added in the second posting.

A. Introduction

1. Title: **Frequency Response and Bias**

2. Number: BAL-003-0

3. Purpose:

This standard provides a consistent method for calculating the Frequency Bias component of ACE.

4. Applicability:

4.1. Balancing Authorities

5. Effective Date: April 1, 2005

B. Requirements

R1. Each Balancing Authority shall review its Frequency Bias Settings by January 1 of each year and recalculate its setting to reflect any change in the Frequency Response of the Balancing Authority Area.

R1.1. The Balancing Authority may change its Frequency Bias Setting, and the method used to determine the setting, whenever any of the factors used to determine the current bias value change.

R1.2. Each Balancing Authority shall report its Frequency Bias Setting, and method for determining that setting, to the NERC Operating Committee.

R2. Each Balancing Authority shall establish and maintain a Frequency Bias Setting that is as close as practical to, or greater than, the Balancing Authority's Frequency Response. Frequency Bias may be calculated several ways:

R2.1. The Balancing Authority may use a fixed Frequency Bias value which is based on a fixed, straight-line function of Tie Line deviation versus Frequency Deviation. The Balancing Authority shall determine the fixed value by observing and averaging the Frequency Response for several Disturbances during on-peak hours.

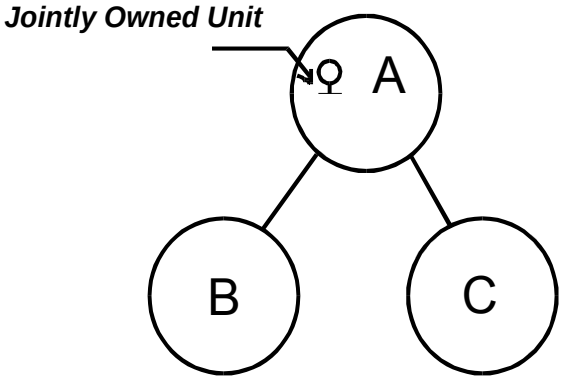
R2.2. The Balancing Authority may use a variable (linear or non-linear) bias value, which is based on a variable function of Tie Line deviation to Frequency Deviation. The Balancing Authority shall determine the variable frequency bias value by analyzing Frequency Response as it varies with factors such as load, generation, governor characteristics, and frequency.

R3. Each Balancing Authority shall operate its Automatic Generation Control (AGC) on Tie Line Frequency Bias, unless such operation is adverse to system or Interconnection reliability.

R4. Balancing Authorities that use Dynamic Scheduling or Pseudo-ties for jointly owned units shall reflect their respective share of the unit governor droop response in their respective Frequency Bias Setting.

R4.1. Fixed schedules for Jointly Owned Units mandate that Balancing Authority (A) that contains the Jointly Owned Unit must incorporate the respective share of the unit governor droop response for any Balancing Authorities that have fixed schedules (B and C). See the diagram below.

R4.2. The Balancing Authorities that have a fixed schedule (B and C) but do not contain the Jointly Owned Unit shall not include their share of the governor droop response in their Frequency Bias Setting.



R5. Balancing Authorities that serve native load shall have a monthly average Frequency Bias Setting that is at least 1% of the Balancing Authority's estimated yearly peak demand per 0.1 Hz change.

R5.1. Balancing Authorities that do not serve native load shall have a monthly average Frequency Bias Setting that is at least 1% of its estimated maximum generation level in the coming year per 0.1 Hz change.

R6. A Balancing Authority that is performing Overlap Regulation Service shall increase its Frequency Bias Setting to match the frequency response of the entire area being controlled. A Balancing Authority shall not change its Frequency Bias Setting when performing Supplemental Regulation Service.

C. Measures

M1. Each Balancing Authority shall perform Frequency Response surveys when called for by the Operating Committee to determine the Balancing Authority's response to Interconnection Frequency Deviations.

D. Compliance

Not Specified.

E. Regional Differences

None identified.

Version History

Version	Date	Action	Change Tracking
0	April 1, 2005	Effective Date	New
0	August 8, 2005	Removed "Proposed" from Effective Date	Errata

NERC
NORTH AMERICAN ELECTRIC RELIABILITY CORPORATION

The information in this Supplemental SAR identifies the modifications to BAL-003-0 that were originally part of Project 2007-18 – Reliability-based Control. The Standards Committee authorized the transfer of this work from Project 2007-18 to Project 2007-12 during its October 13-14, 2010 meeting.

001592

Standard Authorization Request Form

Title of Proposed Standard BAL-003-1 Frequency Response and Frequency Bias Setting Supplemental to SAR dated 30Jun2007
SC Approved the transfer of work identified in this SAR from Project 2007-18 to Project 2007-12 during its October 13-14, 2010 meeting. The supplemental SAR outlining the work that was transferred was accepted by the SC EC on February 2, 2011

SAR Requester Information		**SAR Type** (*Check a box for each one that applies.*)	
Name	Frequency Response Standard Drafting Team	☐	New Standard
Primary Contact	Bill Herbsleb - PJM	X	Revision to existing Standard
Telephone Fax	610.666.8874	☐	Withdrawal of existing Standard
E-mail	herbslhw@pjm.com	☐	Urgent Action

Purpose (Describe what the standard action will achieve in support of bulk power system reliability.)

To require sufficient Frequency Response from the Balancing Authority to maintain Interconnection Frequency within predefined bounds by arresting frequency deviations and supporting frequency until the frequency is restored to schedule and to provide consistent methods for measuring Frequency Response and determining the Frequency Bias Setting.

Industry Need (Provide a justification for the development or revision of the standard, including an assessment of the reliability and market interface impacts of implementing or not implementing the standard action.)

Frequency Response, a measure of an Interconnection's ability to stabilize frequency immediately following the sudden loss of generation or load, is a critical component to the reliable operation of the bulk power system, particularly during disturbances and restoration. There is evidence of continuing decline in Frequency Response in the three Interconnections over the past 10 years, but no confirmed reason for the apparent decline.

Brief Description (Provide a paragraph that describes the scope of this standard action.)

To provide a minimum Frequency Response Obligation for the Balancing Authority to

achieve, methods to obtain Frequency Response and provide a consistent method for calculating the Frequency Bias Setting for a Balancing Authority. In addition, the standard will specify the optimal periodicity of Frequency Response surveys.

Detailed Description (Provide a description of the proposed project with sufficient details for the standard drafting team to execute the SAR.)

This SAR proposes to retire BAL-003-0 when BAL-003-1 is implemented. Below are excerpts from documents relevant to this SAR.

From FERC Order 693:

369 - With respect to the frequency of frequency response surveys, EEI states that NERC currently conducts an annual frequency response characteristic survey that appears to address the Commission's concern. The Commission disagrees. The surveys that were performed on a yearly basis are not available on NERC's website and the ISO/RTO Council believes that more frequent analysis after large frequency disturbances is appropriate. The Commission understands that the last analysis was performed in 2002. Currently, Measure M1 only requires balancing authorities to perform surveys when requested by the NERC operating committee. As identified in Order No. 672, the Reliability Standards should be based on actual data. Therefore, on further consideration, instead of requiring yearly surveys as proposed in the NOPR, the Commission believes that the frequency of these surveys should be based on the data requirements that will assist the ERO to determine if the balancing authorities are providing adequate and equitable frequency response to disturbances on the Bulk-Power System. Accordingly, we direct the ERO to determine the optimal periodicity of frequency response surveys necessary to ensure that Requirement R2 and other Requirements of the Reliability Standard are being met and to modify Measure M1 based on this determination.

372 - The Commission is not persuaded by the commenters. We conclude that the minimum frequency response needed for Reliable Operation should be defined and methods of obtaining the frequency response identified. In addition to the ERCOT experience, EEI provides an additional example that underscores the Commission's concern in this area with its discussion of the ISO-NE frequency oscillations resulting from the August 14, 2003 blackout. Severe oscillations were observed in the ISO-NE frequency when it separated from the Eastern Interconnection during the August 14, 2003 blackout. The ISO-NE operators acted quickly to reduce the bias setting so as to eliminate the self-induced frequency oscillations before they affected system reliability. This apparent mismatch between the bias and the actual frequency response might have caused the ISO-NE system to cascade if it had not been for the quick actions of its operators. Therefore, we direct the ERO to either modify this Reliability Standard or develop a new Reliability Standard that defines the necessary amount of frequency response needed for Reliable Operation and methods of obtaining and measuring that frequency response is available.

Reliability Functions

The Standard will Apply to the Following Functions *(Check box for each one that applies.)*		
☐	Reliability Assurer	Monitors and evaluates the activities related to planning and operations, and coordinates activities of Responsible Entities to secure the reliability of the bulk power system within a Reliability Assurer Area and adjacent areas.
☐	Reliability Coordinator	Responsible for the real-time operating reliability of its Reliability Coordinator Area in coordination with its neighboring Reliability Coordinator's wide area view.
X	Balancing Authority	Integrates resource plans ahead of time, and maintains load-interchange-resource balance within a Balancing Authority Area and supports Interconnection frequency in real time.
☐	Interchange Authority	Ensures communication of interchange transactions for reliability evaluation purposes and coordinates implementation of valid and balanced interchange schedules between Balancing Authority Areas.
☐	Planning Coordinator	Assesses the longer-term reliability of its Planning Coordinator Area.
☐	Resource Planner	Develops a >one year plan for the resource adequacy of its specific loads within its portion of the Planning Coordinator's Area.
☐	Transmission Owner	Owns and maintains transmission facilities.
☐	Transmission Operator	Ensures the real-time operating reliability of the transmission assets within a Transmission Operator Area.
☐	Transmission Planner	Develops a >one year plan for the reliability of the interconnected Bulk Electric System within the Transmission Planner Area.
☐	Transmission Service Provider	Administers the transmission tariff and provides transmission services under applicable transmission service agreements (e.g., the pro forma tariff).
☐	Distribution Provider	Delivers electrical energy to the End-use customer.
☐	Generator Owner	Owns and maintains generation facilities.
☐	Generator Operator	Operates generation unit(s) to provide real and reactive power.
☐	Purchasing-Selling Entity	Purchases or sells energy, capacity, and necessary reliability-related services as required.
☐	Load-Serving Entity	Secures energy and transmission service (and reliability-related services) to serve the End-use Customer.

Reliability and Market Interface Principles

Applicable Reliability Principles *(Check box for all that apply.)*	
X	1. Interconnected bulk power systems shall be planned and operated in a coordinated manner to perform reliably under normal and abnormal conditions as defined in the NERC Standards.
X	2. The frequency and voltage of interconnected bulk power systems shall be controlled within defined limits through the balancing of real and reactive power supply and demand.
X	3. Information necessary for the planning and operation of interconnected bulk power systems shall be made available to those entities responsible for planning and operating the systems reliably.
☐	4. Plans for emergency operation and system restoration of interconnected bulk power systems shall be developed, coordinated, maintained and implemented.
X	5. Facilities for communication, monitoring and control shall be provided, used and maintained for the reliability of interconnected bulk power systems.
☐	6. Personnel responsible for planning and operating interconnected bulk power systems shall be trained, qualified, and have the responsibility and authority to implement actions.
X	7. The security of the interconnected bulk power systems shall be assessed, monitored and maintained on a wide area basis.
☐	8. Bulk power systems shall be protected from malicious physical or cyber attacks.

Does the proposed Standard comply with all of the following Market Interface Principles? *(Select 'yes' or 'no' from the drop-down box.)*
1. A reliability standard shall not give any market participant an unfair competitive advantage. Yes
2. A reliability standard shall neither mandate nor prohibit any specific market structure. Yes
3. A reliability standard shall not preclude market solutions to achieving compliance with that standard. Yes
4. A reliability standard shall not require the public disclosure of commercially sensitive information. All market participants shall have equal opportunity to access commercially non-sensitive information that is required for compliance with reliability standards. Yes

Related Standards

Standard No.	Explanation
BAL-001 through BAL-006	Balancing Standards
Balance Resources and Demand draft standards	Balancing Resources and Demand BAL-007 draft standard is in the Standards Development Process.

Related SARs

SAR ID	Explanation

Regional Variances

Region	Explanation
ERCOT	Single Balancing Authority Interconnections calculate Frequency Response based on the change in generation (or load) rather than Tie-Line deviation.
FRCC	
MRO	
NPCC	
SERC	
RFC	
SPP	
WECC	

Balancing Authority FRS Form 1 Background and Instructions

Subsections

This document includes the purpose and description of the Frequency Response Survey (FRS) Form 1, including specific instructions to complete the survey form.

A. Frequency Response Characteristics and their Measurement

Disturbances can cause frequency to either increase from loss of load or decrease from loss of generation; Frequency Response characteristics should be evaluated for both types of events.

Accurate measurement of Frequency Response for an Interconnection or for individual Balancing Authorities is difficult unless the frequency deviation resulting from a system disturbance is significant. Therefore, it is better to analyze response only when significant frequency deviations occur.

1. Frequency Response — For any change in generation/load balance in the Interconnection, a frequency change occurs. Each Balancing Authority in the Interconnection will respond to this frequency change through:

- A load change resulting from the load's Frequency Response[1] that acts to arrest frequency changes, and varies with frequency in a continuous and inverse relationship,
- A generation change resulting from governor action that acts to arrest frequency changes, and varies with frequency in a continuous and inverse relationship, and
- A change in energy consumption or production from other devices resulting from the device's control system that acts to arrest frequency changes, and varies with frequency in a continuous and inverse relationship.

[1]Rotating (motor) and inductive loads are the dominant load response factors; resistive loads do not change with changing frequency.

Frequency responsive resources (generation, load, and other devices as above described) produce these responses. The net effect of these actions is the Balancing Authority's response to the frequency change, that is, its Frequency Response. The combined response of all Balancing Authorities in the Interconnection will cause the Interconnection frequency to settle at some value different from the pre-disturbance value and maintain it there. Frequency will remain different until the Balancing Authority with the generation/load imbalance (referred to as the "contingent Balancing Authority") corrects that imbalance, thus returning the Interconnection frequency to its pre-disturbance value.

2. **Response to Internal and External Generation/Load Imbalances —** Most of a Balancing Authority's Frequency Response will be reflected in a change in its actual net interchange. By monitoring frequency error (the difference between actual and scheduled frequency) and the change in actual interchange in response to the frequency deviation, a Balancing Authority's automatic generation control (AGC) can determine whether the imbalance in load and generation is internal or external to its system. If internal, the Balancing Authority's AGC and/or deployment of Contingency Reserve should gradually correct the imbalance. If external, the Balancing Authority's AGC should allow its frequency responsive resources to continue responding (as allowed by its Frequency Bias Setting contribution in its ACE equation) until the contingent Balancing Authority corrects its imbalance, which should return frequency to its pre-disturbance value.

3. **Frequency Response versus Frequency Bias Setting—** If the Balancing Authority's Frequency Bias Setting matches its Frequency Response in its AGC ACE equation, the Balancing Authority's Frequency Bias Setting allowance term would exactly offset the change in tie line flow included in the ACE that results from frequency responsive resource action countering a frequency deviation on the Interconnection . The following sections discuss effects of Frequency Bias Settings on control action. The discussion explains control action by all Balancing Authorities external to the contingent Balancing Authority (the Balancing Authority that experienced the sudden generation/load imbalance) and by the contingent Balancing Authority itself.

   While this discussion deals with loss of generation, it applies equally to loss of load, or any sudden contingency resulting in a generation/load mismatch. Each Balancing Authority's Frequency Response will vary with each disturbance because generation and load characteristics change continuously. This discussion also assumes that frequency error from 60 Hz was zero (all ACE values were zero) just prior to the sudden generation/load imbalance.

   For further explanation of the ACE equation, refer to the *Area Interchange Error Training Document*.

4. **Effects of a Disturbance on all Balancing Authorities External to the Contingent Balancing Authority —** When a loss of generation occurs, Interconnection frequency declines because machine speed must decrease to supply a portion of the energy shortfall from rotating kinetic energy. Initially, rotating kinetic energy from all rotating machines with direct mechanical–to-electrical coupling addresses the entire shortfall by lowering machine speed, and hence frequency, of the Interconnection[2]. Over time, Balancing Authorities' frequency responsive

[2]An amount of kinetic energy proportional to the power (generation) lost will be withdrawn from the stored energy in rotating machines with direct mechanical-to-electrical coupling throughout the Interconnection. As the mechanical speeds are reduced, Interconnection frequency decreases proportionally.

resources should respond to frequency error and change energy to stabilize frequency accordingly. This will cause a change in the Balancing Authorities' actual net interchange. In other words, the Actual Net Interchange (NI_A) generally should be greater than its value before the contingency for all but the contingent Balancing Authority, and the result should be an increase in flow out of non-contingent Balancing Authorities (or a decrease in flow into non-contingent Balancing Authorities). The resulting tie flow error ($NI_A - NI_S$) will be counted as Inadvertent Interchange.

If Balancing Authorities were using only tie line flow error (i.e., flat tie control ignoring the frequency error), this non-zero ACE would cause their AGC to reduce generation until NI_A was equal to NI_S; returning their ACE to zero. However, doing this would not help arrest Interconnection frequency decline because the Balancing Authorities would not be helping to temporarily replace some of the generation deficiency in the Interconnection. With the tie-line bias method, the Balancing Authorities' AGC should allow their frequency responsive resources to continue responding to the frequency deviation until the contingent Balancing Authority replaces the generation it has lost.

For the AGC to allow frequency responsive resource action to continue to support frequency, a frequency bias contribution term is added to the ACE equation to offset the tie flow error. This bias contribution term is equal in magnitude and opposite in direction to the frequency responsive resource action and should ideally be equal to each Balancing Authority's Frequency Response measured in MW/0.1 Hz. Then, when multiplied by the frequency error, ideally the Frequency Bias Setting should exactly be offset by the tie flow error portion of the ACE calculation, allowing continued support of frequency responsive resource action to support system frequency while maintaining ACE at zero.

The ACE equation is then:

$$ACE = (Ni_A - Ni_S) - 10B(f_A - f_S) - I_{ME}$$

Where:

- The factor 10 converts the Frequency Bias Setting (B) from MW/0.1 Hz to MW/Hz.
- I_{ME} is a meter error correction estimate; this term should normally be very small or zero.

NOTE: Frequency Response and Frequency Bias Settings are often referred to as positive values (such as "our bias is 50 MW/0.1 Hz"). Frequency Response and Frequency Bias Settings are actually negative values.

If the Frequency Bias Setting is greater (as an absolute value) than the Balancing Authority's actual Frequency Response, then its AGC will increase generation beyond the primary frequency responsive resource response in order to achieve ACE = 0, which further helps arrest the frequency decline, but increases Inadvertent Interchange. Likewise, if the Frequency Bias Setting contribution term is less (as an absolute value) than actual Frequency Response, its AGC will reduce generation in order to achieve ACE = 0, thereby reducing the Balancing Authority's contribution to arresting frequency change.

5. Effects of a Disturbance on the Contingent Balancing Authority — In the contingent Balancing Authority where the generation deficiency occurred, most of the replacement power comes from the Interconnection over its tie lines from Frequency Response contributions by other Balancing Authorities in the Interconnection, as allowed by Frequency Bias Settings. A small portion will be made up internally from the contingent Balancing Authority's own frequency responsive resource response. In this case, the change in NI_A for the contingent Balancing Authority is much greater than its Frequency Bias Setting component. Its ACE will be negative (if the loss is generation), and its AGC will begin to increase generation.

NI_A — drops by the total generation lost less the contingent Balancing Authority's own frequency responsive resource response
NI_S — does not change

The energy supplied from the Interconnection appears in the contingent Balancing Authority's inadvertent balance.

6. Effects of a Disturbance on the Contingent Balancing Authority with a Jointly-Owned Unit[3] — When a generation deficiency occurs within a Balancing Authority on a jointly-owned unit (with dynamically scheduled shares being exported), the effects on the tie line component ($NI_A - NI_S$) of their ACE equation are more complicated. The NI_A drops by the total amount of the generator lost, while the NI_S is reduced only by the dynamic reduction in the shares being exported.

NI_A — drops by the total generation lost less the contingent Balancing Authority's own frequency responsive resource response
NI_S — decreases by the reduction in dynamic shares being exported

The net effect is that the tie line bias component reflects only the response by the contingent Balancing Authority for its share of the lost generation. Most of the replacement power comes from the Interconnection over its tie lines from Frequency Response contributions by other Balancing Authorities in the Interconnection.

7. Effects of a Disturbance on a Balancing Authority with a Contingent Jointly-Owned Unit[4] Geographically-Located in an External Balancing Authority — In a Balancing Authority whose generation deficiency occurred on a jointly-owned unit in another Balancing Authority (with dynamically scheduled shares being exported from the other BA), the effects on the tie line component ($NI_A - NI_S$) of their ACE equations are also complicated. The NI_A increases by the Balancing Authority's own Frequency Response, while the NI_S is reduced only by the dynamic reduction in the share the BA is importing from the unit.

NI_A — increases by the Balancing Authority's own frequency responsive resource response
NI_S — decreases by the BA's dynamic share of the jointly-owned unit.

The net effect is that the tie line bias component reflects only the response by the contingent Balancing Authority for its share of the lost generation. Most of the replacement power comes from the Interconnection over its tie lines from Frequency Response contributions of other Balancing Authorities in the Interconnection.

3 This example assumes dynamic scheduling, not the use of pseudo-ties.
4 This example assumes dynamic scheduling, not the use of pseudo-ties.

B. BAL-003 - FRS Form 1 Instructions

Figure 1 — Classic Frequency Excursion and Recovery

A sample frequency chart is shown in Figure 1 with points A, B, and C labeled. Point A represents the interconnected system frequency immediately before the disturbance. Point B represents the interconnected system frequency at the point immediately after frequency stabilizes due to Frequency Response but before the contingent Balancing Authority takes corrective AGC action. Point C represents the interconnected system frequency at its maximum deviation. All dynamic adjustments as cited bulleted items 4 through 6 needs to be made to NI_A.

Line-by-line instructions for the survey form follow:

FRS Form 1 *Date/Time*		*Point "A" Information*		*Point "B" Information*		*SEFRD*	*Internal*	
Column A (XXXX Prevailing)	**Column B DelFreq**	**Column C Load**	**Column D NAI**	**Column E Load**	**Column F NAI**	**Column G (MW/0.1Hz)**	**Column I Contingency**	Column J **Unit**
12/20/2008 2:12	-0.058	2869.1	-117.0	2861.2	-93.8	-40.2	N	
12/27/2008 4:18	-0.066	2553.6	-138.5	2576.9	-110.8	-41.9	N	
1/5/2009 9:26	-0.040	2838.7	-99.2	2857.8	-88.5	-26.5	N	
1/27/2009 0:39	-0.053	2524.7	-94.4	2522.3	-13.8	-153.6	N	

Point A values are averages over the period from -16 seconds to 0 seconds before initial frequency decline.

Point B values are averages over the period from 18 seconds to 52 seconds after the first scan indicating an initial frequency decline

Data Values

The times of events are approximate; your local observations may vary in time due to the proximity to the loss of generation and SCADA scan rates. The time skew of your observations may be several seconds and your data should be reported accordingly.

Similarly, Delta Frequency values are approximate.

Note: The following table shows the data cells for a Generation Only Balancing Authority

Modified Heading for Generation only BA

A	B	C	D	E	F	G	I
Date/Time (xxxx Prevailing)	**Del Freq**	**Point "A" Information**		**Point "B" Information**		**SEFRD (MW/0.1Hz)**	**Internal Contingency**	**Unit**
		Load	**Generation**	**Load**	**Generation**			

Point A values are averages over the period from -16 seconds to 0 seconds before initial frequency decline.

Point B values are averages over the period from 18 seconds to 52 seconds after the first scan indicating an initial frequency decline

Notes: Add any necessary notes to the response. Please note that Excel allows a maximum of 256 characters for a cell.

All other data on the survey form is calculated.

Balancing Authority **BA_1**

NERC FRS FORM 1

Date/Time (Central Prevailing)	DelFreq	Point "A" Information Load	Point "A" Information NAI	Point "B" Information Load	Point "B" Information NAI	SEFRD (MW/0.1Hz)	Load Contribution	Internal Contingency	Unit
12/20/2008 12:12	-0.058	2869.1	-117.0	2861.2	-93.8	-40.2	34%	N	
12/27/2008 14:18	-0.066	2553.6	-138.5	2576.9	-110.8	-41.9	-84%	N	
1/5/2009 9:26	-0.040	2838.7	-99.2	2857.8	-88.5	-26.5	-179%	N	
1/27/2009 0:39	-0.053	2524.7	-94.4	2522.3	-13.8	-153.6	3%	N	
2/1/2009 18:59	-0.071	2628.6	62.3	2642.9	35.4	37.9	53%	N	
2/19/2009 4:59	-0.052	2295.7	10.2	2283.7	20.1	-19.2	120%	N	
3/24/2009 21:27	-0.058	2438.2	-164.5	2465.3	-161.1	-5.8	-803%	N	
3/26/2009 3:51	-0.076	2198.8	-167.6	2193.6	-131.2	-48.1	14%	Y	Green Valley 1
4/1/2009 17:05	-0.056	2447.9	-185.2	2436.4	-184.7	-0.9	2346%	N	
4/2/2009 17:09	-0.057	2273.1	-124.8	2269.5	-122.1	-4.8	132%	N	
5/3/2009 10:05	-0.052	2010.7	-19.9	2012.6	-6.2	-26.4	-14%	Y	Pleasant View 2
5-21-09 16:36:04	-0.050	2154.9	-2.3	2155.4	8.8	-22.2	-5%	N	
6/21/2009 16:50	-0.052	2104.5	7.8	2103.4	-12.1	38.3	-5%	N	
6-25-09 13:51:44	-0.056	2505.8	33.4	2505.2	45.7	-22.0	5%	N	
7-6-09 13:35:44	-0.058	2382.0	30.9	2383.3	31.7	-1.3	-174%	N	
7-26-09 14:05:48	-0.049	2180.8	-51.6	2178.8	-49.4	-4.6	88%	N	
8-4-09 19:48:12	-0.045	2035.8	0.2	2035.5	9.7	-21.1	3%	N	
8-15-09 16:06:36	-0.038	2103.3	22.0	2100.4	22.4	-0.9	834%	N	
9-12-09 13:30:20	-0.048	2101.7	-49.3	2098.2	-47.1	-4.6	163%	N	
9-29-09 11:16:12	-0.056	2144.0	-13.3	2106.1	16.1	-52.9	129%	N	
10-19-09 9:45:52	-0.047	2376.9	-103.6	2372.8	-99.0	-9.8	89%	N	
10-26-09 14:53:36	-0.060	2319.7	-4.1	2322.4	-2.5	-2.7	-171%	N	
11-2-09 21:40:01	-0.060	2442.3	-154.5	2488.2	-102.1	-87.3	-88%	N	
11-3-09 19:42:08	-0.051	2550.7	-1.8	2549.1	32.2	-66.6	4%	N	

Enter Data in Green Highlighted Cells

Send copy to: Chris.Scheetz@nerc.net

2010	Bias Calculation Form Year
Eastern	Interconnection
BA_1	Balancing Authority
	Contact Name
	Contact Phone #
-	Contact e-mail
3241	Current Year's Actual Peak
3882	Internal Generating Capacity
3242	Next Year's Projected Peak
2009	Current year
-15.8	**2009 Frequency Requirement Obligation(FRO)**

Summary Statistics

-24.5	Average Frequency Response [all events] (MW/0.1Hz)
-20.1	Median Frequency Response [all events] (MW/0.1Hz)
-16.2	Regression Estimate of Frequency Response [all events] (MW/0.1Hz)
-23.3	Average Frequency Response [external contingencies] (MW/0.1Hz)
-33.9	Linear Regression Frequency Response [external contingencies] (MW/0.1Hz)
5%	Median Load Contribution (%)
	Next Year's
-15.8	**2010 Frequency Requirement Obligation(FRO)**
-28.5	**2010 Frequency Bias Setting - (minimum of FRM, next year's FRO, or 0.8% of Projected Peak)**
-14.5	**2009 FRM - Median Frequency Response [external contingencies (MW/0.1Hz)**

Modified Heading for Single BA Interconnection

A	B	C	D	E	F	G	H	I	J	K
Date/Time (Central Prevailing)	**DelFreq**	**Point "A" Information Load**	**Contingency MW**	**Point "B" Information Load**		**SEFRD (MW/0.1Hz)**	**Load Contribution**			**Unit**
12/15/2008 15:18	-0.100	28950.0	600.0	28931.0		**-600.0**	3%			

Implementation Plan for BAL-003-1 – Frequency Response & Frequency Bias

Prerequisite Approvals

There are no other reliability standards or Standard Authorization Requests (SARs), in progress or approved, that must be implemented before this standard can be implemented.

Modified Standards

BAL-003-0 Requirements R1, R2, R3, R4 and R6 should be retired when BAL-003-1 becomes effective.

BAL-003-0 Requirement R5 should be retired as outlined in the following table.

For those Balancing Authorities that serve native load:

- May 2011 through December 2011 -0.8% of peak/0.1 Hz
- January 2012 through December 2012 -0.6% of peak/0.1 Hz
- January 2013 through December 2013 -0.4% of peak/0.1 Hz
- January 2014 through December 2014 -0.2% of peak/0.1 Hz
- January 2015 through -0.0% of peak/0.1 Hz

For those Balancing Authorities that do not serve native load:

- May 2011 through December 2011 -0.8% of upcoming years maximum generation/0.1 Hz
- January 2012 through December 2012 -0.6% of upcoming years maximum generation/0.1 Hz
- January 2013 through December 2013 -0.4% of upcoming years maximum generation/0.1 Hz
- January 2014 through December 2014 -0.2% of upcoming years maximum generation/0.1 Hz
- January 2015 through -0.0% of upcoming years maximum generation/0.1 Hz

The FRR drafting team, NERC and the NERC Resources Subcommittee will observe the impact on frequency and will implement a reversion plan should frequency performance decline.

Compliance with Standards

Once this standard becomes effective, the responsible entities identified in the applicability section of the standard must comply with the requirements. These include:

- Balancing Authorities

Proposed Effective Date

Compliance with BAL-003-1 shall be implemented over a two-year period, as follows:

- In those jurisdictions where regulatory approval is required, Requirements R1, R3 and R4 of this standard shall become effective the first calendar day of the first calendar quarter 12 months after applicable regulatory approval. In those jurisdictions where no regulatory approval is required, Requirements R1, R3 and R4 of this standard shall become effective the first calendar day of the first calendar quarter 12 months after Board of Trustees adoption.
- In those jurisdictions where regulatory approval is required, Requirements R2 of this standard shall become effective the first calendar day of the first calendar quarter 24 months after applicable regulatory approval. In those jurisdictions where no regulatory approval is required, Requirements R2 of this standard shall become effective the first calendar day of the first calendar quarter 24 months after Board of Trustees adoption.

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Unofficial Comment Form for BAL-003-1 Frequency Response and Frequency Bias Standard

Please **DO NOT** use this form to submit comments on the 1st draft of BAL-003-1 – Frequency Response and Frequency Bias Setting. Comments must be submitted by **March 7, 2011**. If you have questions please contact Darrel Richardson by email at darrel.richardson@nerc.net or by telephone at 609.613.1848.

Background Information:

Frequency Response, a measure of an Interconnection's ability to stabilize frequency immediately following the sudden loss of generation or load, is a critical component to the reliable operation of the bulk power system, particularly during disturbances and restoration. The proposed standard's intent is to collect data needed to accurately analyze existing Frequency Response, set a minimum Frequency Response obligation, provide a uniform calculation of Frequency Bias Settings that transition to values closer to Frequency Response, and encourage coordinated AGC operation. There is evidence of continuing decline in Frequency Response over the past 10 years, but no confirmed reason for the apparent decline. The proposed standard requires entities to provide data so that Frequency Response in each of the Interconnections can be analyzed, and the reasons for the decline in Frequency Response can be identified. Once Frequency Response has been analyzed and confirmed, requirements can be modified to maintain reliability.

The Drafting Team would like to receive industry comments on this standard. Please submit your comments using the electronic form **by March 7, 2011**.

You do not have to answer all questions. Enter All Comments in Simple Text Format.

Insert a "check" mark in the appropriate boxes by double-clicking the gray areas.

1. The SDT has developed three new terms to be used with this standard.

   Single Event Frequency Response Data (SEFRD)

   The individual sample of event data from a Balancing Authority which represents the change in Net Actual Interchange (NI_A), divided by the change in frequency, expressed in MW/0.1Hz.

   Frequency Response Measure (FRM)

   The median of all Single Event Frequency Response Data observations reported annually on FRS Form 1.

   Frequency Response Obligation (FRO)

   The Balancing Authority's contribution to the total aggregate Frequency Response needed for reliable operation of an Interconnection assigned by the ERO.

Do you agree with the proposed definitions in this standard? If not, please explain in the comment area.

☐ Yes
☐ No

Comments:

2. The SDT has modified the definition for the term Frequency Bias Setting. The new definition is shown below in redline to show the changes proposed.

Frequency Bias Setting

A value, (either a fixed or variable Frequency Bias), usually expressed in MW/0.1 Hz, set into a Balancing Authority Area Control Error ~~algorithm~~ equation that allows the Balancing Authority to contribute its ~~frequency~~ Frequency ~~r~~Response to the Interconnection.

Do you agree with this new definition for Frequency Bias Setting? If not, please explain in the comment area.

☐ Yes
☐ No

Comments:

3. The proposed purpose statement in the draft standard is:

To require sufficient Frequency Response from the Balancing Authority to maintain Interconnection Frequency within predefined bounds by arresting frequency deviations and supporting frequency until the frequency is restored to schedule. To provide consistent methods for measuring Frequency Response and determining the Frequency Bias Setting.

Do you agree with this purpose? If not, please explain in the comment area.

☐ Yes
☐ No

Comments:

4. Requirement 1 identifies a minimum level of Frequency Response.

R1. Each Balancing Authority shall achieve a Frequency Response Measure (FRM) (as detailed in Attachment A and calculated on FRS Form 1) that is equal to or more negative than its Frequency Response Obligation (FRO).

Do you agree with the concept that a Balancing Authority should be required to achieve a minimum level of Frequency Response and the method for measurement? If not, please explain in the comment area.

☐ Yes
☐ No

Comments:

5. Requirement 2 identifies when the Balancing Authority must implement its Frequency Bias Setting.

   R2. Each Balancing Authority shall implement the Frequency Bias Setting (fixed or variable) provided by the ERO into its Area Control Error (ACE) calculation beginning on the date specified by the ERO to ensure effective coordinated secondary control, using the results from the calculation methodology detailed in Attachment A.

   Do you agree with this implementation? If not, please explain in the comment area.

   ☐ Yes
   ☐ No
   Comments:

6. Requirement 3 mandates that a Balancing Authority operate its Automatic Generation Control (AGC) on Tie Line Bias unless it becomes adverse to the integrity of its system.

   R3. Each Balancing Authority shall operate its Automatic Generation Control (AGC) on Tie Line Bias, unless such operation would have an Adverse Reliability Impact on the Balancing Authority's Area.

   Do you agree that a Balancing Authority should operate its AGC on Tie Line Bias unless it becomes adverse to its system? If not, please explain in the comment area below.

   ☐ Yes
   ☐ No
   Comments:

7. Do you agree with the proposed Implementation Plan for this standard? If not, please explain in the comment area.
   ☐ Yes
   ☐ No
   Comments:

8. This standard proposes to eliminate the 1% minimum Frequency Bias over a period of 4 years as outlined in the Implementation Plan. Do you agree that the elimination of the 1% minimum will bring Frequency Bias closer or equal to natural Frequency Response? If not, please explain in the comment area.
   ☐ Yes
   ☐ No
   Comments:

9. Do you agree with the drafting team that this standard should be field tested? If not, please explain in the comment area.
   ☐ Yes
   ☐ No
   Comments:

10. Attachment A of the proposed standard describes the criteria for selecting events to be analyzed. Do you agree with the criteria as described in Attached A? If not, please explain in the comment area.

☐ Yes
☐ No
Comments:

11. The proposed standard has a document attached to it that describes the SDT's reasoning for the Requirements (Attachment A - Frequency Response Background Document). Do you agree with the SDT that this document is useful and provides a clear understanding of the Requirements? If not, please explain in the comment area.
    ☐ Yes
    ☐ No
    Comments:

12. The proposed standard requires the use of FRS Form 1 for calculating a Balancing Authority's FRM. Do you agree with the SDT that this is the proper method to calculate its FRM? If not, please explain in the comment area and if possible provide an alternate method to calculate FRM.
    ☐ Yes
    ☐ No
    Comments:

13. The proposed standard requires the use of FRS Form 1 for calculating a Balancing Authority's Frequency Bias Setting. Do you agree with the SDT that this is the proper method to calculate its Frequency Bias Setting? If not, please explain in the comment area and if possible provide an alternate method to calculate Frequency Bias Setting.
    ☐ Yes
    ☐ No
    Comments:

14. The SDT has provided a document (FRS Form 1 Instructions) describing how to use FRS Form 1 for calculating FRM and Frequency Bias Setting. Do you agree with the SDT that this document provides a clear understanding of how to use the form? If not, please explain in the comment area.
    ☐ Yes
    ☐ No
    Comments:

15. The SDT is soliciting comments on methods of obtaining Frequency Response to meet the FERC Order 693 directive. If possible please provide any thoughts you may have on this subject.

    Comments:

16. If you are aware of any conflicts between the proposed standard and any regulatory function, rule order, tariff, rate schedule, legislative requirement, or agreement please identify the conflict here.

    Comments:

17. Please provide any other comments (that you have not already provided in response to the questions above) that you have on the draft standard BAL-003-1.

    Comments:

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NORTH AMERICAN ELECTRIC RELIABILITY CORPORATION

Frequency Response Standard Field Test Document

February 2011

to ensure the reliability of the bulk power system

February 2011

116-390 Village Blvd., Princeton, NJ 08540
609.452.8060 | 609.452.9550 fax
www.nerc.com

Need for a Field test

To expedite the delivery of a Frequency Response Standard[1] the draft BAL-003-1 is built upon the traditional annual Frequency Bias Setting calculation. This approach will enable using 2010 event data as a field test of specific aspects of the standard that have never been validated industry-wide. The proposed field test is intended to facilitate the delivery of a technically sound standard as soon as possible. The reasoning and approach for the components of the field test are described below. The field test will be modified if the draft standard changes on the basis of industry comments.

Frequency Bias Setting Floor

BAL-003-1 proposes to bring Frequency Bias Settings closer to Frequency Response. The drafting team proposes to reduce the minimum Frequency Bias Settings over a period of years. The drafting team proposes to establish a new minimum Frequency Bias Setting in 2011 (-0.8% of peak/0.1Hz, compared to the present -1% of peak/0.1Hz). The drafting team, NERC and the Resources Subcommittee will observe the impact on frequency and will implement a reversion plan as necessary.

Impact on other Balancing Standards

Changes in Frequency Bias Settings may have secondary impacts on calculated performance in other balancing standards. For example, with a reduced bias, L10 values tighten. The drafting team will evaluate the impact on other balancing standards.

Evaluating Other Options

The drafting team is evaluating other approaches to evaluate risk and performance obligation. This evaluation will be done in parallel during the field test period using the same underlying data and other data (such as ACE) that will be available without additional effort on the part of Balancing Authorities.

Confirm Calculation and Allocation Methodologies

While the general principles of Frequency Response are understood by Balancing Authorities, there has never been a common methodology for measuring and analyzing Frequency Response. The drafting team will evaluate the following aspects of the standard during the field test:

- The measurement methodology for Balancing Authorities with large amounts of non-conforming load. This is because the impact of non conforming load on NI_A for a small Balancing Authority can be an order of magnitude greater than the Balancing Authority's Frequency Response. The drafting team will solicit volunteer Balancing Authorities to test a

[1] On March 18, 2010, FERC Ordered NERC to deliver a performance-based Frequency Response Standard within 6 months. While FERC granted rehearing to provide time for a technical conference, the Order No 693 directives on BAL-003 must still be addressed. BAL-003-1 is one of the top priority standards for NERC in 2010.

secondary measure that may be superior for measuring Frequency Response in these situations.

- The validity of the measurement methodology for the full spectrum of Balancing Authorities (fixed vs. variable Frequency Bias Settings, large vs. small, load-only, generation-only).

- The variability of calculated Frequency Response (load's Frequency Response, governor response, plus Frequency Response from other technologies).

- Evaluate the event-selection criteria (differences in starting and settling frequency).

NERC
NORTH AMERICAN ELECTRIC RELIABILITY CORPORATION

Standards Announcement

Project 2007-12 Frequency Response
Comment Period Open February 4 – March 7, 2011

Now available at: http://www.nerc.com/filez/standards/Frequency_Response.html

Formal 30-day Comment Period Open through 8 p.m. on March 7, 2011
BAL-003-1 – Frequency Response and Frequency Bias Setting, and associated documents including the required Form 1, Instructions for Form 1, Attachment A, proposal for a field test, and implementation plan have been posted for a 30-day formal comment period.

Instructions
Please use this electronic form to submit comments. If you experience any difficulties in using the electronic form, please contact Monica Benson at monica.benson@nerc.net. An off-line, unofficial copy of the comment form is posted on the project page: http://www.nerc.com/filez/standards/Frequency_Response.html

Next Steps
The drafting team will consider all comments and determine whether to make additional changes to the standard. The team will post its response to comments and, if changes are made to the standard and supporting documents, submit the revised documents for quality review prior to the next posting.

Project Background
Frequency Response, a measure of an Interconnection's ability to stabilize frequency immediately following the sudden loss of generation or load, is a critical component to the reliable operation of the bulk power system, particularly during disturbances and restoration. The proposed standard's intent is to collect data needed to accurately analyze existing Frequency Response, set a minimum Frequency Response obligation, provide a uniform calculation of Frequency Bias Settings that transition to values closer to Frequency Response, and encourage coordinated AGC operation. There is evidence of continuing decline in Frequency Response over the past 10 years, but no confirmed reason for the apparent decline. The proposed standard requires entities to provide data so that Frequency Response in each of the Interconnections can be analyzed, and the reasons for the decline in Frequency Response can be identified. Once Frequency Response has been analyzed and confirmed, requirements can be modified to maintain reliability.

Standards Process
The Standard Processes Manual contains all the procedures governing the standards development process. The success of the NERC standards development process depends on stakeholder participation. We extend our thanks to all those who participate.

For more information or assistance, please contact Monica Benson, Standards Process Administrator, at monica.benson@nerc.net or at 609.452.8060.

Individual or group. (36 Responses)
Name (21 Responses)
Organization (21 Responses)
Group Name (15 Responses)
Lead Contact (15 Responses)
Question 1 (31 Responses)
Question 1 Comments (36 Responses)
Question 2 (31 Responses)
Question 2 Comments (36 Responses)
Question 3 (33 Responses)
Question 3 Comments (36 Responses)
Question 4 (33 Responses)
Question 4 Comments (36 Responses)
Question 5 (30 Responses)
Question 5 Comments (36 Responses)
Question 6 (33 Responses)
Question 6 Comments (36 Responses)
Question 7 (29 Responses)
Question 7 Comments (36 Responses)

-
Group
Arizona Public Service Company
Janet Smith
Yes
Yes
Yes
Yes
What is meant by discretely administered determination, under the heading "Frequency Obligation and Allocation" of Attachment A? Please explain.
Yes
Yes
As long as Appendix 1 interpretation remains in effect for WECC Auto Time Error Payback. WECC BAs operate in Tie-Line and Time.
AZPS has a few questions: 1) has frequency performance been affected by the on-going RBC field trial, 2) what steps will be taken to isolate this field trial from the effects of the RBC field trial, 3) will the frequency bias reduction to 0.8% of peak load include a CPS2 grace-period for thos BAs not involved in the RBC field trial?
Individual
Joe O'Brien
NIPSCO
Yes
No
Frequency Bias and Frequency Response are not the same thing and that may be why "F" & "R" were not capitalized in the present definition. I think the word "secondary" should appear per R2 finishing something like this: "to contribute to secondary (non-immediate)Interconnection frequency control.", removing Frequency Response altogether. (I do understand that you are bringing the FR and Bias closer together).
No
Yes, "Interconnection frequency", small "f".
No

Yes and no, similar to BAL-002 I think this should read "Each Balancing Authority or Reserve Sharing Group shall ....., With so many BA's I believe the RSGs will be play a big role in this compliance ... This comment applies to only R1,
Yes
I guess the ERO will calculate the Bias, interesting.
No
Yes, It was proposed that AGC be replaced by Automatic Resource Control (ARC) in the standards but did not pass. The SDT may want to monitor this related effort.
No
"Effective Date" section at the top of the Standard does not match the Implementation plan; I think there is an R4 missing in the second part of 1.3 . In the implementation plan add RSG to "Compliance with the Standards" 5 year phase-in on removing the 1% is a good idea
Individual
John Canavan
NorthWestern Energy
Yes
Yes
Yes
No
A Balancing Authority's frequency response is based upon a "median" value calculated from analyzing multiple events. Frequency response during some of these events is better than others, depending on the system conditions at the time and the amount system loading and unloaded generation online at the time of the event. Given these circumstances a BA's actual response could vary by event (better or worse than median), thus compliance measurement per event to a frequency response obligation based on the median response (over multiple events) could put BA's in non-compliant situations unjustly.
Yes
Yes
Yes
Individual
Howard F. Illian
Energy Mark, Inc.
No
Comment 1: I agree with the definition of the Single Event Frequency Response Data. Comment 2: I do not agree that the Frequency Response Measure should be the median of all SEFRD observations reported annually on FRS Form 1. Comment 3: The regression values presented on FRS Form 1 have not been calculated correctly. Comment 4: Since the FRM is going to be used to set the value for the Frequency Bias Setting and the Frequency Bias Setting represents a straight line though the origin of zero frequency error and zero megawatt error, the best representation of the data for setting this paramater can be achieved through the use of a regression. Comment 5: Only a regression will weight the impact of each SEFRD correctly. The use of median or mean will not provide the best estimate for use as the Frequency Bias Setting. Comment 6: The standard has been written to include a samlple size (25) large enough to enable effective statistical methods of analysis. What justification is there to then ignor those well proven methods and revert to methods designed to address problems where the sample sizes are insufficient to support sound statistical analysis methods.
No
Comment 7: The definition should be: "A value, (either a fixed or variable Frequency Bias), usually expressed in MW/0.1 Hz, set into a Balancing Authority Area Control Error equation that indicates to the Balancing Authority its contribution of Frequency Response to the Interconnection. Comment 8: The Frequency Bias Setting does not allow or disallow the Frequency Response to be contributed. The BA will contribute its natural Frequency Response to the interconnection through the independent actions of its loads and generators. The only influence that the Frequency Bias Setting has is that it causes the AGC System, and hopefully other outer-loop control systems, to include that natural Frequency Response when developing control actions to implement through AGC in response to BA balancing requirements in a time frame well after the Frequency Response has been provided by the independent actions of its loads and generators.

Yes
No
Comment 9: I agree that each BA should be required to provide a minimum level of Frequency Response to provide for its share of the total Frequency Response required for interconnection reliability. Comment 10: I also agree with the methods used to measure SEFRD subject to my comments on FRS Form 1. Comment 11: I do not agree that the method suggested for setting the FRO will achieve the desired goal of maintaining interconnection reliability. The measurement method offered only evaluates the supply of Frequency Response. It does not evaluate the demand (need) for Frequency Response. Since frequency error is the difference between the demand and supply any effective measure for maintaining reliability due to frequency error must include both the demand and supply parts of this balance. As a consequence, the method will be blind to changes (good or bad) in the demand for Frequency Response. Changes in the demand for Frequency Response will require subsequent changes in the supply for Frequency Response that this standard fails to address until the following year and leaves the interconnection at risk for unreliable operation. Comment 12: The requirements associated with Frequency Response as defined in this standard will not assure interconnection reliability. Frequency Response is a two part service. The first part of this service is the rate at which energy is supplied in proportion to frequency error. This first part is commonly represented as the Frequency Response and the corresponding Frequency Bias Setting. The second part of the service is the amount of capacity that the BA stands ready to supply at this stated proportion in response to frequency error. Failure to effectively specify and measure the amount of capacity that the BA stands ready to supply at the stated proportion could put the interconnection at reliability risk when the required amount of capacity is not included in the operating plan.
No
Comment 13: I agree that the BA shall implement the Frequency Bias Setting provided by the ERO into it Area Control Error (ACE) calculation beginning on the date specified by the ERO to ensure effective coordinated secondary control. Comment 14: I do not agree that the results from the calculation methodology detailed in Attachment A will provide the correct Frequency Bias Setting. My comments on the calculation methodology are included elsewhere in my comments on Attachment A and FRS Form 1.
No
Comment 15: Requirement 3 as written is unenforceable because it is too difficult to define “unless such operation would have an Adverse Reliability Impact on the Balancing Authority’s Area.” Comment 16: What if operation out of Tie line Bias control does not have an Adverse Reliability Impact on the Balancing Authority’s Area, but does have an Adverse Reliability Impact on another BA? Comment 17: A document follows that provides an initial starting justification for the elimination of this Requirement. See following “Requirements for AGC Operation, January 25, 2011.” Requirements for AGC Operation, January 25, 2011 Introduction: As of the date of these comments there are two requirements in the NERC Standards that address the operation of AGC. The first is in BAL-003-0.1b – Frequency Response and Bias, Requirement R3. R3. Each Balancing Authority shall operate its Automatic Generation Control (AGC) on Tie Line Frequency Bias, unless such operation is adverse to system or Interconnection reliability. The second is in BAL-005-0.1b – Automatic Generation Control, Requirement R7. R7. The Balancing Authority shall operate AGC continuously unless such operation adversely impacts the reliability of the Interconnection. If AGC has become inoperative, the Balancing Authority shall use manual control to adjust generation to maintain the Net Scheduled Interchange. These requirements are misdirected and, for compliance purposes, they are difficult to measure effectively. This paper provides the technical basis for replacing these requirements with new requirements that will not only achieve the intent of these requirements, but do so in a more effective and measurable manner. Background: Automatic Generation Control (AGC) is a computer control system contained in the Control Center EMS that performs a number of critical functions related to the balancing function necessary to maintain frequency and associated reliability. Among the functions it performs are: 1) the collection of telemetered and local data useful for determining the appropriate control actions, 2) the calculation of Area Control Error (ACE), 3) determination of desired control actions that should be sent to those resources available for automatic dispatch, and 4) sending the actual control signals to implement that dispatch. Most AGC Systems have three basic modes of operation, 1) Tie-line Frequency Bias, 2) Constant Net Interchange and 3) Constant Frequency. The ACE Equation is the basis for all three modes of operation. In the Tie-line Frequency Bias mode, all of the ACE Equation is used as an input to control action determination. In the Constant Net Interchange mode, only the Tie-line Error portion of the ACE Equation is used as an input to control action determination. The Constant Net Interchange mode would normally be used when there is no information available to indicate interconnection frequency. In the Constant Frequency mode, only the Frequency Bias portion of the ACE Equation is used as an input to control action determination. The Constant Frequency mode of operation would be used when the Tie-line Error is known to be misleading, inaccurate or unavailable. It is also used when there are no tie-lines in service as in the case of a single BA interconnection or during islanded operation. AGC Systems have been used in the industry since before the development of digital computers. Initially AGC Systems did little more than send instructions to generators based on evaluation of the ACE Equation. They have become more sophisticated since their inception and implement greater complexity in their evaluations of appropriate dispatch actions to the point that they include forecasting, reliability and economics within their algorithms. Modern AGC Systems determine control actions based on the collection of much more data than is included in the ACE Equation. This additional data includes: short-term load forecasts and forecast error estimates as influenced by weather; individual

non-conforming load forecasts and forecast error; forecast interchange transaction information; generating unit ramp and response rates; generating unit economic operating points including valve position; generating unit incremental economic costs including start-up and maintenance; Hydro unit river flow limits as related to the operation of other units on the same waterway; energy storage capabilities and available energy; Inadvertent Interchange energy account balances; time error; and current control performance scores. As AGC Systems have evolved, the control mode in which they are operating, Tie-line Frequency Bias, Constant Net Interchange, or Constant Frequency, provides less and less information about the control actions that they implement. In a modern AGC System the control mode provides little information about how control actions are being determined and implemented. In fact, only someone experienced in AGC programming and implementation would have the knowledge necessary to determine whether or not an AGC System is providing reasonable control actions or control actions consistent with Tie-line Frequency Bias Control. Even someone with the necessary experience observing the operation of a modern AGC System for a short period of time will be incapable of determining whether or not that system is providing effective or adequate control. Therefore, neither of the two requirements is effectively enforceable from a practical point of view. Perspective: A couple of examples are offered to add perspective to the problem. Example 1: R3 includes the requirement, “Each Balancing Authority shall operate its Automatic Generation Control (AGC) on Tie Line Frequency Bias, unless such operation is adverse to system or Interconnection reliability.” There are three conditions when operation on Tie-line Frequency Bias control may be adverse to the system or Interconnection reliability. 1. The first is when the Tie-line Error data used in the ACE Equation is incorrect. The ACE Equation will be incorrect when there are errors in the Actual or Scheduled Tie-line flow values. This condition will occur when there is telemetry failure of one or more tie-lines, when there is an unidentified scheduling error, or when there is a separation that causes a tie-line metering point to be located on a separate island due to interconnection separation or islanding. Telemetry failure will be indicated by the quality bits associated with the Tie-line telemetry. If AGC is disabled to identify a scheduling error, there should be an operating log entry. If AGC is disabled because of a separation, there will also be a log entry. 2. The second is when the actual frequency is determined to be incorrect. If measured frequency is incorrect, this condition should be indicated by an operating log entry and transfer to the redundant frequency device to provide measured frequency. When the actual frequency fails, this condition will be indicated by the quality bits associated with the measured frequency value and transfer to the redundant frequency device to provide measured frequency. 3. The third is when operation of AGC would provide control different from the desired control to address some emergency condition in the BA or elsewhere on the interconnection. If the operation of AGC would be adverse to system or Interconnection reliability and is disabled for this reason, this condition should be indicated by an operating log entry. In all cases, there should be a record of the reason for the use of other than Tie-line Frequency Bias control and records indicating the reason for the use of other control modes. In all cases, other than the third indicated above, an error in the value of ACE is the reason for not using Tie-line Bias Control and the quality bits for ACE or ACE component data should provide a reasonable explanation for the condition. The third case occurs with such infrequency that there should be no need for a special rule to address this condition. Example 2: R7 includes the requirement, “…If AGC has become inoperative, the Balancing Authority shall use manual control to adjust generation to maintain the Net Scheduled Interchange.” Cases have been observed of an AGC System that does not perform as well as the manual dispatch used when the AGC System is inoperative. If a BA has a CPS1 score of 120% when using AGC and a CPS1 score of 125% when performing manual dispatch, should that BA be penalized for not having its AGC continuously operating? What is the goal? Is the goal to operate on AGC regardless of the result or is the goal to operate in a manner that provides the best measured control? Alternatives: Since these requirements are not effectively measurable or enforceable, can a requirement or requirements be written to provide an equivalent to the intent of the old requirements addressing AGC operation? The industry has three alternatives to address this issue: 1. Retain requirements that are directed at the AGC System understanding that they are effectively not measureable or enforceable. 2. Eliminate requirements that are directed at the AGC System with the understanding that they were not contributing to reliability. 3. Determine an alternative method to evaluate, measure and enforce a requirement that will achieve a goal similar to the goal originally intended by the implementation of the AGC System requirements. Elimination of the requirement is an appropriate solution. However, if it is determined that a replacement measure is required, then the solution to this problem lies with the third alternative above. Solution: There is already a requirement that effectively enforces the intent of the above requirements. Instead of requiring the BA to control in a particular manner, CPS1, BAAL and DCS require the BA to achieve specific results with their control actions. All three measures require the BA to calculate ACE using Tie-line Frequency Bias for determination of their Reporting ACE. The requirements specify that at least 50% of the data must be valid for the one-minute average data to be included in the measures. The requirements for redundant frequency measurement devices assure that the BA will have the actual frequency data available to perform the necessary calculations. The data retention requirements specify the data they must retain to demonstrate that their control achieved the stated goals. Finally, this approach is consistent with the White House Executive Order on Improving Regulation and Regulatory Review in Section 1(b)(4) stating that regulatory agencies must: “to the extent feasible, specify performance objectives, rather than specifying the behavior or manner of compliance that the regulated entities must adopt;…”

No

Comment 18: The Proposed Effective Date in the implementation plan is inconsistent with the Effective Data in the Draft Standard. Comment 19: The completion of the implementation plan does not occur until 2015. This lengthy plan stems from a standard that only measures reliability annually and provides only an annual window for changing parameters such as Minimum Frequency Response. Alternative methods that measure reliability more frequently could me implemented with a shorter implementation plan.

Group
Northeast Power Coordinating Council
Guy Zito
Refer to the response to Question 17.
Refer to the response to Question 17.
Refer to the response to Question 17.
Refer to the response to Question 17.
Refer to the response to Question 17.
Refer to the response to Question 17.
Refer to the response to Question 17.
Individual
Si Truc PHAN
Hydro-Quebec TransEnergie
No
The proposed method is good to measure frequency response at point “B”. However, point “C” is not taken in consideration in this measure. As for the FRO, a N-2 criteria is more stringent for an Interconnection with less units than a large Interconnection. The risk associated with coincidental events is much higher in a large Interconnection. For this reason, we believe that N-1 criteria should be considered for a small Interconnection like Quebec.
Yes
However the “Tie Line Bias” AGC mode is not appropriate for a Single Balancing Authority operating in an Interconnection. HQT uses the Flat Frequency mode.
Individual
Isaac Read
Beacon Power Corporation
Yes
Yes
Yes
The concept of requiring each Balancing Authority to achieve some level of Frequency Response and calculate it consistently is appropriate and necessary.
Yes
As R3 has not significantly changed, will the Interpretation of Requirement 3 from BAL-003-0.1b still be applicable to BAL-003-1?
No
Why is it appropriate to delay implementation of this standard for over 12 months after applicable approval? This seems an unnecessary delay considering the intent to operate under a field test. Similarly, delaying implementation of R2 for over 2 years seems unnecessary. Based on the suggested schedule for measuring FRM and implementing Frequency Bias Settings, there may be rationale to implement the standard on the first calendar year following approval. However, delays beyond the beginning of the next calendar year should require conclusive justification.
Group
Southern Company
Cindy Martin
Yes
Comments: The Frequency Response Measure should be based on either the median or average of all SEFR’s as currently defined. Due to the varied nature of frequency responsive resources online it should never be based on meeting response on a single event.
Yes

Frequency Bias Setting A value, (either a fixed or variable Frequency Bias), usually expressed in MW/0.1 Hz, set into a Balancing Authority Area Control Error algorithm equation that allows the Balancing Authority to contribute its frequency Frequency rResponse to the Interconnection. Comments: Not sure the word “allows” is the right word. Perhaps use something in terms of preventing withdrawal of Primary Frequency Response with words like “…equation that prevents the withdrawal of the Balancing Authority’s Primary Frequency Response to the Interconnection.”
Yes
No
Comments: Proposed Standard Comment 1: BAL-003-1, Requirement R1. The requirement should be made less prescriptive by removing references to Attachment A and FRS Form 1. The responsible entity should understand the fundamental and basic requirement – to achieve a Frequency Response Measure. Where the methodology is specified or how the BA is supposed to achieve it should be a matter of compliance and/or implementation and not a part of the basic requirement. Proposed language is as follows: Each Balancing Authority shall achieve a Frequency Response Measure (FRM) that is equal to or more negative than its Frequency Response Obligation (FRO).
No
Comments: Comment 2: BAL-003-1, Requirement R2. The requirement should be made less prescriptive by removing references to the calculation methodology and Attachment A. The responsible entity should understand the fundamental and basic requirement – to implement the Frequency Bias Setting into its Areas Control Error calculation. Proposed language is as follows: Each Balancing Authority shall implement the Frequency Bias Setting (fixed or variable) provided by the ERO into its Area Control Error (ACE) calculation beginning on the date specified by the ERO to ensure effective coordinated secondary control. Comment 3: BAL-003-1, Requirement R2 and Section 1.4 Additional Compliance Information. The SDT should consider whether or not the ERO has compliance obligations pursuant to the obligations mentioned in the proposed Standard. Requirement R2, states that the ERO should provide the BA with the Frequency Bias Setting and the specified date to begin the calculation. The R1 Supplemental Information section states that the ERO is obligated to post the official list of events. The R2 Supplemental Information section states that the ERO is obligated to validate the FRM and Frequency Bias Settings and disseminate the Frequency Bias Settings Report along with the implementation date. These obligations should be confirmed and properly incorporated into Standard if appropriate.
No
Comments: Agree only to the extent that an accurate frequency measurement is available to the BA. If not frequency measurement is available, then that should be considered an adverse condition and thus TLB is not appropriate. In other words, one small BA maintaining TLB may not cause the condition in the Glossary definition of Adverse Reliability Impact but it is still not appropriate for them to stay on TLB.
Yes
We did not want to vote on Question 7, but clicked 'yes' in error.
Individual
Bryan Taggart
Westar Energy
No
For FRM, why is median used rather than average? The method in the standard for dsetermining FRM needs to allow for excluding some events due to non-conforming loads, scan rates, intermittent resources, large interchange ramps, etc that may cause the actual response during the 16 seconds to actually be opposite of the expected response.
No
We propose the following: A value, (either a fixed or variable), expressed in MW/0.1 Hz, set into a Balancing Authority Area Control Error equation that allows the Balancing Authority to contribute its SECONDARY Frequency Response to the Interconnection.
Yes
No
The lagging measure is a concern. The ERO should be required to provide an updated proposed/possible list of frequency events monthly so BA's can determine their FRM through out the year so corrective action can be taken if needed. Prior year events should be excluded (just to get to 25 events). This could result in begin non-compliant twice for the same events.
Yes
Yes
Yes
Yes, if field testing validates the standard.

Individual
Thomas Washburn
FMPP
Yes
Yes
Yes
No
The proposed Requirement 1 states: Each Balancing Authority shall achieve a Frequency Response Measure (FRM) (as detailed in Attachment A and calculated on FRS Form 1) that is equal to or more negative than its Frequency Response Obligation (FRO). Attachment A states that if a year occurs in which there are not 25 events that meet the remaining criteria below, then the most recent 25 events (as defined below) will be used for determination of an entity's compliance with the FRM requirement and storage of SEFRD. Problem – by using events from last year to determine an entity's compliance with a Requirement for this year puts the entity in double jeopardy for last year's events, which were already used for compliance for last year.
Yes
Yes
Group
Santee Cooper
Terry L. Blackwell
No
We suggest the SDT consider defining SEFRD as: The calculated frequency response by a Balancing Authority for a specific frequency excursion event as identified by the ERO (or NERC). As a comment, how frequency response is calculated needs to be defined and may not always be the Net Actual Interchange (NIa) divided by the change in frequency expressed in hertz. For example, the NIa may need to be adjusted for known generation and load changes that do not represent frequency response for the period being measured such as known generation and load ramp changes. Change in frequency needs to be more specific, such as the frequency difference between B and A measured at B. If Frequency Response Obligation (FRO) is a targeted value, then perhaps the definition should be: The Balancing Authority's annual median frequency response as assigned by the ERO (or NERC). The word "contribution" should be considered to be replaced with "the balancing authority piece of the total….." The review team is concerned that the FRO and FRM definitions do not contain enough clarity as to how the BAs will be held accountable. Also, the definitions do not explain who will determine the value of each BA's FRO and the method used to determine the FRO value. Should the definition of Frequency Response Measure be a median or mean value?
No
We suggest the following changes to the definition: A value, fixed or variable, expressed in MW/0.1 hertz, as part of a Balancing Authority's Area Control Error (ACE) equation that influences its Automatic Generation Control (AGC) to provide frequency response without secondary control action withdrawing the response.
Yes
No
The concept seems reasonable but since the measure of compliance (FRM) is determined only after the 25 events are identified; it is a lagging indicator. The BA may have to ensure it measures all frequency excursions and develops its own leading indicator to ensure compliance following year end.
No
It is not clear what the methodology (should be method) is in Attachment A. Is the frequency bias setting the BA's prior year FRM with a minimum value being a percentage of estimated yearly peak load or upcoming year maximum generation? What does "provided by the ERO" mean? Perhaps it should be verified or approved by the ERO (NERC).
No
BAL-003-0, Requirement 3 requires operation of AGC on Tie Line Frequency Bias. BAL-005-0.1b, Requirement 6 requires the BA to compare total Net Interchange to total Net Scheduled Interchange plus Frequency Bias obligation to determine the Balancing Authority's ACE. We suggest that Requirement 3 be restated to "shall operate its Automatic Generation Control (AGC) on Tie Line Frequency Bias, unless ....." Tie Line bias is the (Ia-Is) term and frequency bias is the -10B(Fa-Fs) term.

No
The implementation plan has specific dates for reducing the bias settings currently defined in Requirement 5 over several years. Perhaps these dates should not be specific but tied to months following regulatory approval. Attachment A should be modified to match what is in the proposed standard. The values currently shown as percent “of peak/0.1 Hz” should be changed to percent of estimated yearly peak demand per 0.1 Hz change. For BAs that do not serve native load, percent “of upcoming years maximum generation/0.1 Hz should be changed to percent of its estimated maximum generation level in the coming year/0.1 Hz change.
Individual
Chris Adams
EKPC
No
These definitions should be revised to include specifics on how to calculate each term. The FRM calculation method should take into account large non-conforming loads. A median will not reflect the true nature of the system.
No
"Frequency Bias” should not be used in the definition. "Usually" can be omitted.
Yes
No
The method for measurement is not detailed. Also, the method indicates a lagging indicator. Hows is the BA to ensure its compliance through the year?
No
The method is not clear in Attachment A.
No
Tie line bias is calculated using (NAI-NSI) while frequency bias is -10B(FA-FS).
No
Specific dates should be tied to regulatory approval.
Individual
Kathleen Goodman
ISO New Engand Inc.
No
If this is really intended to be a Field Trial, it should be written as such and the standard should not be developed or promulgated until the Field Trial has accomplished its purpose and the performance criteria and measures have been determined. The standard should be put into place later; it is premature at this time. Since this is to be a data gathering process to be used to determine appropriate performance parameters, the purpose statement of the Field Trial should be changed to read as follows: To determinerequire sufficient Frequency Response arranged by from the Balancing Authority to maintain Interconnection Frequency within predefined bounds by responding to and arresting frequency deviations and supporting frequency until the frequency is restored to schedule. To identify and establishprovide consistent methods for measuring Frequency Response and determining the Frequency Bias Setting and Frequency Response Obligation. We should not write the new standard and its requirements until this Field Trial work has been accomplished; to do so possibly would result in difficulty changing the standard requirements based upon Field Trial results. Further, while we do not have any issue with the general intent of the scope statement, we have a difficulty seeing the BA being the only entity held responsible for maintaining interconnection frequency and arresting frequency deviations. When there is a sudden and sizable change to system resource or demand, the first response to a frequency deviation caused by this change would be the generators’ governors. This will provide a mitigating effect for the immediate seconds up to minutes. The frequency bias setting will then kick in to supplement the mitigation need. The governors are owned by the Generator Owners; the BAs do not own these facilities and hence can do little to address frequency response during this initial period. To hold only the BA responsible for maintaining interconnection frequency and arresting frequency deviations would be inappropriate. The industry needs to have a discussion to determine who should be held responsible for providing governor responses immediately following an event, and by what mechanism, and for implementing additional measures thereafter. We suggest that BAL-003 development be withheld until this discussion takes place and a decision is made on who and how the governor response shall be provided.
No
We have a difficulty seeing the BA being the only entity held responsible for maintaining interconnection frequency and arresting frequency deviations. When there is a sudden and sizable change to system resource or demand, the first response to a frequency deviation caused by this change would be the generators’ governors. This will provide a mitigating effect for the immediate seconds up to minutes. The frequency bias setting will then kick in to supplement the

mitigation need. The governors are owned by the Generator Owners; the BAs do not own these facilities and hence can do little to address frequency response during this initial period.
No
Single BA Interconnections do not operate on Tie Line Bias. The requirement should be modified to accommodate this or regional variances should be written by the SDT to address existing differences. In addition this requirement, as written, does not provide for momentary cessation of AGC for any reason, nor for reasonable system maintenance, repair, or updates. As written, it seems to say that any duration of operation off Tie Line Bias is unacceptable and, thus, would be a violation.
No
We do not agree that a meaningful Implementation Plan can be developed until such time as the data gathering/field testing is completed. Therefore, we believe this Standard may be premature.
Individual
Hao Li
Seattle City Light
Yes
Yes
Yes
Yes
No
Currently a Balancing Authority has only about one month over holiday periods(December 10 to January 10) to assemble its data and calculate the Frequency Response Measure (FRM). Further, Attachment A requires the ERO to use at least 25 events for the calculation of FRM. Seattle City Light (SCL) believes that one month is insufficient time given the number of events required. So SCL recommends additional time, such as two months or to reduce the number of events to be included in annual reviews.
Yes
Yes
Individual
Kasia Mihalchuk
Manitoba Hydro
Yes
Yes
Yes
The new more likely improved method of measuring Frequency Response is welcome. This should be an improvement over the existing methods of using 1% of projected peak load, or average of DCS events. Calculating projected peaks leave lots of room for error and limiting calculations to only DCS events likely does not reflect accurate BIAS.
Yes
Yes
The implementation schedule seems reasonable.
Yes
Yes
Group
MRO's NERC Standards Review Subcommittee
Carol Gerou

No
For Frequency Response Measure, the drafting team should consider using average rather than median. Because median is literally the middle value, a Balancing Authority could have 12 really bad Single Event Frequency Response Data and still comply. Average values would prevent this from happening. Should FRM be clear that it includes at least 25 events in the definition? While that can be garnered from Attachment A, it is not specified in the Form 1 instructions. We are concerned that the regulators may argue that 25 events do not apply because an attachment is not part of the standard.
No
Given that frequency response is “contributed” long before AGC has an impact, “contribute” should probably be changed to “maintain”. The goal is to ensure AGC does not withdraw frequency response and that it is maintained while frequency is depressed. We are not sure if Frequency Response has a precise enough definition and it is part of the definition of Frequency Bias Setting. The definition of Frequency Response really just reflects how it is measured. It does not define what it really is which is the dynamic response of load, generation, and other frequency responsive devices to a perturbation in frequency. The drafting team should also consider resolving the definition of Frequency Bias. Is it needed? It is often confused with Frequency Bias Setting and is often used interchangeably with Frequency Response even though the meanings are slightly different.
No
In general, we don’t have significant issues with a standard that attempts to establish a minimum Frequency Response performance level. However, we caution the drafting team that the minimum level established needs to be determined based on an extensive data analysis based on the field trial, based on the Frequency Response Initiative Work Plan that NERC filed in response to the Commission’s September 23 technical conference and based on the plan outlined in NERC’s October 25, 2010 compliance filing.
No
In general, we don’t have significant issues with a standard that attempts to establish a minimum frequency response performance level. However, we caution the drafting team that the minimum level established needs to be determined based on an extensive data analysis based on the field trial, based on the Frequency Response Initiative Work Plan that NERC filed in response to the Commission’s September 23 technical conference and based on the plan outline in NERC’s October 25, 2010 compliance filing. The effects of the nonconforming load should be considered in the calculation of the frequency response obligation in order to get accurate results.
No
Flexibility established in the date is better than the existing currently defined date in the standards. It is better to allow the ERO to specify the date to allow some flexibility in implementation. It appears that the responsible for identifying Frequency Bias Setting is being removed from the Balancing Authority. There is an implied obligation that the ERO will determine the Frequency Bias Setting but it is not stated explicitly. Thus, we are left wondering who has the responsibility for determining the Frequency Bias Setting. Frequency Response of the interconnection is constantly changing. As a result, the Frequency Bias Setting will never match the Frequency Response exactly. It is better to overbias than underbias to prevent withdrawal of frequency response by AGC. Historically, the 1% floor for frequency bias setting was chosen to ensure that BAs are always over-biased. The standard needs to allow some margin in the frequency bias setting to ensure that the bias setting is overbiased.
Yes
No
We agree with the plan to phase out BAL-003-0.1b R5 over a period of years rather than abruptly terminate it because it will take several years to assess the impact. We recommend a wording change to the implementation plan. Please change ‘BAL-003-0 Requirement 5 should be retired as outlined in the following table,” to “BAL-003-0.1b Requirement 5 should be phased out by reducing the minimum frequency bias setting per the table.” It is not clear if the minimum frequency bias setting can be modified without modifying the existing BAL-003-0.1b standard. Is this being accomplished through the field trial? The implementation plan makes no mention of a field trial. It should. Please change all BAL-003-0 to BAL-003-0.1b.
Group
LG&E and KU Energy
Brent Ingebrigtson
No
We suggest the SDT consider defining SEFRD as: The calculated frequency response by a Balancing Authority for a specific frequency excursion event as identified by the ERO (or NERC). As a comment, how frequency response is calculated needs to be defined and may not always be the Net Actual Interchange (NIa) divided by the change in frequency expressed in hertz. For example, the NIa may need to be adjusted for known generation and load changes that do not represent frequency response for the period being measured such as known generation and load ramp changes. Change in frequency needs to be more specific, such as the frequency difference between two physical locations B and A measured at B. Frequency deviation used in the calculation needs to be the deviation observed by the BA performing the calculation. If Frequency Response Obligation (FRO) is a targeted value, then perhaps the

definition should be: The Balancing Authority's annual median frequency response as assigned by the ERO (or NERC). The word "contribution" should be considered to be replaced with "the balancing authority piece of the total….." The standard does not explain who will determine the value of each BA's FRO nor the method used to determine the FRO value. Should the definition of Frequency Response Measure be a median or mean value?
No
We suggest the following changes to the definition: 1. Delete the word "usually" 2. Replace "set into" with "as part of". 3. Replace the remainder of the sentence following "Area Control Error equation" with "that influences its Automatic Generation Control (AGC) to provide its frequency response while Interconnection frequency is not at its scheduled value" – (The frequency bias does not allow a BA to contribute its frequency response to the Interconnection. The frequency bias term only affects the AGC response of the BA, which is part of its frequency response usually minutes after the initial event and is dependent upon generation units being on AGC control and capable of responding.) 4. The suggested changes would result in the following definition: A value, (either a fixed or variable Frequency Bias), expressed in MW/0.1 hertz as part of a Balancing Authority's Area Control Error (ACE) equation that influences its Automatic Generation Control (AGC) to provide its frequency response while Interconnection frequency is not at its scheduled value.
No
The proposed purpose statement as provided in this question is not the same as the purpose statement for BAL-003-1 as posted on the Project 2007-12 page of the NERC website. The posted purpose on the NERC website is: To require sufficient Frequency Response from the Balancing Authority to maintain Interconnection Frequency within predefined bounds by arresting frequency deviations and supporting frequency until the frequency is restored. To schedule and provide consistent methods for measuring Frequency Response and determining the Frequency Bias Setting. The version posted in the question appears to correct errors in the last sentence of the purpose statement given in the project page. We do not agree with the purpose statement as posted on the project page. In addition, we suggest the following edits to what appears to be a corrected purpose statement as provided in this question: To require sufficient Frequency Response from the Balancing Authority to maintain Interconnection Frequency within predefined bounds by arresting frequency deviations due to contingencies on the interconnected BES and supporting frequency until the frequency is restored to schedule. To provide consistent methods for measuring Frequency Response and determining the Frequency Bias Setting. As NERC/FERC has differentiated Frequency Response from Frequency Regulation, the standards addressing Frequency Response should clearly be related to unplanned contingencies occurring on the interconnected BES.
No
The concept seems reasonable but since the measure of compliance (FRM) is determined only after the 25 events are identified; it is a lagging indicator. The BA may have to ensure it measures all frequency excursions and develops its own leading indicator to ensure compliance following year end. A sample CPS bounds report should be considered, perhaps based on 2010 numbers, to demonstrate how FRM submitted would translate to FRO frequency bias settings and how it will affect the L10 values
No
It is not clear what the methodology (should be method) is in Attachment A. Is the frequency bias setting the BA's prior year FRM with a minimum value being a percentage of estimated yearly peak load or upcoming year maximum generation? What does "provided by the ERO" mean? Perhaps it should be verified or approved by the ERO (NERC).
No
BAL-003-0, Requirement 3 requires operation of AGC on Tie Line Frequency Bias. BAL-005-0.1b, Requirement 6 requires the BA to compare total Net Interchange to total Net Scheduled Interchange plus Frequency Bias obligation to determine the Balancing Authority's ACE. We suggest that Requirement 3 be restated to "shall operate its Automatic Generation Control (AGC) on Tie Line Frequency Bias, unless ....." Tie Line bias is the (Ia-Is) term and frequency bias is the -10B(Fa-Fs) term. This should be coordinated with BARCSDT modifications to BAL-005.
No
The implementation plan has specific dates for reducing the bias settings currently defined in Requirement 5 over several years. Perhaps these dates should not be specific but tied to months following regulatory approval. Attachment A should be modified to match what is in the proposed standard. The values currently shown as percent "of peak/0.1 Hz" should be changed to percent of estimated yearly peak demand per 0.1 Hz change. For BAs that do not serve native load, percent "of upcoming years maximum generation/0.1 Hz should be changed to percent of its estimated maximum generation level in the coming year/0.1 Hz change
Group
Progress Energy
James Eckelkamp
No
The proposed definition for SEFRD assumes that there is no change in the Net Scheduled Interchange (NIS) as a result of the event. However, a dynamic schedule for load or generation based on data obtained with a two second scan rate will impact the NIS, and therefore the corresponding load or generation response will offset the change to NIA. Therefore, the definition of SEFRD should replace "NIA" with "change in NIA minus NIS".

No
A bias, either fixed or variable, usually expressed in MW/0.1 Hz, included in a Balancing Authority's Area Control Error equation to account for the Balancing Authority's Frequency Response contribution to the interconnection, and prevent response withdrawal through secondary control systems. The changes suggested are to clarify that biasing of the ACE equation "allow[s]" primary frequency response to continue beyond the initial event window by accounting for it in the ACE input to secondary control systems (i.e. AGC). It's important to note that Primary Frequency Response will occur no matter what the Bias value is set to in the ACE equation, and biasing "supports" the response until the frequency is restored".
Yes
No
Progress Energy believes the Eastern Interconnection does not have the same issues with frequency experienced in the other two interconnections, and that load response is significant enough in the interconnection to arrest and stabilize frequency as long as BAs do not withdraw that effect (accurate biasing of the ACE equation). We also believe this standard should reference standrd PRC-024 related to accurate relay settings to allow out of bounds operations related to frequency and voltage deviations.
Yes
Yes
No
We agree with the graduated implementation for the FRO portion of the standard, but feel NERC needs to losen the minimum frequency bias requirement immediately so that it matches the newly required frequency response. There are also other areas within the EMS the besides BA's frequency bias that should be addressed such as secondary frequency response systems that should also be included in this standard. Additionally, if the industry was truly concerned with matching bias values to actual response, they would swich to variable frequency bias. Variable bias requires additional up front work along with general maintenance, but it truly is the best way to accurately bias the ACE equation.
Individual
JC Culberson
ERCOT
No
The definition of SEFRD will not work as described for a single BA Interconnection. There is no change in NI for frequency deviations. Similarly, the definition assumes all response is provided by change in Interchange and does not really reflect the frequency response of a contingent BA. Either the definition needs to be changed to accommodate single BA Interconnections (such as ERCOT and Hydro Quebec), or regional variances for them need to be written by the SDT. A BA’s frequency response is composed of load frequency response, governor response, and, for BAs external to the resource loss, change in Net Interchange. Some approximation may be achieved by recognizing that the magnitude of frequency deviation is attenuated by load frequency response and governor response (or frequency activated demand response to reduce load). The definition of FRM specifies the median of all SEFRD observations reported annually. What is the technical basis for selecting the median rather than the mean? The definition of FRO raises questions. The discretely administered determination of FRO described in the draft Attachment A sets too stringent a requirement; particularly for the smaller Interconnections which may also have large size generation resources just as do the larger Interconnections. To “assure that Point C will not encroach on the first step UFLS” is significantly more stringent than existing and historical performance for those smaller Interconnections. Such assurance will assuredly prove to be very expensive. In fact, we question the need to define FRM and FRO since they can easily be stipulated in the standard requirements. Having them defined and added to the ever-growing NERC glossary creates unnecessary work to maintain the glossary, unless these terms are used by other NERC standards for which consistent meaning need to be established. For example, R1 can easily be reworded as: “R1: Each Balancing Authority shall achieve a median of all Single Event Frequency Response Data observations reported annually on FRS Form 1 that is equal to or more negative than its contribution obligation to the total aggregate Frequency Response needed for reliable operation of an Interconnection assigned by the ERO.” Similar wording changes can be made to the FRS Form 1 to eliminate the need to define these two terms. Further, the Attachment A states that the SDT is evaluating a risk based approach to establishing an Interconnection Frequency Response Obligation which can be based on a probability function. If the N-2 criteria is established, it will be unlikely to be possible to change that if the new approach is viewed as a reduction in required performance. As an example, in the ERCOT Interconnection, it is recognized that the present level of required frequency responsive reserve cannot in all scenarios assure that Point C will not encroach the first step of UFLS. The system conditions that exist for the encroachment to occur represent a small likelihood and would require the N-2 contingency to occur on something like the minimum hour of the minimum load day of the year. It has occurred one time in the history of ERCOT. Thus, it is less than once in ten years based upon actual history. The cost of precluding such an event would be astronomical.

No
The definition appears to be accurate, but where is “fixed” and “variable” Frequency Bias defined in the context of these requirements? Should it be Frequency Bias Setting, instead? “Fixed” seems to be straightforward, but what is “variable”? How often must Frequency Bias Setting change in order to be considered to be “variable”?
No
If this is really intended to be a Field Trial, it should be written as such and the standard should not be developed or promulgated until the Field Trial has accomplished its purpose and the performance criteria and measures have been determined. We request that the results of the Field Trial should be published and discussed BEFORE any changes are made. The standard should be put into place later; it is premature at this time. Since this is to be a data gathering process to be used to determine appropriate performance parameters, the purpose statement of the Field Trial should be changed to read as follows: To determine require sufficient Frequency Response arranged by from the Balancing Authority to maintain Interconnection Frequency within predefined bounds by responding to and arresting frequency deviations and supporting frequency until the frequency is restored to schedule. To identify and establish provide consistent methods for measuring Frequency Response and determining the Frequency Bias Setting and Frequency Response Obligation. We should not write the new standard and its requirements until this Field Trial work has been accomplished; to do so possibly would result in difficulty changing the standard requirements based upon Field Trial results. Further, while we do not have any issue with the general intent of the scope statement, we have a difficulty seeing the BA being the only entity held responsible for maintaining interconnection frequency and arresting frequency deviations. When there is a sudden and sizable change to system resource or demand, the first response to a frequency deviation caused by this change would be the generators’ governors. This will provide a mitigating effect for the immediate seconds up to minutes. The frequency bias setting will then kick in to supplement the mitigation need. The governors are owned by the Generator Owners; the BAs do not own these facilities and hence can do little to address frequency response during this initial period. To hold only the BA responsible for maintaining interconnection frequency and arresting frequency deviations would be inappropriate. The industry needs to have a discussion to determine who should be held responsible for providing governor responses immediately following an event, and by what mechanism, and for implementing additional measures thereafter. We suggest that BAL-003 development be withheld until this discussion takes place and a decision is made on who and how the governor response shall be provided.
No
The SRC agrees that a Frequency Response of some minimum level for each Interconnection should be achieved. However, the measure as described does not apply to all Interconnections. It does not apply to single BA Interconnections such as ERCOT and Hydro Quebec. This requirement should be added later—not included now; and it should clarify what the BA must do and what the response providers must do. BAs do not own and operate the resources. An entity which does own or operate the resources may also be registered as a BA, but an entity which does not own or operate resources may also be registered as a BA. Therefore, it is important to detail what a BA must do and also to detail what the resource owner or operator must do. The resource owner may be registered as a GO or a TO or even a DP. The resource operator may be registered as a GOP, a TOP, or a LSE. The BA must establish an operations plan, using data provided to it by the resource owners and or operators, that will meet the performance requirements. The BA must then deploy the proper amount of response through AGC or verbal instructions to supplement the automatic responses that the resources will provide, must calculate the actual responses after-the-fact, and report the performance as required. The resources must, as standards already provide, comply with the deployments and instructions provided by the BA. However, if an entity which is functioning as a BA does not own its resources, nor does it directly operate those resources, the BA cannot ensure the achievement. The standard must not create an organizational or contractual arrangement that dictates how the compliance is provided. It should state what must be done, not how. If entities choose to write and enter into such arrangements, that should be permissible, but not required. Specific to R1, the wording does not correspond to the figures shown in the FRS (Form 1) in that the FRM (the median) is -14.5 whereas the FRO is -15.8. The FRO is more negative than the FRM, which does not seem to correspond to what’s stipulated in R1 (FRM to be equal or more negative than its FRO).
No
It is not clear how the ERO uses the FRM to determine the required Frequency Bias Settings. It should not be necessary for the ERO to do the determination for all the Interconnections. There are already in place methods for this by the existing ERCOT and WECC Interconnections. The SRC suggests that the ERO may not be the appropriate technical entity. The ERO may be the appropriate entity to serve as the receiver of the forms and analyze results for the Eastern Interconnection, but existing processes are already in place elsewhere. It should be sufficient that those processes continue and submit copies of Form 1 to the ERO. This may also be appropriate for Hydro Quebec. In addition, whichever entity determines the Frequency Bias Setting must provide implementation time for the BAs to implement the settings. The proposed language says only that the BA shall implement it on the date specified, but it doesn’t address the need for that date to include some implementation time.
No
Single BA Interconnections do not operate on Tie Line Bias. The requirement should be modified to accommodate this or regional variances should be written by the SDT to address existing differences. In addition this requirement, as written, does not provide for momentary cessation of AGC for any reason, nor for reasonable system maintenance, repair, or updates. As written, it seems to say that any duration of operation off Tie Line Bias is unacceptable and, thus,

would be a violation.
No
What is the technical basis for the phase-out schedule? Making the standard requirements effective earlier than the schedule shown could result in the unintended consequence of non-compliance enforcement for performance that is caused by the change rather than by the non-performance of the functional entity. Also, the effective dates given in the Implementation differ from those in the draft standard. Different requirement numbers are expressed in each. Some of the implementation steps (retiring R5 of BAL-003-0) presented in the implementation plan start as early as May 2011. We do not believe that the BAL-003-1 standard will be approved by the industry or the NERC BoT at that time and that does not even take into account regulatory approval (or 12 months after BoT adoption in those jurisdictions where no regulatory approval is required). How can a standard begins to phase out while the successor standard is not anywhere near becoming effective? If the SDT wants to propose a gradual replacement of the current R5, we would suggest that the phase-out steps be tied to the date that the standard becomes effective.
Individual
Howard Rulf
We Energies
No
For Frequency Response Measure, the drafting team should consider using average rather than median. Because median is literally the middle value, a Balancing Authority could have 12 really bad Single Event Frequency Response Data points and still comply. Average values would prevent this from happening. Should FRM be clear that it includes at least 25 events in the definition? While that can be garnered from Attachment A, it is not specified in the Form 1 instructions. We are concerned that the regulators may argue that 25 events do not apply because an attachment is not part of the standard.
No
Given that frequency response is “contributed” long before AGC has an impact, “contribute” should probably be changed to “maintain.” The goal is to ensure AGC does not withdraw frequency response and that it is maintained while frequency is depressed. We are not sure if Frequency Response has a precise enough definition and it is part of the definition of Frequency Bias Setting. The current NERC Glossary definition of Frequency Response really just reflects how it is measured, it does not define Frequency Response. Frequency Response is the dynamic real power response of load, generation, and other devices to a perturbation in frequency. The drafting team should also consider resolving the definition of Frequency Bias. Is it needed? It is often confused with Frequency Bias Setting and is often used interchangeably with Frequency Response even though the meanings are slightly different.
No
In general, we don’t have significant issues with a standard that attempts to establish a minimum Frequency Response performance level. However, we caution the drafting team that the minimum level established needs to be determined based on an extensive data analysis, field trial data, the Frequency Response Initiative Work Plan that NERC filed in response to the Commission’s September 23 technical conference, and the plan outlined in NERC’s October 25, 2010 compliance filing.
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No
Flexibility established in the date is better than the existing currently defined date in the standards. It is better to allow the ERO to specify the date to allow some flexibility in implementation. It appears that the responsibility for identifying Frequency Bias Setting is being removed from the Balancing Authority. There is an implied obligation that the ERO will determine the Frequency Bias Setting but it is not stated explicitly. Thus, we are left wondering who has the responsibility for determining the Frequency Bias Setting. Frequency Response of the interconnection is constantly changing. As a result, the Frequency Bias Setting will never match the Frequency Response exactly. It is better to over–bias than under–bias to prevent withdrawal of frequency response by AGC. Historically, the 1% floor for frequency bias setting was chosen to ensure that BAs are always over-biased. The standard needs to allow some margin in the frequency bias setting to ensure that the bias setting is over–biased.
Yes
No
We agree with the plan to phase out BAL-003-0.1b R5 over a period of years rather than abruptly terminate it because it will take several years to assess the impact. We recommend a wording change to the implementation plan. Please change ‘BAL-003-0 Requirement 5 should be retired as outlined in the following table,” to “BAL-003-0.1b Requirement 5 should be phased out by reducing the minimum frequency bias setting per the table.” It is not clear if the minimum frequency bias setting can be modified without modifying the existing BAL-003-0.1b standard. Is this being

accomplished through the field trial? The implementation plan makes no mention of a field trial. It should. Please change all BAL-003-0 to BAL-003-0.1b
Group
Midwest ISO Standards Collaborators
Jason Marshall
No
For Frequency Response Measure, the drafting team should consider using average rather than median. Because median is literally the middle value, a Balancing Authority could have 12 really bad Single Event Frequency Response Data and still comply. Average values would prevent this from happening. Should FRM be clear that it includes at least 25 events in the definition? While that can be garnered from Attachment A, it is not specified in the Form 1 instructions. We are concerned that the regulators may argue that 25 events do not apply because an attachment is not part of the standard.
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Yes
No
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Group
FirstEnergy
Sam Ciccone
Yes
For the definition of FRM, we are not clear as to the rationale for choosing the median value instead of the mean.
Yes
Although we support the definition, we suggest the word “contribute” be changed to “maintain”.

Yes
No
We cannot agree at this time since Attachment A of the materials posted do not include sufficient details regarding the calculations used. Furthermore, there is no obligation imposed on the ERO to provide neither a reasonable time frame for implementation of the Frequency Bias Setting nor a requirement for the ERO to follow the methodology detailed in Attachment A. The team should consider adding a requirement for the ERO or clarifying where this obligation is covered in NERC's Rules of Procedure.
Yes
Although we mostly agree with the requirement, we believe it can be improved. We suggest that the team add wording in the requirement to allow for brief periods where meters or communication channels fail and trip the AGC off Tie Line Bias. In most areas, if merely one BA trips off bias it would not have an adverse affect on BES reliability and furthermore, the BA can take alternative measures for these periods such as manual AGC. We suggest the team add wording similar to the second sentence of requirement R7 of BAL-005 which states: "If AGC has become inoperative, the Balancing Authority shall use manual control to adjust generation to maintain the Net Scheduled Interchange."
No
We believe that the implementation plan should include information regarding the field trial and how it fits in with the phase-in implementation. It appears as though the field trial is being conducted based on 2010 data and will be concluded upon completion of the development of the standard but we think this could be clarified. Furthermore, as stated in the process manual, a field test "should include at a minimum the data collection and analysis or field test plan, the implementation schedule, and an expectation for periodic updates of the results." The field test information posted is not clear on the implementation schedule of the field test as well as when and how periodic updates will be available.
Group
Bonneville Power Administration
Denise Koehn
No
FRO definition – BPA feels uncomfortable supporting this standard when the ERO is given a blank check to FRO. The methodology for determining the FRO must be spelled out in detail in order to allow all entities an opportunity to comment on that methodology.
Yes
Yes
No
BPA agrees that there should be a minimum level of Frequency Response, but disagree with the way the measure is obtained in the requirement. • R1 – BPA suggests replacing "achieve" with "calculate". Achieve: indicates it is a performance. • R1 – BPA does not agree with the requirements in Attachment A not being in the standard. These should not be modified without full review and voting by members. • R1 – BPA believes that there should be more description on Variable Bias. What variable bias number should we use: average, minimum, peak for the event? BPA feels that the peak bias of each event would be appropriate.
No
R2 – BPA believes that the ERO should not be providing the BA the Frequency Bias Settings for the BA. R2 points to Attachment A as having the calculation methodology, but there is no methodology spelled out in Attachment A, there are simply data requirements, delta frequency that will be included in surveys, tools to be used, etc. The statement 'natural frequency response' is in Attachment A many times, but it is never spelled out. What is meant by this phrase. This differs dramatically depending on when the event occurs due to different generating patterns, different types of load (frequency responsive versus not frequency responsive), etc. The methodology needs to spell out how this will be taken into account when calculating the correct frequency bias. Secondly, how would this be done for variable bias?
No
R3. BPA does not believe this standard should dictate the control mode for AGC. That is better suited to be in BAL-001 and should not be repeated in this standard – the ACE used for reporting is spelled out in BAL-001 R1 and is also discussed in BAL-005 R6. R3 should be removed from this standard, not modified to fit with what is stated in BAL-001 or BAL-005.
No
From a compliance perspective, it is administratively very burdensome to have portions of two different versions of a standard applicable at the same time, as specified in the Implementation Plan for BAL-003-1. This type of structure adds an additional layer of complexity to all parts of the compliance administration process, as necessary to distinguish

between the separate versions of the standard. Rather than create and prolong this type of situation over a 4 year time period, BPA asks that BAL-003-0 be retired in its entirety and that the contents of BAL-003-1 be expanded to also include R5, as specified in BAL-003-0. This change resolves the identified issues while also ensuring that all requirements of BAL-005 are in effect, as originally intended. The Implementation Plan for BAL-003-1 also includes a proposal to modify the specified limiting percentage of Native Load on a sliding scale over a 4 year time period. BAL-003-3 R5, as approved, explicitly specifies 1% as a minimum value for monthly average Frequency Bias Setting. As such, changing this value results in a change in the requirement itself. Instead of being done through an Implementation Plan, these types of changes should be made as specific modifications to the requirement in question. To resolve this issue, BPA asks that the sliding scale specified for percentage of peak load specified in the Implementation Plan be incorporated directly into BAL-003-1 as a part of the specified text of R5. This change meets the intended goal of applying a sliding scale to this value over time while assuring that the underlying change is implemented as a change to the requirement through the Standards Development Process.
Individual
Thad Ness
American Electric Power
Yes
No
If “the proposed standard’s intent is to collect data needed to accurately analyze existing Frequency Response, set a minimum Frequency Response obligation, provide a uniform calculation of Frequency Bias Settings that transition to values closer to Frequency Response, and encourage coordinated AGC operation”, it appears the current and stated definition is precluding the process for determination of the Frequency Bias Setting itself. I believe it is too early to state in definition the frequency bias setting to be based on MW/0.1 Hz, when this appears to be more of the expected response. Using the word usually does not appear to be defining anything. To eventually get to an acceptable performance measure with reliability basis the project needs to be expanded to also address associated governor droop issues, which inherently affect response. When the current definition references using “either a fixed or variable Frequency Bias”, it does not state whether or not to be applied in the calculation to either load or generation. The current Standard uses 1% of yearly estimated peak demand for BAs that serve load, when the actual load at time of disturbance could be greatly different. Response is more directly related to the amount of Generation on-line and active AGC within the BA at time of trip. MW/0.1 Hz states more of expected result of response than defining Frequency Bias Setting.
No
AEP believes the statement should read “To require sufficient Frequency Response from governors and AGC of Generators within the Balancing Authority to maintain Interconnection Frequency within predefined bounds by arresting frequency deviations and supporting frequency until the frequency is restored to schedule.To provide consistent methods for measuring Frequency Response from governors and AGC of Generators within the Balancing Authority for determining the overall Frequency Bias Setting threshold. Since Generators are directly responsible for response, applicability must be added to Generator Operators.
No
Between the definition and the requirement in Attachment A, it is unclear if FRM is a reliability-supported, performance-based measure, or instead, if it is a calculated number based on previous performance. As written, it is unclear if this is a performance-based requirement, or simply a calculation that should be utilized in some way. In any event, the requirement needs to be re-written to clarify its intent.
No
It appears this standard deviates from past practice for calculating frequency bias. It is unclear how this might affect the CPS Bounds L10 calculation.
Yes
No
It is unprecedented that an implementation plan would require following some (but not all) requirement(s) within multiple versions of the same standard. This would make following the standard very difficult. Having to piece together multiple documents into a coherent requirement would be very difficult to achieve. There needs to be a definitive start and stop date for each version, rather than a phase in and phase out across multiple versions. We disagree with setting preselected dates beginning months away. Timing should be driven by applicable regulatory approval, as opposed to dates which appear to be arbitrarily selected. Going from 100% of the load-based, frequency bias calculation to 0% is unclear without correlating it to something else being phased in over time. It is very hard to follow how BAL-003-0 R5 relates to BAL-003-1. More work needs to be done by the SDT to explain how these relate to one another.
Individual
Greg Rowland
Duke Energy

No
The definition of SEFRD would conflict with any alternative measurement of frequency response. The SEFRD makes no provision for the impacts of generation loss experienced by a contingent BA, impacts of non-conforming loads, or impacts of schedule ramps. The FRM also makes no such provisions. The resulting FRM for a BA experiencing one or more of these impacts for one or more SEFRDs will be skewed and completely miss the intended measurement of the BA's response to frequency excursions. In addition, as it is not yet clear how provision of Frequency Response by one BA to meet a portion of another BA's requirement would be achieved, Duke Energy cannot say that a simple measure of the NIA against the frequency deviation will capture the net of the response desired. Regarding the definition of FRO, the industry should agree on the methodology which would be used for the ERO to determine the response desired for the Interconnection that is used for allocation of the FRO, and not leave it as a parameter subject to change outside of the standards process. The definition is only acceptable if the assignment by the ERO is based upon a methodology supported by the industry and subject to change only through the standards process.
No
Duke Energy would suggest not using "Frequency Bias" in the definition of "Frequency Bias Setting". In addition, Duke Energy would like to point out that ACE does not allow Frequency Response; response will occur with or without the ACE equation. The Frequency Bias Setting is needed so that the AGC does not negate what may be provided in frequency response. The bias component of ACE provides the feedback so that a BA may sustain the intended amount of response with secondary control as long as Actual Frequency deviates from Scheduled Frequency. Duke Energy would suggest the following: "A fixed or variable value usually expressed in MW/0.1 Hz, set into a Balancing Authority Area Control Error equation to bias the control of resources so that Interconnection frequency is driven toward the Scheduled Frequency."
Yes
No
Duke Energy agrees that a BA should be required to achieve a minimum level of Frequency Response, however Duke Energy believes the method for measurement needs improvement – please see comments to 1 and 2 above. Duke Energy agrees with the concept that a Balancing Authority should be required to achieve a minimum level of Frequency Response however the method for measurement should also allow exclusion of certain events, such as when the frequency deviation is associated with the BA's contingent loss of generation, or when an event is coincident with a significant change in ramped interchange. It is not clear how the FRO will be determined – Duke Energy believes that the industry should agree on the methodology which would be used for the ERO to determine the response desired for the Interconnection and how the allocation for the FRO would be determined for each Balancing Authority. The calculation of FRO allocation (in Attachment 1) is not clear on whether the peak load and generation data used is historic data or forecasted data. It is also not clear how the assignment of the FRO would accommodate a mid-year change in Balancing Authority size or other attribute that could change the calculated response. Duke Energy questions if a BA providing better response than its allocated FRO in any year should be held to achieving that in the following year – Duke Energy believes that should be the decision of the BA if it chooses to achieve more than the minimum requirement applied to others.
No
Duke Energy believes that this needs to be restated. Will the ERO perform the calculations to determine each BA's Bias? Will the ERO provide ample time between publication of the settings and the date of implementation? If effective coordinated secondary control is desired, other related operational parameters (e.g., L10) need to be set at the same time. Since measurement and reporting of operational performance is primarily on a monthly basis (e.g., CPS1/CPS2), the implementation date should be on or near the first of a month, but during normal working hours (so that adequate support personnel are available).
No
Duke Energy agrees to the simple statement posed in the question; however, the requirement goes beyond that by using a defined term, Adverse Reliability Impact, which has a relatively narrow focus on extreme conditions. If a single BA lost a significant amount of its tie-line telemetry or its frequency sources, cascading outages and/or grid separation would not necessarily be imminent but it would be imprudent to remain in Tie Line Bias mode. Go back to the original language for the requirement – "Each Balancing Authority shall operate its Automatic Generation Control (AGC) on Tie Line Frequency Bias, unless such operation is adverse to system or Interconnection reliability."
No
Duke Energy does not agree with having prescribed dates for the gradual reduction of the minimum Frequency Bias Setting, as the implementation may drive significant issues which could delay, or halt the implementation at a certain level. It is not clear what process would be used to give the "go-ahead" to move to the next level (agree?).
Group
SPP Standards Development
Robert Rhodes
No
In the past tie line flow changes that did not have the expected response for the given frequency deviation have been

excluded from the determination of Frequency Bias. It appears that this exclusion does not carry forth in the determination of Frequency Response Measure. Therefore, non-conforming loads, intermittent resources and other events/issues within a Balancing Authority could very well mask its natural frequency repsonse thereby setting the Balancing Authority's Frequency Bias and its Frequency Response Obligation incorrectly. Then the Balancing Authority is obligated to respond and will be measured for compliance against an incorrect value. This being the case, we can support the definition of Single Event Frequency Response Data but have reservations about Frequency Response Measure and Frequency Response Obligation.
No
We would suggest inserting 'secondary' in front of Frequency Response at the end of the sentence and delete 'Frequency Bias' following 'variable' at the beginning of the sentence.
Yes
Yes
No
We would suggest ending the sentence at the second ERO, deleting the phrase '…to ensure effective coordinated secondary control, using the results from the calculation methodology detailed in Attachment A.' This phrase is more of an explanation of why this is being done rather than a part of an actual requirement.
Yes
Yes
Individual
LeRoy Patterson
Patterson Consulting, Inc.
No
SEFRD: From the definition, it is not clear whether SEFRD is a Balancing Authority's 1) data collected for each frequency event, 2) calculated Frequency Response for a selected event, 3) Net Actual Interchange divided by the change in frequency for a selected event, or 4) some combination of these interpretations. If the SDT determines that adjustments to Net Actual Interchange should be made such as adjustments for joint-owned generation and non-conforming loads as suggested in the field test document, then since this definition requires Frequency Response to be determined from Net Actual Interchange, this definition would require changing to allow those adjustments. I suggest defining SEFRD as "The individual sample of event data from a Balancing Authority that is necessary to calculate its Frequency Response on FRS Form 1, expressed in MW/0.1Hz." FRM: This definition and its calculation in FRS Form 1 do not match. FRS Form 1 calculates FRM as "The median of Single Event Frequency Response Data observations reported annually on FRS Form 1 [for events external to the Balancing Authority]." (Brackets added for emphasis.) The FRS Form 1 calculation appears more appropriate based on data collected, since data are not reported and calculations are not adjusted to compensate for contingencies within the Balancing Authority. Regardless, the difference between definition and calculation makes it impossible for a Balancing Authority to know the expected performance measure. FRO: The definition should be changed to remove the opposing concepts of performance and obligation. For example: FRO is defined to be "The Balancing Authority's contribution to the total aggregate Frequency Response…" FRM, not FRO, is the Balancing Authority's contribution toward the aggregated Frequency Response. FRO is "The Balancing Authority's allocation of the interconnection's required Frequency Response…" or "The Balancing Authority's required Frequency Response needed for reliable operation of an Interconnection …"
Yes
No
The purpose should not expect Frequency Response to maintain frequency beyond a few minutes, perhaps 15 minutes for example. This purpose statement suggests the requirements will be "…to maintain Interconnection Frequency within predefined bounds by arresting frequency deviations and support frequency until the frequency is restored to schedule…" The phrase "until the frequency is restored to schedule" is problematic since regulation must bring frequency to schedule. Frequency Response, and the associated requirements, should not be expected to substitute for poor regulation beyond the first few minutes.
No
Requiring a Balancing Authority to provide Frequency Response and measuring that Frequency Response consistently, is critical to maintaining reliability. The requirement is long overdue and the concept is a good one. The method for measurement in FRS Form 1 is not consistent with the definition of FRM. The desired "averaging" of input data over specific time ranges by the Balancing Authority as it completes FRS Form 1 appears only in the background and instructions for FRS Form 1. Since this "instruction" document will not be a part of the standard, it is not obvious that Balancing Authority's will be compelled to provide consistent data. Therefore, the standard will fail to achieve the

stated purpose of providing "…consistent methods for measuring Frequency Response…". Attachment A, other than the section providing guidance regarding event selection, appears to be explanatory, contextual, and instructional in content. These aspects are important, but should not be requirements. Attachment A should include only the event selection process and calculations associated with requirements, including an explanation of what is necessary if variable Frequency Bias Settings are implemented. If other "requirements" are included in Attachment A, they should be moved to the standard. FRS Form 1 should be an attachment to the standard as this form contains and performs the required calculations. The remaining information in Attachment A should become either a standalone (technical) document, or be combined with information such as "FRS Form 1 Background and Instructions" and renamed. As further clarification regarding the ambiguity identified in the previous paragraph, Attachment A could be interpreted as additional requirements on the Balancing Authority, ERO, or both. The language and scope is not sufficiently clear to identify whether statements are informative or requirements. This lack of clarity makes it impossible for entities to identify requirements, acquire appropriate tools and resources related to requirements, and to provide suitable performance to meet requirements. For example, the statement "A final listing of official events to be used in the calculation will be available from NERC by December 10 each year." may be intended as a requirement rather than a statement suggesting a typical schedule. Further, if the previous statement is a typical schedule, then the statement "The ERO will use the following criteria for the selection of events to be analyzed." could be interpreted as merely the typical process to be used, but not a binding one.

No

The concept of requiring a Balancing Authority to implement its Frequency Bias Setting at a specific time and using a specific calculation is meaningful. This requirement is not clearly worded, however. If the intent of Requirement 2 is to identify "…when the Balancing Authority must implement its Frequency Bias Setting…" the requirement should stop after "…on the date specified by the ERO." The remaining portion of the requirement explains the need for the requirement and should be moved to supporting material. Attachment A does not have a "calculation methodology" associated with the Frequency Bias Setting unless the language describing historical practice and the benefits of moving a Frequency Bias Setting closer to a Balancing Authority's natural Frequency Response are intended to constitute a "calculation methodology." FRS Form 1 has the "calculation methodology" of using the minimum (since the value is negative) of last year's FRM, next year's FRO, and percentage of next year's peak load or generation. Attachment A does not mention this methodology and the requirement does not mention FRS Form 1. The clause "…, using the results from the calculation methodology detailed in Attachment A." appears to place an obscure requirement on the ERO since the ERO is the entity providing the Frequency Bias Setting to be implemented by the Balancing Authority. If the ERO is intended to use the value from FRS Form 1, after verifying data and calculations, then state that expectation explicitly and clearly. Otherwise, the ERO could set Frequency Bias Settings in another manner after observing the Form 1 values. The requirement for the ERO to provide a Frequency Bias Setting to each Balancing Authority begs the question of how variable bias will be implemented. Historically, the Balancing Authority implements its algorithm with oversight from NERC (Resources Subcommittee). The manner and expectation for providing data and algorithms related to variable bias are inadequate.

No

While this requirement is in the existing standard, it places a significant reporting burden on a Balancing Authority to demonstrate compliance during audits for little reliability gain. In addition for single Balancing Authority interconnections, operating in this AGC mode is functionally equivalent to operating in flat frequency mode. This may cause some interconnections to seek a variance, just to avoid compliance complications. Perhaps this requirement could be replaced with a requirement for Balancing Authorities to contribute to frequency performance as well as balance commitments and resources, or to calculate the ACE it uses to report in other standards in a specific manner. As written, it could be interpreted to create a violation when AGC suspends or is offline.

No

The implementation plan should address implementing these requirements at the same time for all Balancing Authorities within an interconnection, regardless of regulatory approvals. The present implementation plan will require some Balancing Authorities within an interconnection to operate to the new standard while other Balancing Authorities operate to the old standard if multiple regulatory jurisdictions exist as they do within two interconnections. This could lead to uncoordinated and unreliable operation within an interconnection.

Group

IRC Standards Review Committee

Albert DiCaprio

No

The definition of SEFRD will not work as described for a single BA Interconnection. There is no change in NI for frequency deviations. Similarly, the definition assumes all response is provided by change in Interchange and does not really reflect the frequency response of a contingent BA. Either the definition needs to be changed to accommodate single BA Interconnections (such as ERCOT and Hydro Quebec), or regional variances for them need to be written by the SDT. A BA’s frequency response is composed of load frequency response, governor response, and, for BAs external to the resource loss, change in Net Interchange. Some approximation may be achieved by recognizing that the magnitude of frequency deviation is attenuated by load frequency response and governor response (or frequency activated demand response to reduce load). The definition of FRM specifies the median of all SEFRD observations

reported annually. What is the technical basis for selecting the median rather than the mean? The definition of FRO raises questions. The discretely administered determination of FRO described in the draft Attachment A sets too stringent a requirement; particularly for the smaller Interconnections which may also have large size generation resources just as do the larger Interconnections. To “assure that Point C will not encroach on the first step UFLS” is significantly more stringent than existing and historical performance for those smaller Interconnections. Such assurance will assuredly prove to be very expensive. In fact, we question the need to define FRM and FRO since they can easily be stipulated in the standard requirements. Having them defined and added to the ever-growing NERC glossary creates unnecessary work to maintain the glossary, unless these terms are used by other NERC standards for which consistent meaning need to be established. For example, R1 can easily be reworded as: “R1: Each Balancing Authority shall achieve a median of all Single Event Frequency Response Data observations reported annually on FRS Form 1 that is equal to or more negative than its contribution obligation to the total aggregate Frequency Response needed for reliable operation of an Interconnection assigned by the ERO.” Similar wording changes can be made to the FRS Form 1 to eliminate the need to define these two terms. Further, the Attachment A states that the SDT is evaluating a risk based approach to establishing an Interconnection Frequency Response Obligation which can be based on a probability function. If the N-2 criteria is established, it will be unlikely to be possible to change that if the new approach is viewed as a reduction in required performance. As an example, in the ERCOT Interconnection, it is recognized that the present level of required frequency responsive reserve cannot in all scenarios assure that Point C will not encroach the first step of UFLS. The system conditions that exist for the encroachment to occur represent a small likelihood and would require the N-2 contingency to occur on something like the minimum hour of the minimum load day of the year. It has occurred one time in the history of ERCOT. Thus, it is less than once in ten years based upon actual history. The cost of precluding such an event would be astronomical.
No
The definition appears to be accurate, but where is “fixed” and “variable” Frequency Bias defined in the context of these requirements? Should it be Frequency Bias Setting, instead? “Fixed” seems to be straightforward, but what is “variable”? How often must Frequency Bias Setting change in order to be considered to be “variable”?
No
If this is really intended to be a Field Trial, it should be written as such and the standard should not be developed or promulgated until the Field Trial has accomplished its purpose and the performance criteria and measures have been determined. We request that the results of the Field Trial should be published and discussed BEFORE any changes are made. The standard should be put into place later; it is premature at this time. Since this is to be a data gathering process to be used to determine appropriate performance parameters, the purpose statement of the Field Trial should be changed to read as follows: To determine require sufficient Frequency Response arranged by from the Balancing Authority to maintain Interconnection Frequency within predefined bounds by responding to and arresting frequency deviations and supporting frequency until the frequency is restored to schedule. To identify and establish provide consistent methods for measuring Frequency Response and determining the Frequency Bias Setting and Frequency Response Obligation. We should not write the new standard and its requirements until this Field Trial work has been accomplished; to do so possibly would result in difficulty changing the standard requirements based upon Field Trial results. Further, while we do not have any issue with the general intent of the scope statement, we have a difficulty seeing the BA being the only entity held responsible for maintaining interconnection frequency and arresting frequency deviations. When there is a sudden and sizable change to system resource or demand, the first response to a frequency deviation caused by this change would be the generators’ governors. This will provide a mitigating effect for the immediate seconds up to minutes. The frequency bias setting will then kick in to supplement the mitigation need. The governors are owned by the Generator Owners; the BAs do not own these facilities and hence can do little to address frequency response during this initial period. To hold only the BA responsible for maintaining interconnection frequency and arresting frequency deviations would be inappropriate. The industry needs to have a discussion to determine who should be held responsible for providing governor responses immediately following an event, and by what mechanism, and for implementing additional measures thereafter. We suggest that BAL-003 development be withheld until this discussion takes place and a decision is made on who and how the governor response shall be provided.
No
The SRC agrees that a Frequency Response of some minimum level for each Interconnection should be achieved. However, the measure as described does not apply to all Interconnections. It does not apply to single BA Interconnections such as ERCOT and Hydro Quebec. This requirement should be added later—not included now; and it should clarify what the BA must do and what the response providers must do. BAs do not own and operate the resources. An entity which does own or operate the resources may also be registered as a BA, but an entity which does not own or operate resources may also be registered as a BA. Therefore, it is important to detail what a BA must do and also to detail what the resource owner or operator must do. The resource owner may be registered as a GO or a TO or even a DP. The resource operator may be registered as a GOP, a TOP, or a LSE. The BA must establish an operations plan, using data provided to it by the resource owners and or operators, that will meet the performance requirements. The BA must then deploy the proper amount of response through AGC or verbal instructions to supplement the automatic responses that the resources will provide, must calculate the actual responses after-the-fact, and report the performance as required. The resources must, as standards already provide, comply with the deployments and instructions provided by the BA. However, if an entity which is functioning as a BA does not own its resources, nor does it directly operate those resources, the BA cannot ensure the achievement. The standard must not

create an organizational or contractual arrangement that dictates how the compliance is provided. It should state what must be done, not how. If entities choose to write and enter into such arrangements, that should be permissible, but not required. Specific to R1, the wording does not correspond to the figures shown in the FRS (Form 1) in that the FRM (the median) is -14.5 whereas the FRO is -15.8. The FRO is more negative than the FRM, which does not seem to correspond to what's stipulated in R1 (FRM to be equal or more negative than its FRO).
No
It is not clear how the ERO uses the FRM to determine the required Frequency Bias Settings. Please clarify. Also, it should not be necessary for the ERO to do the determination for all the Interconnections. There are already in place methods for this by the existing ERCOT and WECC Interconnections. The SRC suggests that the ERO may not be the appropriate technical entity. The ERO may be the appropriate entity to serve as the receiver of the forms and analyze results for the Eastern Interconnection, but existing processes are already in place elsewhere. It should be sufficient that those processes continue and submit copies of Form 1 to the ERO. This may also be appropriate for Hydro Quebec. In addition, whichever entity determines the Frequency Bias Setting must provide implementation time for the BAs to implement the settings. The proposed language says only that the BA shall implement it on the date specified, but it doesn't address the need for that date to include some implementation time.
No
Single BA Interconnections do not operate on Tie Line Bias. The requirement should be modified to accommodate this or regional variances should be written by the SDT to address existing differences. In addition this requirement, as written, does not provide for momentary cessation of AGC for any reason, nor for reasonable system maintenance, repair, or updates. As written, it seems to say that any duration of operation off Tie Line Bias is unacceptable and, thus, would be a violation.
No
What is the technical basis for the phase-out schedule? Making the standard requirements effective earlier than the schedule shown could result in the unintended consequence of non-compliance enforcement for performance that is caused by the change rather than by the non-performance of the functional entity. Also, the effective dates given in the Implementation differ from those in the draft standard. Different requirement numbers are expressed in each. Some of the implementation steps (retiring R5 of BAL-003-0) presented in the implementation plan start as early as May 2011. We do not believe that the BAL-003-1 standard will be approved by the industry or the NERC BoT at that time and that does not even take into account regulatory approval (or 12 months after BoT adoption in those jurisdictions where no regulatory approval is required). How can a standard begins to phase out while the successor standard is not anywhere near becoming effective? If the SDT wants to propose a gradual replacement of the current R5, we would suggest that the phase-out steps be tied to the date that the standard becomes effective.
Individual
RoLynda Shumpert
South Carolina Electric and Gas
No
We suggest the SDT consider defining SEFRD as: The calculated frequency response by a Balancing Authority for a specific frequency excursion event as identified by the ERO (or NERC). As a comment, how frequency response is calculated needs to be defined and may not always be the Net Actual Interchange (NIa) divided by the change in frequency expressed in hertz. For example, the NIa may need to be adjusted for known generation and load changes that do not represent frequency response for the period being measured such as known generation and load ramp changes. Change in frequency needs to be more specific, such as the frequency difference between B and A measured at B. If Frequency Response Obligation (FRO) is a targeted value, then perhaps the definition should be: The Balancing Authority's annual median frequency response as assigned by the ERO (or NERC). The word "contribution" should be considered to be replaced with "the balancing authority piece of the total….." The review team is concerned that the FRO and FRM definitions do not contain enough clarity as to how the BAs will be held accountable. Also, the definitions do not explain who will determine the value of each BA's FRO and the method used to determine the FRO value. Should the definition of Frequency Response Measure be a median or mean value? May need to clarify what FRS stands for.
We suggest the following changes to the definition: 1. Delete "Frequency Bias" in the parenthetical expression – ("Frequency Bias" should not be used to define Frequency Bias) 2. Delete the word "usually" 3. Replace "set into" with "as part of" as defined in BAL-001. 4. Replace the remainder of the sentence following "Area Control Error equation" with "that influences its Automatic Generation Control (AGC) to provide its frequency response while Interconnection frequency is not at its scheduled value" – (The frequency bias does not allow a BA to contribute its frequency response to the Interconnection. The frequency bias term only affects the AGC response of the BA, which is part of its frequency response usually minutes after the initial event and is dependent upon generation units being on AGC control and capable of responding.) 5. The suggested changes would result in the following definition" A value, fixed or variable, expressed in MW/0.1 hertz as part of a Balancing Authority's Area Control Error (ACE) equation that influences its Automatic Generation Control (AGC) to provide its frequency response while Interconnection frequency is not at its scheduled value.
Yes

No
The concept seems reasonable but since the measure of compliance (FRM) is determined only after the 25 events are identified; it is a lagging indicator. The BA may have to ensure it measures all frequency excursions and develops its own leading indicator to ensure compliance following year end. A sample CPS bounds report should be considered, perhaps based on 2010 numbers, to demonstrate how FRM submitted would translate to FRO frequency bias settings and how it will affect the L10 values.
No
It is not clear what the methodology (should be method) is in Attachment A. Is the frequency bias setting the BA's prior year FRM with a minimum value being a percentage of estimated yearly peak load or upcoming year maximum generation? What does "provided by the ERO" mean? Perhaps it should be verified or approved by the ERO (NERC). We suggest defining the date as by the end of the first business day following the deadline for Frequency Bias Setting implementation.
No
BAL-003-0, Requirement 3 requires operation of AGC on Tie Line Frequency Bias. BAL-005-0.1b, Requirement 6 requires the BA to compare total Net Interchange to total Net Scheduled Interchange plus Frequency Bias obligation to determine the Balancing Authority's ACE. We suggest that Requirement 3 be restated to "shall operate its Automatic Generation Control (AGC) on Tie Line Frequency Bias, unless ....." Tie Line bias is the (Ia-Is) term and frequency bias is the -10B(Fa-Fs) term. This should be coordinated with BARCSDT modifications to BAL-005.
No
The implementation plan has specific dates for reducing the bias settings currently defined in Requirement 5 over several years. Perhaps these dates should not be specific but tied to months following regulatory approval. Attachment A should be modified to match what is in the proposed standard. The values currently shown as percent "of peak/0.1 Hz" should be changed to percent of estimated yearly peak demand per 0.1 Hz change. For BAs that do not serve native load, percent "of upcoming years maximum generation/0.1 Hz should be changed to percent of its estimated maximum generation level in the coming year/0.1 Hz change.
Group
ENBALA Power Networks
Rob Coulbeck
Yes
No
: ENBALA would modify the above as follows: A value, (either a fixed or variable Frequency Bias), usually expressed in MW/0.1 Hz, set into a Balancing Authority Area Control Error algorithm equation that allows the Balancing Authority AGC System to ignore the export or import caused by the Primary Frequency Response.
Yes
ENBALA strongly agrees that a Frequency Response standard is necessary to ensure reliable operation of the bulk power system. We fully support all efforts to understand the declining trend, and the development of accurate models, of Frequency Response in each Interconnection.
Yes
ENBALA does believe that a BA should be responsible for a minimum level of Frequency Response as calculated on Form 1 and reflected in its FRO. Furthermore, we feel that additional data collected on the frequency nadir, such as the metric suggested in the recent Lawrence Berkeley National Laboratory of nadir-based frequency response, would be useful in assessing the current inertial response capabilities and level of risk for under-frequency load shedding.
Yes
Yes
Yes
Individual
Todd Bennett
Associated Electric Cooperative, Inc.
No
1) SEFRD - I had to read this definition several times because "The individual sample of event data" is actually an internally calculated value derived from a set of event sample data, and not really a "sample" value at all. So, I believe the SEFRD definition needs further work. 2) FRM is defined by undefined terms "FRS" and "FRS Form 1". 3) FRO – fine 4) FRS – "Frequency Response Survey"
No

1) SEFRD - I had to read this definition several times because “The individual sample of event data” is actually an internally calculated value derived from a set of event sample data, and not really a “sample” value at all. So, I believe the SEFRD definition needs further work.
Yes
Yes
Yes
Individual
Mark Thompson
Alberta Electric System Operator
No
The frequency response has 2 aspects: arresting frequency deviation (Point C) and deviation where frequency has settled (Point B). The proposed SEFRD and FRM seem all based on the Point B, however the intention in purpose statement is towards Point C... It is not clear to AESO that these proposed SEFRD and FRM based on settled frequency deviation (Point B) are technically sufficient to address the concern of arresting frequency deviation (Point C).
Yes
Yes
The purpose statement mentioned arresting deviation, restored to schedule and frequency bias setting, which are all at different time frames. The AESO suggests that NERC provide some clarification of the relationships for the different time frames.
Yes
The AESO agrees that there should be certain minimum requirement(s) of Frequency Response. In Attachment A, it mentioned that it will be based on the protection criteria and Point C, and the FRM is determined based on the settled deviation. The AESO suggests that the SDT describe how the FRM be related with the FRO as they are determined by different time frames. The AESO suggests NERC investigate the measure and method of separate FRM / FRO for different time frames, or provide technical evidence that the proposed FRM / FRO can also address the technical concerns in different time frames.
Yes
The AESO suggests that the standard should provide a description on how the ERO would determine the frequency bias setting and the relation to the FRO.
Yes
Individual
Dan Rochester
Independent Electricity System Operator
No
We concur with the definitions for SEFRD, FRM and FRO but do not believe that the latter two terms (FRM and FRO) need to be defined since they can easily be stipulated in the standard requirements. Having them defined and added to the ever-growing NERC glossary creates unnecessary work to maintain the glossary, unless these terms are used by other NERC standards for which consistent meaning need to be established. For example, R1 can easily be reworded as: “R1: Each Balancing Authority shall achieve a median of all Single Event Frequency Response Data observations reported annually on FRS Form 1 that is equal to or more negative than its contribution obligation to the total aggregate Frequency Response needed for reliable operation of an Interconnection assigned by the ERO.” Similar wording changes can be made to the FRS Form 1 to eliminate the need to define these two terms.
Yes
No
We do not have any issue with the general intent of the scope statement, but have a difficulty in seeing the BA being the only entity held responsible for maintaining interconnection frequency and arresting frequency deviations. When there is a sudden and sizable change to system resource or demand, the system frequency will change. The first

response to such deviation would be the generators' governors. This will provide a mitigating effect for the immediate seconds up to minutes. The frequency bias setting will then kick in to supplement the mitigation need. To hold only the BA responsible for maintaining interconnection frequency arresting frequency deviations would be only part of the solution. The industry needs to have a discussion to determine who should be held responsible for providing governor responses, and by what mechanism. We suggest that BAL-003 development be withheld until this discussion takes place and a decision is made on who and how the governor response shall be provided.
Yes
We agree with the BA being one of the responsible entities to achieve a minimum level of FR, and the method of measurement. However, R1 does not correspond to the figures shown in the FRS (Form 1) in that the FRM (the median) is -14.5 whereas the FRO is -15.8. The FRO is more negative than the FRM, which does not seem to correspond to what's stipulated in R1 (FRM to be equal or more negative than its FRO).
Yes
Yes
No
We have a difficulty understanding the basis for some of the dates in the implementation plan. Some of the implementation steps (retiring R5 of BAL-003-0) start as early as May 2011. We do not believe that the BAL-003-1 standard will be approved by the industry or the NERC BoT at that time and that does not even take into account regulatory approval (or 12 months after BoT adoption in those jurisdictions where no regulatory approval is required). How can a standard begins to phase out while the successor standard is not anywhere near becoming effective? If the SDT wants to propose a gradual replacement of the current R5, we would suggest that the phase-out steps be tied to the date that the standard becomes effective.
Individual
Alice Ireland
Xcel Energy
Group
SERC OC Standards Review Group
Gerald Beckerle
No
We suggest the SDT consider defining SEFRD as: The calculated frequency response by a Balancing Authority for a specific frequency excursion event as identified by the ERO (or NERC). As a comment, how frequency response is calculated needs to be defined and may not always be the Net Actual Interchange (NIa) divided by the change in frequency expressed in hertz. For example, the NIa may need to be adjusted for known generation and load changes that do not represent frequency response for the period being measured such as known generation and load ramp changes. Change in frequency needs to be more specific, such as the frequency difference between B and A measured at B. If Frequency Response Obligation (FRO) is a targeted value, then perhaps the definition should be: The Balancing Authority's annual median frequency response as assigned by the ERO (or NERC). The word "contribution" should be considered to be replaced with "the balancing authority piece of the total….." The review team is concerned that the FRO and FRM definitions do not contain enough clarity as to how the BAs will be held accountable. Also, the definitions do not explain who will determine the value of each BA's FRO and the method used to determine the FRO value. Should the definition of Frequency Response Measure be a median or mean value?
No
We suggest the following changes to the definition: 1. Delete "Frequency Bias" in the parenthetical expression – ("Frequency Bias" should not be used to define Frequency Bias) 2. Delete the word "usually" 3. Replace "set into" with "as part of" as defined in BAL-001. 4. Replace the remainder of the sentence following "Area Control Error equation" with "that influences its Automatic Generation Control (AGC) to provide its frequency response while Interconnection frequency is not at its scheduled value" – (The frequency bias does not allow a BA to contribute its frequency response to the Interconnection. The frequency bias term only affects the AGC response of the BA, which is usually minutes after the initial event and is dependent upon generation units being on AGC control and capable of responding.) 5. The suggested changes would result in the following definition" A value, fixed or variable, expressed in MW/0.1 hertz as part of a Balancing Authority's Area Control Error (ACE) equation that influences its Automatic Generation Control

(AGC) to continue to provide its frequency response while Interconnection frequency is not at its scheduled value.
Yes
No
The concept seems reasonable but since the measure of compliance (FRM) is determined only after the 25 events are identified; it is a lagging indicator. The BA may have to ensure it measures all frequency excursions and develops its own leading indicator to ensure compliance following year end. A sample CPS bounds report should be considered, perhaps based on 2010 numbers, to demonstrate how FRM submitted would translate to FRO frequency bias settings and how it will affect the L10 values.
No
It is not clear what the methodology (should be method) is in Attachment A. Is the frequency bias setting the BA's prior year FRM with a minimum value being a percentage of estimated yearly peak load or upcoming year maximum generation? What does "provided by the ERO" mean? Perhaps it should be verified or approved by the ERO (NERC).
No
BAL-003-0, Requirement 3 requires operation of AGC on Tie Line Frequency Bias. BAL-005-0.1b, Requirement 6 requires the BA to compare total Net Interchange to total Net Scheduled Interchange plus Frequency Bias obligation to determine the Balancing Authority's ACE. We suggest that Requirement 3 be restated to "shall operate its Automatic Generation Control (AGC) on Tie Line Frequency Bias, unless ....." Tie Line bias is the (Ia-Is) term and frequency bias is the -10B(Fa-Fs) term. This should be coordinated with BARCSDT modifications to BAL-005.
The implementation plan has specific dates for reducing the bias settings currently defined in Requirement 5 over several years. Perhaps these dates should not be specific but tied to months following regulatory approval. Attachment A should be modified to match what is in the proposed standard. The values currently shown as percent "of peak/0.1 Hz" should be changed to percent of estimated yearly peak demand per 0.1 Hz change. For BAs that do not serve native load, percent "of upcoming years maximum generation/0.1 Hz should be changed to percent of its estimated maximum generation level in the coming year/0.1 Hz change.
Group
Kansas City Power & Light
Michael Gammon
Yes
Yes
No
This purpose statement presumes that each Balancing Authority (BA) will have generation online to meet a predetermined frequency response obligation. There are many small BA's that do not have any generation online and rely on load regulation agreements and energy agreements to provide their energy needs during parts of the year. This purpose statement would not allow a BA to operate without generation online.
No
This requirement presumes that each Balancing Authority (BA) will have generation online to meet a predetermined frequency response obligation. There are many small BA's that do not have any generation online and rely on load regulation agreements and energy agreements to provide their energy needs during parts of the year. This requirement would not allow a BA to operate without generation online. Under Requirement 1, item 2a in Attachment A suggests governor deadband as 36MHz (Megahertz). Suggest what is intended is 36mHz (millihertz). The Frequency Response Obligation determination for the interconnection as described in Attachment A is a crude method and will result in obligations that will exceed the FRO that is intended. This will result in additional cost to BA's that is unnecessary to achieve the purpose of maintaining sufficient generation online to arrest frequency degradation events caused by loss of generating resources. The current NERC method for calculating a BA's actual frequency response are inaccurate and provide misleading guidance in the actual frequency response of a BA. These methods need considerable improvement before any attempts to hold a BA to an expected level of frequency response as this proposal has stated.
No
The Frequency Response Obligation determination for the interconnection as described in Attachment A is a crude method and will result in obligations that will exceed the FRO that is intended. This will result in additional cost to BA's that is unnecessary to achieve the purpose of maintaining sufficient generation online to arrest frequency degradation events caused by loss of generating resources. The current NERC method for calculating a BA's actual frequency response are inaccurate and provide misleading guidance in the actual frequency response of a BA. These methods need considerable improvement before any attempts to hold a BA to an expected level of frequency response as this proposal has stated.
No
The impact of operating in an inappropriate AGC control mode is bigger than the BA's own balancing area. The control of the area affects other BA's around a BA and if enough BA's are involved, can affect an interconnection. Recommend

the requirement be modified to consider the reliability impact on its own balancing area, the balancing areas of adjacent BA's and the interconnection.
No
How can hard dates for the phasing out of the current R5 be in the implementation plan for a standard under development? The concept of phasing out R5 and phasing in R2 could be done, however, this would take considerable thought as to how to implement that. This current proposed implementation plan should be carefully reconsidered.

NERC
NORTH AMERICAN ELECTRIC RELIABILITY CORPORATION

Consideration of Comments

BAL-003-1 – Frequency Response and Frequency Bias Setting
Project 2007-12 - 1st Draft

There are a few places where the team missed providing a comment in response to a suggestion – these are highlighted in yellow. In general, the team did a good job of responding!

The Frequency Response and Frequency Bias Setting Drafting Team thanks all commenters who submitted comments on the 1st draft of BAL-003-1 – Frequency Response and Frequency Bias Setting. This standard was posted for a 30-day public comment period from February 4, 2011 through March 7, 2011. The stakeholders were asked to provide feedback on the standards through a special electronic comment form. There were 36 sets of comments, including comments from more than 139 different people from approximately 86 companies representing 10 of the 10 Industry Segments as shown in the table on the following pages.

Based on the comments received the drafting team made the following changes to the proposed Standard:

- Removed the Single Event Frequency Response Data (SEFRD) definition from the standard.
- Modified the definitions for Frequency Response Measure (FRM) and Frequency Response Obligation (FRO).
- Modified the proposed definition of Frequency Bias Setting.
- Modified FRS Form 1 to correct errors, allow for adjustments and provide clarity.
- Separated Attachment A Background Document into two documents; 1) Attachment A – Supporting Document detailing the methodology to be followed for calculations, and 2) Background Document detailing the rational for the development of the requirements.
- Created Attachment B – Process for Adjusting Bias Setting Floor to clarify the methodology to be used in reducing the present 1% minimum Frequency Bias Setting.
- Added measures, VRFs and VSLs.

There were a couple of minority issues that the team was unable to resolve, including the following:

- A few stakeholders requested the SDT to consider a standard for generators to support the Balancing Authority in achieving the targeted level of Frequency Response. The team stated that this was outside the scope of the industry approved SAR. The SDT further stated that any entity could submit a SAR addressing this issue to the SC for consideration and that the SDT supported this option.

- A couple of comments stated they believed that the standard should support the development of a market for supporting a Balancing Authority in achieving the target Frequency Response. The SDT explained that this standard would provide for the metrics for Frequency Response while the market would define itself. The SDT further stated a market could be created by a region, sub-region, ISO, RTO or other entity as appropriate to facilitate compliance however the NERC Reliability Standards do not establish markets.

In this "Consideration of Comments" document stakeholder comments have been organized so that it is easier to see the responses associated with each question. All comments received can be viewed in their original format at:

http://www.nerc.com/filez/standards/Frequency_Response.html

If you feel that your comment has been overlooked, please let us know immediately. Our goal is to give every comment serious consideration in this process! If you feel there has been an error or omission, you can contact the Vice President and Director of Standards, Herb Schrayshuen, at 404-446-2560 or at herb.schrayshuen@nerc.net. In addition, there is a NERC Reliability Standards Appeals Process.[1]

[1] The appeals process is in the Reliability Standards Development Procedures: http://www.nerc.com/standards/newstandardsprocess.html.

Index to Questions, Comments, and Responses

The Industry Segments are:

1 — Transmission Owners
2 — RTOs, ISOs
3 — Load-serving Entities
4 — Transmission-dependent Utilities
5 — Electric Generators
6 — Electricity Brokers, Aggregators, and Marketers
7 — Large Electricity End Users
8 — Small Electricity End Users
9 — Federal, State, Provincial Regulatory or other Government Entities
10 — Regional Reliability Organizations, Regional Entities

Group/Individual		Commenter	Organization	Registered Ballot Body Segment									
				1	2	3	4	5	6	7	8	9	10
1.	Group	Guy Zito	Northeast Power Coordinating Council										X

	Additional Member	Additional Organization	Region	Segment Selection
1.	Alan Adamson	New York State Reliability Council, LLC	NPCC	10
2.	Gregory Campoli	New York Independent System Operator	NPCC	2
3.	Kurtis Chong	Independent Electricity System Operator	NPCC	2
4.	Sylvain Clermont	Hydro-Quebec TransEnergie	NPCC	1
5.	Bohdan M. Dackow	US Power Generating Company (USPG)	NPCC	NA
6.	Chris de Graffenried	Consolidated Edison Co. of New York, Inc.	NPCC	1
7.	Gerry Dunbar	Northeast Power Coordinating Council	NPCC	10
8.	Brian D. Evans-Mongeon	Utility Services	NPCC	8
9.	Mike Garton	Dominion Resources Services, Inc.	NPCC	5
10.	Brian L. Gooder	Ontario Power Generation Incorporated	NPCC	5

Group/Individual	Commenter	Organization	Registered Ballot Body Segment									
			1	2	3	4	5	6	7	8	9	10

11.	Kathleen Goodman	ISO - New England	NPCC	2
12.	David Kiguel	Hydro One Networks Inc.	NPCC	1
13.	Michael R. Lombardi	Northeast Utilities	NPCC	1
14.	Randy MacDonald	New Brunswick Power Transmission	NPCC	1
15.	Bruce Metruck	New York Power Authority	NPCC	6
16.	Chantel Haswell	FPL Group, Inc.	NPCC	5
17.	Lee Pedowicz	Northeast Power Coordinating Council	NPCC	10
18.	Robert Pellegrini	The United Illuminating Company	NPCC	1
19.	Saurabh Saksena	National Grid	NPCC	1
20.	Michael Schiavone	National Grid	NPCC	1
21.	Wayne Sipperly	New York Power Authority	NPCC	5
22.	Donald Weaver	New Brunswick System Operator	NPCC	2
23.	Ben Wu	Orange and Rockland Utilities	NPCC	1
24.	Peter Yost	Consolidated Edison Co. of New York, Inc.	NPCC	3

2.	Group	Terry L. Blackwell	Santee Cooper	X		X		X	X				

	Additional Member	Additional Organization	Region	Segment Selection
1.	S. Tom Abrams	Santee Cooper	SERC	1
2.	Glenn Stephens	Santee Cooper	SERC	1
3.	Rene Free	Santee Cooper	SERC	1
4.	Wayne Ahl	Santee Cooper	SERC	1
5.	Jim Peterson	Santee Cooper	SERC	1

3.	Group	Carol Gerou	MRO's NERC Standards Review Subcommittee										X

	Additional Member	Additional Organization	Region	Segment Selection
1.	Mahmood Safi	Omaha Public Utility District	MRO	1, 3, 5, 6
2.	Chuck Lawrence	American Transmission Company	MRO	1
3.	Tom Webb	Wisconsin Public Service Corporation	MRO	3, 4, 5, 6
4.	Jason Marshall	Midwest ISO Inc.	MRO	2
5.	Jodi Jenson	Western Area Power Administration	MRO	1, 6
6.	Ken Goldsmith	Alliant Energy	MRO	4
7.	Alice Ireland	Xcel Energy	MRO	1, 3, 5, 6
8.	Dave Rudolph	Basin Electric Power Cooperative	MRO	1, 3, 5, 6

Group/Individual	Commenter	Organization	Registered Ballot Body Segment									
			1	2	3	4	5	6	7	8	9	10

9.	Eric Ruskamp	Lincoln Electric System	MRO	1, 3, 5, 6
10.	Joseph Knight	Great River Energy	MRO	1, 3, 5, 6
11.	Joe DePoorter	Madison Gas & Electric	MRO	3, 4, 5, 6
12.	Scott Nickels	Rochester Public Utilties	MRO	4
13.	Terry Harbour	MidAmerican Energy Company	MRO	1, 3, 5, 6
14.	Richard Burt	Minnkota Power Cooperative, Inc.	MRO	1, 3, 5, 6

4.	Group	Brent Ingebrigtson	LG&E and KU Energy		X							

	Additional Member	Additional Organization	Region	Segment Selection
1.	Brenda Truhe	PPL Electric Utilities Corporation	NA - Not Applicable	1
2.	Annette Bannon	PPL Generation LLC	NA - Not Applicable	5
3.	Mark Heimbach	PPL Energy Plus	NA - Not Applicable	6

5.	Group	Jason Marshall	Midwest ISO Standards Collaborators		X							

	Additional Member	Additional Organization	Region	Segment Selection
1.	Robert Thomasson	Big Rivers Electric Cooperative	SERC	1, 3
2.	Terry Harbour	Midamerican Energy	MRO	1
3.	Joe Knight	Great River Energy	MRO	1, 3, 5, 6
4.	Mike Moltane	ITC Holdings	RFC	1

6.	Group	Sam Ciccone	FirstEnergy	X		X	X	X	X				

	Additional Member	Additional Organization	Region	Segment Selection
1.	Dave Folk	FE	RFC	1, 3, 4, 5, 6
2.	Doug Hohlbaugh	FE	RFC	1, 3, 4, 5, 6

7.	Group	Denise Koehn	Bonneville Power Administration	X		X		X	X				

	Additional Member	Additional Organization	Region	Segment Selection
1.	Jamie Murphy	BPA, Transmission Technical Operations	WECC	1
2.	Bart McManus	BPA, Transmission Technical Operations	WECC	1
3.	Dave Kirsch	BPA, Transmission Technical Operations	WECC	1
4.	Deanna Phillips	BPA, FERC Compliance Office	WECC	1, 3, 5, 6

8.	Group	Robert Rhodes	SPP Standards Development									

	Additional Member	Additional Organization	Region	Segment Selection
1.	John Allen	City Utilities of Springfield, MO	SPP	1, 4

Group/Individual		Commenter	Organization		Registered Ballot Body Segment									
					1	2	3	4	5	6	7	8	9	10
2.	Michelle Corley	Cleco	SPP	1, 3, 5										
3.	Lisa Duffey	Cleco	SPP	1, 3, 5										
4.	Jeff Elting	Nebraska Public Power District	MRO	1, 3, 5										
5.	Denney Fales	Kansas City Power & Light	SPP	1, 3, 5, 6										
6.	Louis Guidry	Cleco	SPP	1, 3, 5										
7.	Allen Klassen	Westar Energy	SPP	1, 3, 5, 6										
8.	Rick Koch	Nebraska Public Power District	MRO	1, 3, 5										
9.	Errol Ortego	Louisiana Energy and Power Authority	SPP	10										
10.	David Pham	Empire District Electric	SPP	1, 3, 5, 6										
11.	Don Schmit	Nebraska Public Power District	MRO	1, 3, 5										
12.	John Stephens	City Utililties of Springfield, MO	SPP	1, 4										
13.	Bryan Taggart	Westar Energy	SPP	1, 3, 5, 6										
14.	Jim Useldinger	Kansas City Power & Light	SPP	1, 3, 5, 6										
15.	Barry Warren	Empire District Electric	SPP	1										
16.	Bryn Wilson	Empire District Electric	SPP	1										
9.	Group	Albert DiCaprio	IRC Standards Review Committee			X								

	Additional Member	Additional Organization	Region	Segment Selection
1.	Patrick Brown	PJM	RFC	2
2.	Matt Goldberg	ISO-NE	NPCC	2
3.	Dan Rochester	IESO	NPCC	2
4.	Steve Myers	ERCOT	ERCOT	2
5.	Mark Thompson	AESO	WECC	2
6.	Greg Van Pelt	CAISO	WECC	2
7.	Charles Yeung	SPP	SPP	2
8.	Terry Bilke	Midwest ISO	RFC	2
9.	Greg Campoli	NYISO	NPCC	2
10.	Kathleen Goodman	ISO-NE	NPCC	2
11.	Ben Li	IESO	NPCC	2
12.	Jason Marshall	Midwest ISO	RFC	2
13.	Don Weaver	NBSO	NPCC	2

10.	Group	Gerald Beckerle	SERC OC Standards Review Group		X		X							

Group/Individual	Commenter	Organization	Registered Ballot Body Segment									
			1	2	3	4	5	6	7	8	9	10

	Additional Member	Additional Organization	Region	Segment Selection
1.	John Neagle	AECI	SERC	1, 3, 5
2.	Larry Akens	TVA	SERC	1, 3, 5, 9
3.	Chris Adams	EKPC	SERC	3, 5, 9, 1
4.	Joel Wise	TVA	SERC	1, 3, 5, 9
5.	Ron Wyble	CWLD	SERC	1, 5, 9
6.	Andy Burch	EEI	SERC	1, 5
7.	Rene' Free	Santee Cooper	SERC	1, 3, 5, 9
8.	Glenn Stephens	Santee Cooper	SERC	1, 3, 5, 9
9.	Robert Thomasson	BREC	SERC	1, 3, 5, 9
10.	Gene Delk	SCE&G	SERC	1, 3, 5
11.	Mike Oatts	Southern	SERC	1, 3, 5
12.	Sam Holeman	Duke	SERC	1, 3, 5
13.	Marc Butts	Southern	SERC	1, 3, 5
14.	Melinda Montgomery	Entergy	SERC	1, 3
15.	Ron Carlsen	Southern	SERC	1, 3, 5
16.	Tim Hattaway	PowerSouth	SERC	1, 3, 5, 9
17.	John Troha	SERC	SERC	10

11.	Group	Michael Gammon	Kansas City Power & Light	X		X		X	X				

	Additional Member	Additional Organization	Region	Segment Selection
1.	Jennifer Flandermeyer	Kansas City Power & Light	SPP	1, 3, 5, 6
2.	Denney Fales	Kansas City Power & Light	SPP	1, 3, 5, 6

12.	Individual	Janet Smith	Arizona Public Service Company	X		X		X	X				
13.	Individual	Cindy Martin	Southern Company	X		X							
14.	Individual	James Eckelkamp	Progress Energy	X		X		X	X				
15.	Individual	Rob Coulbeck	ENBALA Power Networks										
16.	Individual	Joe O'Brien	NIPSCO	X		X		X	X				
17.	Individual	John Canavan	NorthWestern Energy	X									
18.	Individual	Howard F. Illian	Energy Mark, Inc.								X		
19.	Individual	Si Truc PHAN	Hydro-Quebec TransEnergie	X									

Group/Individual		Commenter	Organization	Registered Ballot Body Segment									
				1	2	3	4	5	6	7	8	9	10
20.	Individual	Isaac Read	Beacon Power Corporation						X				
21.	Individual	Bryan Taggart	Westar Energy	X		X		X	X				
22.	Individual	Thomas Washburn	FMPP						X				
23.	Individual	Chris Adams	EKPC	X				X		X	X		
24.	Individual	Kathleen Goodman	ISO New Engand Inc.		X								
25.	Individual	Hao Li	Seattle City Light	X		X	X	X	X				
26.	Individual	Kasia Mihalchuk	Manitoba Hydro	X		X		X	X				
27.	Individual	JC Culberson	ERCOT		X								
28.	Individual	Howard Rulf	We Energies			X	X	X					
29.	Individual	Thad Ness	American Electric Power	X		X		X	X				
30.	Individual	Greg Rowland	Duke Energy	X		X		X	X				
31.	Individual	LeRoy Patterson	Patterson Consulting, Inc.										
32.	Individual	RoLynda Shumpert	South Carolina Electric and Gas	X		X		X	X				
33.	Individual	Todd Bennett	Associated Electric Cooperative, Inc.	X		X		X	X		X		
34.	Individual	Mark Thompson	Alberta Electric System Operator		X								
35.	Individual	Dan Rochester	Independent Electricity System Operator		X								
36.	Individual	Alice Ireland	Xcel Energy	X		X		X	X				

1. ***The SDT has developed three new terms to be used with this standard.***
   - ***Single Event Frequency Response Data (SEFRD) The individual sample of event data from a Balancing Authority which represents the change in Net Actual Interchange (NIA), divided by the change in frequency, expressed in MW/0.1Hz.***
   - ***Frequency Response Measure (FRM) The median of all Single Event Frequency Response Data observations reported annually on FRS Form 1.***
   - ***Frequency Response Obligation (FRO) The Balancing Authority's contribution to the total aggregate Frequency Response needed for reliable operation of an Interconnection assigned by the ERO.***

Do you agree with the proposed definitions in this standard? If not, please explain in the comment area?

Summary Consideration: The majority of the commenters disagreed with the proposed definitions for this standard. The primary concerns cited are the definitions, and the calculations and methodology associated with the definitions, are not clear.

Many commenters expressed concern that the FRM methodology did not allow exclusion of events that, if included, would mask true frequency response. Commenters also indicated that the 'average' and not the 'median' should be used for the FRM calculation. Other observations include inconsistency between the FRM definition and its calculation on FRS Form 1; that proposed language allows the ERO to unilaterally change FRO value; and that definitions seem more focused on the frequency excursion curve point B value and not point C value. Suggestions for improving the standard include making it clear that 25 events are used for determining FRM; that definitions should specify how to calculate each term; and that FRM should take into account nonconforming load.

In response to industry comments, the SDT has deleted the SEFRD definition from the standard; revised the FRO and FRM definitions; and also improved the calculations. With regards to use of the median for calculating FRM, in general, statisticians use the median as the best measure of central tendency when a population has outliers. Two independent reviews by the FR SDT have shown the Median to be less influenced by noise in the measurement process. FRS Form 1 has been modified to allow for adjustments to the load and generation. To allay industry concern over the ERO's role, the SDT is evaluating if a modification to the NERC Rules of Procedure to obligate the ERO to perform the tasks specified in the standard is necessary.

In regards to concerns over the frequency excursion curve point B value, the SDT explained that while point B measurements have some data quality challenges to be mastered, point C measurements are not practical at this time for Balancing Authorities in an Interconnection with more than one Balancing Authority. The SDT intends to study point B and point C relationships of each Interconnection with more than one Balancing Authority to address this issue during the field trial.

The SDT has chosen the deterministic approach detailed in Attachment A as the method to use to allocate the Interconnection FRO to the BAs. The SDT is evaluating a probabilistic method during the field trial.

Organization	Yes or No	Question 1 Comment

Organization	Yes or No	Question 1 Comment
Patterson Consulting, Inc.	No	From the definition, it is not clear whether SEFRD is a Balancing Authority's 1) data collected for each frequency event, 2) calculated Frequency Response for a selected event, 3) Net Actual Interchange divided by the change in frequency for a selected event, or 4) some combination of these interpretations. If the SDT determines that adjustments to Net Actual Interchange should be made such as adjustments for joint-owned generation and nonconforming loads as suggested in the field test document, then since this definition requires Frequency Response to be determined from Net Actual Interchange, this definition would require changing to allow those adjustments. I suggest defining SEFRD as "The individual sample of event data from a Balancing Authority that is necessary to calculate its Frequency Response on FRS Form 1, expressed in MW/0.1Hz." FRM: This definition and its calculation in FRS Form 1 do not match. FRS Form 1 calculates FRM as "The median of Single Event Frequency Response Data observations reported annually on FRS Form 1 [for events external to the Balancing Authority]." (Brackets added for emphasis.) The FRS Form 1 calculation appears more appropriate based on data collected, since data are not reported and calculations are not adjusted to compensate for contingencies within the Balancing Authority. Regardless, the difference between definition and calculation makes it impossible for a Balancing Authority to know the expected performance measure. FRO: The definition should be changed to remove the opposing concepts of performance and obligation. For example: FRO is defined to be "The Balancing Authority's contribution to the total aggregate Frequency Response…" FRM, not FRO, is the Balancing Authority's contribution toward the aggregated Frequency Response. FRO is "The Balancing Authority's allocation of the interconnection's required Frequency Response…" or "The Balancing Authority's required Frequency Response needed for reliable operation of an Interconnection …"
Response: The SDT agrees with your concern regarding the definition of SEFRD. The SDT has removed the definition from the standard. The SDT has modified the definition for FRM to read "The median of all the Frequency Response observations reported annually on FRS Form 1." The SDT also agrees with your concern regarding the definition of FRO and has revised the definition to read "The Balancing Authority's share of the required Frequency Response needed for the reliable operation of an Interconnection."		
Santee Cooper	No	We suggest the SDT consider defining SEFRD as: The calculated frequency response by a Balancing Authority for a specific frequency excursion event as identified by the ERO (or NERC). As a comment, how frequency response is calculated needs to be defined and may not always be the Net Actual Interchange (NIa) divided by the change in frequency expressed in hertz. For example, the NIa may need to be adjusted for known generation and load changes that do not represent frequency response for the period being measured such as known generation and load ramp changes. Change in frequency needs to be more specific, such as the frequency difference between B and A measured at B. If Frequency Response Obligation (FRO) is a targeted value, then perhaps the definition should be: The

Organization	Yes or No	Question 1 Comment
		Balancing Authority's annual median frequency response as assigned by the ERO (or NERC). The word "contribution" should be considered to be replaced with "the balancing authority piece of the total....."The review team is concerned that the FRO and FRM definitions do not contain enough clarity as to how the BAs will be held accountable. Also, the definitions do not explain who will determine the value of each BA's FRO and the method used to determine the FRO value.Should the definition of Frequency Response Measure be a median or mean value?
Response: The SDT agrees with your concern regarding the definition of SEFRD. The SDT has removed the definition from the standard. The SDT also agrees with your concern regarding the definition of FRO and has revised the definition to read "The Balancing Authority's share of the required Frequency Response needed for the reliable operation of an Interconnection." With regards to use of the median for calculating FRM, in general, statisticians use the median as the best measure of central tendency when a population has outliers. Two independent reviews by the FR SDT have shown the Median to be less influenced by noise in the measurement process.		
LG&E and KU Energy	No	We suggest the SDT consider defining SEFRD as: The calculated frequency response by a Balancing Authority for a specific frequency excursion event as identified by the ERO (or NERC). As a comment, how frequency response is calculated needs to be defined and may not always be the Net Actual Interchange (NIa) divided by the change in frequency expressed in hertz. For example, the NIa may need to be adjusted for known generation and load changes that do not represent frequency response for the period being measured such as known generation and load ramp changes. Change in frequency needs to be more specific, such as the frequency difference between two physical locations B and A measured at B. Frequency deviation used in the calculation needs to be the deviation observed by the BA performing the calculation. If Frequency Response Obligation (FRO) is a targeted value, then perhaps the definition should be: The Balancing Authority's annual median frequency response as assigned by the ERO (or NERC). The word "contribution" should be considered to be replaced with "the balancing authority piece of the total....."The standard does not explain who will determine the value of each BA's FRO nor the method used to determine the FRO value. Should the definition of Frequency Response Measure be a median or mean value?
Response: The SDT agrees with your concern regarding the definition of SEFRD. The SDT has removed the definition from the standard. The SDT also agrees with your concern regarding the definition of FRO and has revised the definition to read "The Balancing Authority's share of the required Frequency Response needed for the reliable operation of an Interconnection." With regards to use of the median for calculating FRM, in general, statisticians use the median as the best measure of central tendency when a population has outliers. Two independent reviews by the FR SDT have shown the Median to be less influenced by noise in the measurement process.		

Organization	Yes or No	Question 1 Comment
SERC OC Standards Review Group	No	We suggest the SDT consider defining SEFRD as: The calculated frequency response by a Balancing Authority for a specific frequency excursion event as identified by the ERO (or NERC). As a comment, how frequency response is calculated needs to be defined and may not always be the Net Actual Interchange (NIa) divided by the change in frequency expressed in hertz. For example, the NIa may need to be adjusted for known generation and load changes that do not represent frequency response for the period being measured such as known generation and load ramp changes. Change in frequency needs to be more specific, such as the frequency difference between B and A measured at B. If Frequency Response Obligation (FRO) is a targeted value, then perhaps the definition should be: The Balancing Authority's annual median frequency response as assigned by the ERO (or NERC). The word "contribution" should be considered to be replaced with "the balancing authority piece of the total....."The review team is concerned that the FRO and FRM definitions do not contain enough clarity as to how the BAs will be held accountable. Also, the definitions do not explain who will determine the value of each BA's FRO and the method used to determine the FRO value. Should the definition of Frequency Response Measure be a median or mean value?
Response: The SDT agrees with your concern regarding the definition of SEFRD. The SDT has removed the definition from the standard. The SDT also agrees with your concern regarding the definition of FRO and has revised the definition to read "The Balancing Authority's share of the required Frequency Response needed for the reliable operation of an Interconnection." The ERO is the responsible party for determining a BA's FRO. The explanation of who determines the BA's FRO as-well-as how the BA's FRO is determined is now contained in the revised Attachment A. With regards to use of the median for calculating FRM, in general, statisticians use the median as the best measure of central tendency when a population has outliers. Two independent reviews by the FR SDT have shown the Median to be less influenced by noise in the measurement process.		
South Carolina Electric and Gas	No	We suggest the SDT consider defining SEFRD as: The calculated frequency response by a Balancing Authority for a specific frequency excursion event as identified by the ERO (or NERC). As a comment, how frequency response is calculated needs to be defined and may not always be the Net Actual Interchange (NIa) divided by the change in frequency expressed in hertz. For example, the NIa may need to be adjusted for known generation and load changes that do not represent frequency response for the period being measured such as known generation and load ramp changes. Change in frequency needs to be more specific, such as the frequency difference between B and A measured at B. If Frequency Response Obligation (FRO) is a targeted value, then perhaps the definition should be: The Balancing Authority's annual median frequency response as assigned by the ERO (or NERC). The word

Organization	Yes or No	Question 1 Comment
		"contribution" should be considered to be replaced with "the balancing authority piece of the total....." The review team is concerned that the FRO and FRM definitions do not contain enough clarity as to how the BAs will be held accountable. Also, the definitions do not explain who will determine the value of each BA's FRO and the method used to determine the FRO value. Should the definition of Frequency Response Measure be a median or mean value? May need to clarify what FRS stands for.
Response: The SDT agrees with your concern regarding the definition of SEFRD. The SDT has removed the definition from the standard. The SDT also agrees with your concern regarding the definition of FRO and has revised the definition to read "The Balancing Authority's share of the required Frequency Response needed for the reliable operation of an Interconnection." The ERO is the responsible party for determining a BA's FRO. The explanation of who determines the BA's FRO as-well-as how the BA's FRO is determined is now contained in the revised Attachment A. With regards to use of the median for calculating FRM, in general, statisticians use the median as the best measure of central tendency when a population has outliers. Two independent reviews by the FR SDT have shown the Median to be less influenced by noise in the measurement process.		
MRO's NERC Standards Review Subcommittee	No	For Frequency Response Measure, the drafting team should consider using average rather than median. Because median is literally the middle value, a Balancing Authority could have 12 really bad Single Event Frequency Response Data and still comply. Average values would prevent this from happening. Should FRM be clear that it includes at least 25 events in the definition? While that can be garnered from Attachment A, it is not specified in the Form 1 instructions. We are concerned that the regulators may argue that 25 events do not apply because an attachment is not part of the standard.
Response: Based on analysis of data the SDT has determined that the median value is the proper method to be used in defining FRM. The SDT has been advised by NERC Legal that an attachment explicitly referenced in a Reliability Standard Requirement is enforceable as part of that Requirement.		
Midwest ISO Standards Collaborators	No	For Frequency Response Measure, the drafting team should consider using average rather than median. Because median is literally the middle value, a Balancing Authority could have 12 really bad Single Event Frequency Response Data and still comply. Average values would prevent this from happening. Should FRM be clear that it includes at least 25 events in the definition? While that can be garnered from Attachment A, it is not specified in the Form 1 instructions. We are concerned that the regulators may argue

Organization	Yes or No	Question 1 Comment
		that 25 events do not apply because an attachment is not part of the standard.
Response: With regards to use of the median for calculating FRM, in general, statisticians use the median as the best measure of central tendency when a population has outliers. Two independent reviews by the FR SDT have shown the Median to be less influenced by noise in the measurement process. The SDT has been advised by NERC Legal that an attachment explicitly referenced in a Reliability Standard Requirement is enforceable as part of that Requirement.		
We Energies	No	For Frequency Response Measure, the drafting team should consider using average rather than median. Because median is literally the middle value, a Balancing Authority could have 12 really bad Single Event Frequency Response Data points and still comply. Average values would prevent this from happening.Should FRM be clear that it includes at least 25 events in the definition? While that can be garnered from Attachment A, it is not specified in the Form 1 instructions. We are concerned that the regulators may argue that 25 events do not apply because an attachment is not part of the standard.
Response: With regards to use of the median for calculating FRM, in general, statisticians use the median as the best measure of central tendency when a population has outliers. Two independent reviews by the FR SDT have shown the Median to be less influenced by noise in the measurement process. The SDT has been advised by NERC Legal that an attachment explicitly referenced in a Reliability Standard Requirement is enforceable as part of that Requirement.		
Westar Energy	No	For FRM, why is median used rather than average? The method in the standard for dsetermining FRM needs to allow for excluding some events due to non-conforming loads, scan rates, intermittent resources, large interchange ramps, etc that may cause the actual response during the 16 seconds to actually be opposite of the expected response.
Response: With regards to use of the median for calculating FRM, in general, statisticians use the median as the best measure of central tendency when a population has outliers. Two independent reviews by the FR SDT have shown the Median to be less influenced by noise in the measurement process. The FRS Form 1 has been modified to allow for adjustments (not exclusions) to the load and generation.		
Bonneville Power Administration	No	FRO definition - BPA feels uncomfortable supporting this standard when the ERO is given a blank check to FRO. The methodology for determining the FRO must be spelled out in detail in order to allow all entities an opportunity to comment on that methodology.
Response: The SDT is evaluating if a modification to the NERC Rules of Procedure to obligate the ERO to perform the tasks identified in the standard is		

Organization	Yes or No	Question 1 Comment
necessary.		
SPP Standards Development	No	In the past tie line flow changes that did not have the expected response for the given frequency deviation have been excluded from the determination of Frequency Bias. It appears that this exclusion does not carry forth in the determination of Frequency Response Measure. Therefore, non-conforming loads, intermittent resources and other events/issues within a Balancing Authority could very well mask its natural frequency repsonse thereby setting the Balancing Authority's Frequency Bias and its Frequency Response Obligation incorrectly. Then the Balancing Authority is obligated to respond and will be measured for compliance against an incorrect value. This being the case, we can support the definition of Single Event Frequency Response Data but have reservations about Frequency Response Measure and Frequency Response Obligation.
Response: The SDT agrees with your concern regarding the definition of FRO and has revised the definition to read "The Balancing Authority's share of the required Frequency Response needed for the reliable operation of an Interconnection." With regards to use of the median for calculating FRM, in general, statisticians use the median as the best measure of central tendency when a population has outliers. Two independent reviews by the FR SDT have shown the Median to be less influenced by noise in the measurement process. The FRS Form 1 has been modified to allow for adjustments (not exclusions) to the load and generation. Note that based on other stakeholder concerns, the definition of SEFRD has been deleted.		
IRC Standards Review Committee	No	The definition of SEFRD will not work as described for a single BA Interconnection. There is no change in NI for frequency deviations. Similarly, the definition assumes all response is provided by change in Interchange and does not really reflect the frequency response of a contingent BA. Either the definition needs to be changed to accommodate single BA Interconnections (such as ERCOT and Hydro Quebec), or regional variances for them need to be written by the SDT. A BA's frequency response is composed of load frequency response, governor response, and, for BAs external to the resource loss, change in Net Interchange. Some approximation may be achieved by recognizing that the magnitude of frequency deviation is attenuated by load frequency response and governor response (or frequency activated demand response to reduce load). The definition of FRM specifies the median of all SEFRD observations reported annually. What is the technical basis for selecting the median rather than the mean? The definition of FRO raises questions. The discretely administered determination of FRO described in the draft Attachment A sets too stringent a requirement; particularly for the smaller Interconnections which may also have large size generation resources just as do the larger Interconnections. To "assure that Point C will not encroach on the first step UFLS" is significantly more stringent than existing and historical performance for those smaller Interconnections. Such assurance will assuredly prove to be very expensive.In fact, we question the need to define FRM and FRO since they can easily be stipulated in

Organization	Yes or No	Question 1 Comment
		the standard requirements. Having them defined and added to the ever-growing NERC glossary creates unnecessary work to maintain the glossary, unless these terms are used by other NERC standards for which consistent meaning need to be established. For example, R1 can easily be reworded as:"R1: Each Balancing Authority shall achieve a median of all Single Event Frequency Response Data observations reported annually on FRS Form 1 that is equal to or more negative than its contribution obligation to the total aggregate Frequency Response needed for reliable operation of an Interconnection assigned by the ERO.\ "Similar wording changes can be made to the FRS Form 1 to eliminate the need to define these two terms.Further, the Attachment A states that the SDT is evaluating a risk based approach to establishing an Interconnection Frequency Response Obligation which can be based on a probability function. If the N-2 criteria is established, it will be unlikely to be possible to change that if the new approach is viewed as a reduction in required performance. As an example, in the ERCOT Interconnection, it is recognized that the present level of required frequency responsive reserve cannot in all scenarios assure that Point C will not encroach the first step of UFLS. The system conditions that exist for the encroachment to occur represent a small likelihood and would require the N-2 contingency to occur on something like the minimum hour of the minimum load day of the year. It has occurred one time in the history of ERCOT. Thus, it is less than once in ten years based upon actual history. The cost of precluding such an event would be astronomical.
Response: The SDT believes that the FRO and FRM definitions will be used in later revisions to the BAL group of standards and therefore is keeping the definitions in the standard so they can be added to the approved NERC Glossary of Terms. The SDT agrees with your concern regarding the definition of SEFRD. The SDT has removed the definition from the standard. The SDT also agrees with your concern regarding the definition of FRO and has revised the definition to read "The Balancing Authority's share of the required Frequency Response needed for the reliable operation of an Interconnection." With regards to use of the median for calculating FRM, in general, statisticians use the median as the best measure of central tendency when a population has outliers. Two independent reviews by the FR SDT have shown the Median to be less influenced by noise in the measurement process. The SDT has chosen the deterministic approach detailed in Attachment A as the method to use to allocate the Interconnection FRO to the BAs. The SDT is evaluating a probabilistic approach during the field trial.		
ERCOT	No	The definition of SEFRD will not work as described for a single BA Interconnection. There is no change in NI for frequency deviations. Similarly, the definition assumes all response is provided by change in Interchange and does not really reflect the frequency response of a contingent BA. Either the definition needs to be changed to accommodate single BA Interconnections (such as ERCOT and Hydro Quebec), or regional variances for them need to be written by the SDT. A BA's frequency response is composed of load frequency response, governor response, and, for BAs external to the resource loss, change in Net Interchange. Some approximation may be achieved by recognizing that the magnitude of frequency deviation is attenuated by

Organization	Yes or No	Question 1 Comment
		load frequency response and governor response (or frequency activated demand response to reduce load). The definition of FRM specifies the median of all SEFRD observations reported annually. What is the technical basis for selecting the median rather than the mean? The definition of FRO raises questions. The discretely administered determination of FRO described in the draft Attachment A sets too stringent a requirement; particularly for the smaller Interconnections which may also have large size generation resources just as do the larger Interconnections. To "assure that Point C will not encroach on the first step UFLS" is significantly more stringent than existing and historical performance for those smaller Interconnections. Such assurance will assuredly prove to be very expensive. In fact, we question the need to define FRM and FRO since they can easily be stipulated in the standard requirements. Having them defined and added to the ever-growing NERC glossary creates unnecessary work to maintain the glossary, unless these terms are used by other NERC standards for which consistent meaning need to be established. For example, R1 can easily be reworded as:"R1: Each Balancing Authority shall achieve a median of all Single Event Frequency Response Data observations reported annually on FRS Form 1 that is equal to or more negative than its contribution obligation to the total aggregate Frequency Response needed for reliable operation of an Interconnection assigned by the ERO." Similar wording changes can be made to the FRS Form 1 to eliminate the need to define these two terms.Further, the Attachment A states that the SDT is evaluating a risk based approach to establishing an Interconnection Frequency Response Obligation which can be based on a probability function. If the N-2 criteria is established, it will be unlikely to be possible to change that if the new approach is viewed as a reduction in required performance. As an example, in the ERCOT Interconnection, it is recognized that the present level of required frequency responsive reserve cannot in all scenarios assure that Point C will not encroach the first step of UFLS. The system conditions that exist for the encroachment to occur represent a small likelihood and would require the N-2 contingency to occur on something like the minimum hour of the minimum load day of the year. It has occurred one time in the history of ERCOT. Thus, it is less than once in ten years based upon actual history. The cost of precluding such an event would be astronomical.

Response: The SDT believes that the FRO and FRM definitions will be used in later revisions to the BAL group of standards and therefore is keeping the definitions in the standard so they can be added to the approved NERC Glossary of Terms.

The SDT agrees with your concern regarding the definition of SEFRD. The SDT has removed the definition from the standard.

The SDT also agrees with your concern regarding the definition of FRO and has revised the definition to read "The Balancing Authority's share of the required Frequency Response needed for the reliable operation of an Interconnection."

With regards to use of the median for calculating FRM, in general, statisticians use the median as the best measure of central tendency when a population has outliers. Two independent reviews by the FR SDT have shown the Median to be less influenced by noise in the measurement process.

The SDT has chosen the deterministic approach detailed in Attachment A as the method to use to allocate the Interconnection FRO to the BAs. The SDT is

Organization	Yes or No	Question 1 Comment
evaluating a probabilistic approach during the field trial.		
Progress Energy	No	The proposed definition for SEFRD assumes that there is no change in the Net Scheduled Interchange (NIS) as a result of the event. However, a dynamic schedule for load or generation based on data obtained with a two second scan rate will impact the NIS, and therefore the corresponding load or generation response will offset the change to NIA. Therefore, the definition of SEFRD should replace "NIA" with "change in NIA minus NIS".
Response: The SDT agrees with your concern regarding the definition of SEFRD. The SDT has removed the definition from the standard.		
Energy Mark, Inc.	No	Comment 1: I agree with the definition of the Single Event Frequency Response Data. Comment 2: I do not agree that the Frequency Response Measure should be the median of all SEFRD observations reported annually on FRS Form 1. Comment 3: The regression values presented on FRS Form 1 have not been calculated correctly. Comment 4: Since the FRM is going to be used to set the value for the Frequency Bias Setting and the Frequency Bias Setting represents a straight line though the origin of zero frequency error and zero megawatt error, the best representation of the data for setting this paramater can be achieved through the use of a regression. Comment 5: Only a regression will weight the impact of each SEFRD correctly. The use of median or mean will not provide the best estimate for use as the Frequency Bias Setting. Comment 6: The standard has been written to include a samlple size (25) large enough to enable effective statistical methods of analysis. What justification is there to then ignor those well proven methods and revert to methods designed to address problems where the sample sizes are insufficient to support sound statistical analysis methods.
Response: (1) The SDT thanks you for your affirmative response, however several other stakeholders disagreed with the definition of SEFRD and the drafting team has removed the proposed definition from the revised standard. (2, 4, 5) With regards to use of the median for calculating FRM, in general, statisticians use the median as the best measure of central tendency when a population has outliers. Two independent reviews by the FR SDT have shown the Median to be less influenced by noise in the measurement process. (3) The SDT has corrected FRS Form 1. (6) Research conducted by the Frequency Response Standard Drafting Team (FR SDT) indicated that a Balancing Authority's FRM will converge to a reasonably stable value with 20 to 25 samples. The FR SDT as well as the NERC Frequency Response Initiative is evaluating other methods of FRM. The SDT is not ignoring methods of proven statistical design and the chosen method does require at least 25		

Organization	Yes or No	Question 1 Comment
samples.		
EKPC	No	These definitions should be revised to include specifics on how to calculate each term. The FRM calculation method should take into account large non-conforming loads. A median will not reflect the true nature of the system.
Response: The SDT does not believe the definition should include the specific calculation and therefore has incorporated the calculation methodology in Attachment A. The FRM calculation, using FRS Form 1, has been modified to now include adjustments. Based on analysis of data the SDT has determined that the median value is the proper method to be used in defining FRM.		
Duke Energy	No	The definition of SEFRD would conflict with any alternative measurement of frequency response. The SEFRD makes no provision for the impacts of generation loss experienced by a contingent BA, impacts of non-conforming loads, or impacts of schedule ramps. The FRM also makes no such provisions. The resulting FRM for a BA experiencing one or more of these impacts for one or more SEFRDs will be skewed and completely miss the intended measurement of the BA's response to frequency excursions. In addition, as it is not yet clear how provision of Frequency Response by one BA to meet a portion of another BA's requirement would be achieved, Duke Energy cannot say that a simple measure of the NIA against the frequency deviation will capture the net of the response desired. Regarding the definition of FRO, the industry should agree on the methodology which would be used for the ERO to determine the response desired for the Interconnection that is used for allocation of the FRO, and not leave it as a parameter subject to change outside of the standards process. The definition is only acceptable if the assignment by the ERO is based upon a methodology supported by the industry and subject to change only through the standards process.
Response: The SDT agrees with your concern regarding the definition of SEFRD. The SDT has removed the definition from the standard. The FRS Form 1 has been modified to allow for adjustments (not exclusions) to the load and generation. The methodology that the ERO will use for determining the FRO is now outlined in the new Attachment A. The industry will either accept or reject this methodology in the balloting phase of the standard.		
Associated Electric Cooperative, Inc.	No	1) SEFRD - I had to read this definition several times because "The individual sample of event data" is actually an internally calculated value derived from a set of event sample data, and not really a "sample" value at all. So, I believe the SEFRD definition needs further work.

Organization	Yes or No	Question 1 Comment
		2) FRM is defined by undefined terms “FRS” and “FRS Form 1”. 3) FRO – fine 4) FRS - “Frequency Response Survey”
Response: The SDT agrees with your concern regarding the definition of SEFRD. The SDT has removed the definition from the standard. FRS Form 1 is the name of the form to be used for calculating FRM.		
Alberta Electric System Operator	No	The frequency response has 2 aspects: arresting frequency deviation (Point C) and deviation where frequency has settled (Point B). The proposed SEFRD and FRM seem all based on the Point B, however the intention in purpose statement is towards Point C... It is not clear to AESO that these proposed SEFRD and FRM based on settled frequency deviation (Point B) are technically sufficient to address the concern of arresting frequency deviation (Point C).
Response: The SDT recognizes that point C is the primary reliability concern. However, while Point B measurements have some data quality challenges to be mastered, point C measurements are not practical at this time for Balancing Authorities in an Interconnection with more than one Balancing Authority. The SDT intends to study point B and point C relationships of each Interconnection with more than one Balancing Authority to address this issue.		
Independent Electricity System Operator	No	We concur with the definitions for SEFRD, FRM and FRO but do not believe that the latter two terms (FRM and FRO) need to be defined since they can easily be stipulated in the standard requirements. Having them defined and added to the ever-growing NERC glossary creates unnecessary work to maintain the glossary, unless these terms are used by other NERC standards for which consistent meaning need to be established. For example, R1 can easily be reworded as:”R1: Each Balancing Authority shall achieve a median of all Single Event Frequency Response Data observations reported annually on FRS Form 1 that is equal to or more negative than its contribution obligation to the total aggregate Frequency Response needed for reliable operation of an Interconnection assigned by the ERO.”Similar wording changes can be made to the FRS Form 1 to eliminate the need to define these two terms.
Response: Several stakeholders indicated concerns with the definition of SEFRD and the team has removed this definition from the revised standard. The SDT believes that the FRO and FRM definitions will be used in later revisions to the BAL group of standards and therefore is keeping the definitions in the standard so they can be added to the approved NERC Glossary of Terms.		
FirstEnergy	Yes	For the definition of FRM, we are not clear as to the rationale for choosing the median value instead of the mean.
Response: The SDT thanks you for your affirmative response and clarifying comment.		

Organization	Yes or No	Question 1 Comment
With regards to use of the median for calculating FRM, in general, statisticians use the median as the best measure of central tendency when a population has outliers. Two independent reviews by the FR SDT have shown the Median to be less influenced by noise in the measurement process.		
Southern Company	Yes	Comments: The Frequency Response Measure should be based on either the median or average of all SEFR's as currently defined. Due to the varied nature of frequency responsive resources online it should never be based on meeting response on a single event.
Response: The SDT thanks you for your affirmative response and clarifying comment. With regards to use of the median for calculating FRM, in general, statisticians use the median as the best measure of central tendency when a population has outliers. Two independent reviews by the FR SDT have shown the Median to be less influenced by noise in the measurement process.		
Seattle City Light	Yes	
Manitoba Hydro	Yes	
ENBALA Power Networks	Yes	
NIPSCO	Yes	
NorthWestern Energy	Yes	
Kansas City Power & Light	Yes	
Arizona Public Service Company	Yes	
FMPP	Yes	
American Electric Power	Yes	
Northeast Power Coordinating Council		Refer to the response to Question 17.
Response: Please refer to the SDT response to Question 17.		

2. The SDT has modified the definition for the term Frequency Bias Setting. The current definition and revised definition are shown below to show the changes proposed.

Frequency Bias Setting

Current Definition in NERC Glossary: A value, usually expressed in MW / 0.1 Hz, set into a Balancing Authority ACE algorithm, that allows the Balancing Authority to contribute its frequency response to the Interconnection.

Revised Definition: A value, (either a fixed or variable Frequency Bias), usually expressed in MW / 0.1 Hz, set into a Balancing Authority Area Control Error equation that allows the Balancing Authority to contribute its Frequency Response to the Interconnection.

Do you agree with this new definition for Frequency Bias Setting? If not, please explain in the comment area.

Summary Consideration: Many of the commenters did not agree with the new definition proposed for Frequency Bias Setting. Several commenters recommend revising the Frequency Bias Setting definition and have offered suggestions for the SDT to consider. In response, the SDT has revised the Frequency Bias Setting definition to better address concerns raised by industry.

The revised definition is:

Frequency Bias Setting: A number, either fixed or variable, usually expressed in MW/0.1 Hz, included in a Balancing Authority's Area Control Error equation to account for the Balancing Authority's Frequency Response contribution to the Interconnection, and discourage response withdrawal through secondary control systems.

Some commenters also questioned if the definition of Frequency Response also needed to be revised, however in reviewing the current definition of Frequency Response the SDT believes that the current definition is both accurate and appropriate. Concern was also raised regarding what constitutes variable bias. - Fixed bias is a value approved by the ERO whereas variable bias is a methodology for determining the Frequency Bias Setting approved by the ERO.

Organization	Yes or No	Question 2 Comment
Santee Cooper	No	We suggest the following changes to the definition: A value, fixed or variable, expressed in MW/0.1 hertz, as part of a Balancing Authority's Area Control Error (ACE) equation that influences its Automatic Generation Control (AGC) to provide frequency response without secondary control action withdrawing the response.
Response: The SDT has modified the definition. The definition now reads "A number, either fixed or variable, usually expressed in MW/0.1 Hz, included in a Balancing Authority's Area Control Error equation to account for the Balancing Authority's Frequency Response contribution to the Interconnection, and discourage response withdrawal through secondary control systems."		
ENBALA Power Networks	No	: ENBALA would modify the above as follows: A value, (either a fixed or variable Frequency Bias), usually

Organization	Yes or No	Question 2 Comment
		expressed in MW/0.1 Hz, set into a Balancing Authority Area Control Error algorithm equation that allows the Balancing Authority AGC System to ignore the export or import caused by the Primary Frequency Response.
Response: The SDT has modified the definition. The definition now reads "A number, either fixed or variable, usually expressed in MW/0.1 Hz, included in a Balancing Authority's Area Control Error equation to account for the Balancing Authority's Frequency Response contribution to the Interconnection, and discourage response withdrawal through secondary control systems."		
Westar Energy	No	We propose the following:A value, (either a fixed or variable), expressed in MW/0.1 Hz, set into a Balancing Authority Area Control Error equation that allows the Balancing Authority to contribute its SECONDARY Frequency Response to the Interconnection.
Response: The SDT has modified the definition. The definition now reads "A number, either fixed or variable, usually expressed in MW/0.1 Hz, included in a Balancing Authority's Area Control Error equation to account for the Balancing Authority's Frequency Response contribution to the Interconnection, and discourage response withdrawal through secondary control systems."		
EKPC	No	"Frequency Bias" should not be used in the definition."Usually" can be omitted.
Response: The SDT has modified the definition and "frequency bias" is not used in the revised definition. The definition now reads "A number, either fixed or variable, usually expressed in MW/0.1 Hz, included in a Balancing Authority's Area Control Error equation to account for the Balancing Authority's Frequency Response contribution to the Interconnection, and discourage response withdrawal through secondary control systems."		
LG&E and KU Energy	No	We suggest the following changes to the definition: 1. Delete the word "usually" 2. Replace "set into" with "as part of". 3. Replace the remainder of the sentence following "Area Control Error equation" with "that influences its Automatic Generation Control (AGC) to provide its frequency response while Interconnection frequency is not at its scheduled value" - (The frequency bias does not allow a BA to contribute its frequency response to the Interconnection. The frequency bias term only affects the AGC response of the BA, which is part of its frequency response usually minutes after the initial event and is dependent upon generation units being on AGC control and capable of responding.) 4. The suggested changes would result in the following definition:A value, (either a fixed or variable Frequency Bias), expressed in MW/0.1 hertz as part of a Balancing Authority's Area Control Error (ACE) equation that influences its Automatic Generation Control (AGC) to provide its frequency response while Interconnection frequency is not at its scheduled value.
Response: The SDT did adopt the suggestion to remove, "set into" and replaced this phrase with, "included", however the team did not adopt the suggestion to		

Organization	Yes or No	Question 2 Comment
delete the word, 'usually' as the inclusion of this word recognizes that there may be rare instances when the Frequency Bias Setting could be expressed in other than MW/0.1 Hz. The SDT did not adopt the third proposed change because it can cause confusion since primary Frequency Response cannot be delivered by AGC. The SDT has modified the definition. The definition now reads "A number, either fixed or variable, usually expressed in MW/0.1 Hz, included in a Balancing Authority's Area Control Error equation to account for the Balancing Authority's Frequency Response contribution to the Interconnection, and discourage response withdrawal through secondary control systems."		
SERC OC Standards Review Group	No	We suggest the following changes to the definition: 1. Delete "Frequency Bias" in the parenthetical expression - ("Frequency Bias" should not be used to define Frequency Bias) 2. Delete the word "usually" 3. Replace "set into" with "as part of" as defined in BAL-001. 4. Replace the remainder of the sentence following "Area Control Error equation" with "that influences its Automatic Generation Control (AGC) to provide its frequency response while Interconnection frequency is not at its scheduled value" - (The frequency bias does not allow a BA to contribute its frequency response to the Interconnection. The frequency bias term only affects the AGC response of the BA, which is usually minutes after the initial event and is dependent upon generation units being on AGC control and capable of responding.) 5. The suggested changes would result in the following definition"A value, fixed or variable, expressed in MW/0.1 hertz as part of a Balancing Authority's Area Control Error (ACE) equation that influences its Automatic Generation Control (AGC) to continue to provide its frequency response while Interconnection frequency is not at its scheduled value.
Response: The SDT has modified the definition and "frequency bias" is not used in the revised definition and the phase, "set into" was replaced with "included". The SDT did not adopt the suggestion to delete the word, 'usually' because there may be rare instances when the Frequency Bias Setting is expressed in other than MW/0.1 Hz. The SDT has modified the definition. The definition now reads "A number, either fixed or variable, usually expressed in MW/0.1 Hz, included in a Balancing Authority's Area Control Error equation to account for the Balancing Authority's Frequency Response contribution to the Interconnection, and discourage response withdrawal through secondary control systems."		
Midwest ISO Standards Collaborators	No	Given that frequency response is "contributed" long before AGC has an impact, "contribute" should probably be changed to "maintain". The goal is to ensure AGC does not withdraw frequency response and that it is maintained while frequency is depressed. We are not sure if Frequency Response has a precise enough definition and it is part of the definition of Frequency Bias Setting. The definition of Frequency Response really just reflects how it is measured. It does not define what it really is which is the dynamic response of load, generation, and other frequency responsive devices to a perturbation in frequency.

Organization	Yes or No	Question 2 Comment
		The drafting team should also consider resolving the definition of Frequency Bias. Is it needed? It is often confused with Frequency Bias Setting and is often used interchangeably with Frequency Response even though the meanings are slightly different.
Response: The SDT has modified the definition of Frequency Bias Setting. The definition now reads "A number, either fixed or variable, usually expressed in MW/0.1 Hz, included in a Balancing Authority's Area Control Error equation to account for the Balancing Authority's Frequency Response contribution to the Interconnection, and discourage response withdrawal through secondary control systems." The SDT believes that based on the modified definition, the use of the term "contribution" better describes the action that has taken place. The SDT has reviewed the current definition of Frequency Response and believes that the current definition is both accurate and appropriate.		
We Energies	No	Given that frequency response is "contributed" long before AGC has an impact, "contribute" should probably be changed to "maintain." The goal is to ensure AGC does not withdraw frequency response and that it is maintained while frequency is depressed. We are not sure if Frequency Response has a precise enough definition and it is part of the definition of Frequency Bias Setting. The current NERC Glossary definition of Frequency Response really just reflects how it is measured, it does not define Frequency Response. Frequency Response is the dynamic real power response of load, generation, and other devices to a perturbation in frequency. The drafting team should also consider resolving the definition of Frequency Bias. Is it needed? It is often confused with Frequency Bias Setting and is often used interchangeably with Frequency Response even though the meanings are slightly different.
Response: The SDT has modified the definition of Frequency Bias Setting. The definition now reads "A number, either fixed or variable, usually expressed in MW/0.1 Hz, included in a Balancing Authority's Area Control Error equation to account for the Balancing Authority's Frequency Response contribution to the Interconnection, and discourage response withdrawal through secondary control systems." The SDT believes that based on the modified definition, the use of the term "contribution" better describes the action that has taken place. The SDT has reviewed the current definition of Frequency Response and believes that the current definition is both accurate and appropriate.		
SPP Standards Development	No	We would suggest inserting 'secondary' in front of Frequency Response at the end of the sentence and delete 'Frequency Bias' following 'variable' at the beginning of the sentence.
Response: The SDT has modified the definition. The definition now reads "A number, either fixed or variable, usually expressed in MW/0.1 Hz, included in a Balancing Authority's Area Control Error equation to account for the Balancing Authority's Frequency Response contribution to the Interconnection, and discourage response withdrawal through secondary control systems." The SDT believes that the modified definition is more appropriate than the recommended change. The SDT does not believe it is necessary to differentiate between primary and secondary Frequency Response in the definition.		
IRC Standards Review	No	The definition appears to be accurate, but where is "fixed" and "variable" Frequency Bias defined in the

Organization	Yes or No	Question 2 Comment
Committee		context of these requirements? Should it be Frequency Bias Setting, instead? "Fixed" seems to be straightforward, but what is "variable"? How often must Frequency Bias Setting change in order to be considered to be "variable"?
Response: The SDT has modified the definition. The definition now reads "A number, either fixed or variable, usually expressed in MW/0.1 Hz, included in a Balancing Authority's Area Control Error equation to account for the Balancing Authority's Frequency Response contribution to the Interconnection, and discourage response withdrawal through secondary control systems." If the ERO provides the Frequency Bias Setting then it is considered fixed. If the ERO accepts a methodology for determining the Frequency Bias Setting then it is considered variable.		
ERCOT	No	The definition appears to be accurate, but where is "fixed" and "variable" Frequency Bias defined in the context of these requirements? Should it be Frequency Bias Setting, instead? "Fixed" seems to be straightforward, but what is "variable"? How often must Frequency Bias Setting change in order to be considered to be "variable"?
Response: The SDT has modified the definition. The definition now reads "A number, either fixed or variable, usually expressed in MW/0.1 Hz, included in a Balancing Authority's Area Control Error equation to account for the Balancing Authority's Frequency Response contribution to the Interconnection, and discourage response withdrawal through secondary control systems." If the ERO provides the Frequency Bias Setting then it is considered fixed. If the ERO accepts a methodology for determining the Frequency Bias Setting then it is considered variable.		
Progress Energy	No	A bias, either fixed or variable, usually expressed in MW/0.1 Hz, included in a Balancing Authority's Area Control Error equation to account for the Balancing Authority's Frequency Response contribution to the interconnection, and prevent response withdrawal through secondary control systems. The changes suggested are to clarify that biasing of the ACE equation "allow[s]" primary frequency response to continue beyond the initial event window by accounting for it in the ACE input to secondary control systems (i.e. AGC). It's important to note that Primary Frequency Response will occur no matter what the Bias value is set to in the ACE equation, and biasing "supports" the response until the frequency is restored".
Response: The SDT has modified the definition. The definition now reads "A number, either fixed or variable, usually expressed in MW/0.1 Hz, included in a Balancing Authority's Area Control Error equation to account for the Balancing Authority's Frequency Response contribution to the Interconnection, and discourage response withdrawal through secondary control systems." The SDT believes that the revised definition agrees with your comment related to supporting the response until frequency is restored. The SDT also believes that it is impossible to "prevent" withdrawal and that you can only try to discourage withdrawal.		
NIPSCO	No	Frequency Bias and Frequency Response are not the same thing and that may be why "F" & "R" were not

Organization	Yes or No	Question 2 Comment
		capitalized in the present definition. I think the word "secondary" should appear per R2 finishing something like this: "to contribute to secondary (non-immediate)Interconnection frequency control.", removing Frequency Response altogether.(I do understand that you are bringing the FR and Bias closer together).
Response: The SDT has modified the definition. The definition now reads "A number, either fixed or variable, usually expressed in MW/0.1 Hz, included in a Balancing Authority's Area Control Error equation to account for the Balancing Authority's Frequency Response contribution to the Interconnection, and discourage response withdrawal through secondary control systems." The SDT believes that the modified definition is more appropriate than the recommended change. The SDT does not believe it is necessary to differentiate between primary and secondary Frequency Response in the definition.		
Energy Mark, Inc.	No	Comment 7: The definition should be:"A value, (either a fixed or variable Frequency Bias), usually expressed in MW/0.1 Hz, set into a Balancing Authority Area Control Error equation that indicates to the Balancing Authority its contribution of Frequency Response to the Interconnection. Comment 8: The Frequency Bias Setting does not allow or disallow the Frequency Response to be contributed. The BA will contribute its natural Frequency Response to the interconnection through the independent actions of its loads and generators. The only influence that the Frequency Bias Setting has is that it causes the AGC System, and hopefully other outer-loop control systems, to include that natural Frequency Response when developing control actions to implement through AGC in response to BA balancing requirements in a time frame well after the Frequency Response has been provided by the independent actions of its loads and generators.
Response: The SDT has modified the definition. The definition now reads "A number, either fixed or variable, usually expressed in MW/0.1 Hz, included in a Balancing Authority's Area Control Error equation to account for the Balancing Authority's Frequency Response contribution to the Interconnection, and discourage response withdrawal through secondary control systems." The SDT agrees with comment #8.		
American Electric Power	No	If "the proposed standard's intent is to collect data needed to accurately analyze existing Frequency Response, set a minimum Frequency Response obligation, provide a uniform calculation of Frequency Bias Settings that transition to values closer to Frequency Response, and encourage coordinated AGC operation", it appears the current and stated definition is precluding the process for determination of the Frequency Bias Setting itself. I believe it is too early to state in definition the frequency bias setting to be based on MW/0.1 Hz, when this appears to be more of the expected response. Using the word usually does not appear to be defining anything.To eventually get to an acceptable performance measure with reliability basis the project needs to be expanded to also address associated

Organization	Yes or No	Question 2 Comment
		governor droop issues, which inherently affect response. When the current definition references using “either a fixed or variable Frequency Bias”, it does not state whether or not to be applied in the calculation to either load or generation. The current Standard uses 1% of yearly estimated peak demand for BAs that serve load, when the actual load at time of disturbance could be greatly different. Response is more directly related to the amount of Generation on-line and active AGC within the BA at time of trip.MW/0.1 Hz states more of expected result of response than defining Frequency Bias Setting.
Response: The SDT has modified the definition. The definition now reads “A number, either fixed or variable, usually expressed in MW/0.1 Hz, included in a Balancing Authority’s Area Control Error equation to account for the Balancing Authority’s Frequency Response contribution to the Interconnection, and discourage response withdrawal through secondary control systems.”The “MW/0.1 Hz” term represents the units of Frequency Bias and is not intended to reference magnitude. Issues dealing with governor droop are outside of the scope of the industry approved SAR. The SDT agrees with the last comment which is why the SDT also supports using a variable bias where appropriate.		
Duke Energy	No	Duke Energy would suggest not using “Frequency Bias” in the definition of “Frequency Bias Setting”. In addition, Duke Energy would like to point out that ACE does not allow Frequency Response; response will occur with or without the ACE equation. The Frequency Bias Setting is needed so that the AGC does not negate what may be provided in frequency response. The bias component of ACE provides the feedback so that a BA may sustain the intended amount of response with secondary control as long as Actual Frequency deviates from Scheduled Frequency. Duke Energy would suggest the following:”A fixed or variable value usually expressed in MW/0.1 Hz, set into a Balancing Authority Area Control Error equation to bias the control of resources so that Interconnection frequency is driven toward the Scheduled Frequency.”
Response: The term Frequency Bias has been removed from the definition. The SDT has modified the definition. The definition now reads “A number, either fixed or variable, usually expressed in MW/0.1 Hz, included in a Balancing Authority’s Area Control Error equation to account for the Balancing Authority’s Frequency Response contribution to the Interconnection, and discourage response withdrawal through secondary control systems.”		
Associated Electric Cooperative, Inc.	No	SEFRD - I had to read this definition several times because “The individual sample of event data” is actually an internally calculated value derived from a set of event sample data, and not really a “sample” value at all. So, I believe the SEFRD definition needs further work.
Response: The SDT agrees with your concern regarding the definition of SEFRD. The SDT has removed the definition from the standard.		

Organization	Yes or No	Question 2 Comment
MRO's NERC Standards Review Subcommittee	No	
Southern Company	Yes	Frequency Bias SettingA value, (either a fixed or variable Frequency Bias), usually expressed in MW/0.1 Hz, set into a Balancing Authority Area Control Error algorithm equation that allows the Balancing Authority to contribute its frequency Frequency rResponse to the Interconnection. Comments: Not sure the word "allows" is the right word. Perhaps use something in terms of preventing withdrawal of Primary Frequency Response with words like "...equation that prevents the withdrawal of the Balancing Authority's Primary Frequency Response to the Interconnection."
Response: The SDT thanks you for your affirmative response and clarifying comments. The revised definition does not use the word, "allows." The definition now reads "A number, either fixed or variable, usually expressed in MW/0.1 Hz, included in a Balancing Authority's Area Control Error equation to account for the Balancing Authority's Frequency Response contribution to the Interconnection, and discourage response withdrawal through secondary control systems."		
FirstEnergy	Yes	Although we support the definition, we suggest the word "contribute" be changed to "maintain".
Response: The SDT thanks you for your affirmative response and clarifying comments. The SDT has modified the definition. The definition now reads "A number, either fixed or variable, usually expressed in MW/0.1 Hz, included in a Balancing Authority's Area Control Error equation to account for the Balancing Authority's Frequency Response contribution to the Interconnection, and discourage response withdrawal through secondary control systems." The SDT believes that based on the modified definition, the use of the term "contribution" better describes the action that has taken place.		
Patterson Consulting, Inc.	Yes	
Beacon Power Corporation	Yes	
NorthWestern Energy	Yes	
Kansas City Power & Light	Yes	
Arizona Public Service Company	Yes	
Bonneville Power Administration	Yes	

Organization	Yes or No	Question 2 Comment
Alberta Electric System Operator	Yes	
Independent Electricity System Operator	Yes	
FMPP	Yes	
Seattle City Light	Yes	
Manitoba Hydro	Yes	
South Carolina Electric and Gas		We suggest the following changes to the definition: 1. Delete “Frequency Bias” in the parenthetical expression - (“Frequency Bias” should not be used to define Frequency Bias) 2. Delete the word “usually” 3. Replace “set into” with “as part of” as defined in BAL-001. 4. Replace the remainder of the sentence following “Area Control Error equation” with “that influences its Automatic Generation Control (AGC) to provide its frequency response while Interconnection frequency is not at its scheduled value” - (The frequency bias does not allow a BA to contribute its frequency response to the Interconnection. The frequency bias term only affects the AGC response of the BA, which is part of its frequency response usually minutes after the initial event and is dependent upon generation units being on AGC control and capable of responding.) 5. The suggested changes would result in the following definition”A value, fixed or variable, expressed in MW/0.1 hertz as part of a Balancing Authority’s Area Control Error (ACE) equation that influences its Automatic Generation Control (AGC) to provide its frequency response while Interconnection frequency is not at its scheduled value.
Response: The term, “Frequency Bias” was deleted, the phrase, “set into” was replaced with, “included in”. The other suggestions were not adopted. The SDT has modified the definition. The definition now reads “A number, either fixed or variable, usually expressed in MW/0.1 Hz, included in a Balancing Authority’s Area Control Error equation to account for the Balancing Authority's Frequency Response contribution to the Interconnection, and discourage response withdrawal through secondary control systems.” The SDT believes that the modified definition addresses your concerns but provides for additional clarity as to the action that has taken place.		
Northeast Power Coordinating Council		Refer to the response to Question 17.

Organization	Yes or No	Question 2 Comment
Response: Please refer to the SDT response to Question 17.		

3. The proposed purpose statement in the draft standard is: To require sufficient Frequency Response from the Balancing Authority to maintain Interconnection Frequency within predefined bounds by arresting frequency deviations and supporting frequency until the frequency is restored to schedule. To provide consistent methods for measuring Frequency Response and determining the Frequency Bias Setting.

Do you agree with this purpose? If not, please explain in the comment area.

Summary Consideration: Several of the commenters agree with the purpose statement of the draft standard as written. Most of the feedback received disagreeing with the purpose statement reflects general comments and suggestions for the SDT to consider. A major concern identified is that the minimum level of Frequency Bias Setting established needs to be determined based on extensive data analysis of field trial results. Some commenters even stated that the standard should not be revised until the field trial is completed, performance criteria and measures determined, and results vetted by industry. Several commenters expressed concern with making the Balancing Authority the only entity responsible for maintaining interconnection frequency and arresting frequency decline; with an observation that the purpose statement presumes that each Balancing Authority must have generation online to meet a predetermined frequency response obligation. It was pointed out that on occasion small Balancing Authorities may not have generation online and instead rely on load regulation and energy agreements to meet their energy needs. Another commenter indicated that since NERC and FERC have differentiated Frequency Response from Frequency Regulation, the standard should only apply to unplanned contingencies that occur.

In response to these general comments the SDT notes that the minimum Frequency Response level used during the field trial uses a deterministic approach and the actual level of Frequency Response required in the final version of the draft standard will be based on field trial results. Issues involving governor droop, dead-band settings, and governor operation are outside the scope of the project's approved SAR. The purpose statement does not mandate generation dispatch for Frequency Response. This standard only prescribes a minimum Frequency Response obligation for reliable BES operation. Each entity must determine how to meet its Frequency Response obligation using existing resources and agreements.

Another commenter noted that the purpose statement addresses several concepts that do not share a common timeframe. In response, the SDT has revised Attachment A to explain the relationship for the different time frames associated with these concepts.

Organization	Yes or No	Question 3 Comment
MRO's NERC Standards Review Subcommittee	No	In general, we don't have significant issues with a standard that attempts to establish a minimum Frequency Response performance level. However, we caution the drafting team that the minimum level established needs to be determined based on an extensive data analysis based on the field trial, based on the Frequency Response Initiative Work Plan that NERC filed in response to the Commission's September 23 technical conference and based on the plan outlined in NERC's October 25, 2010 compliance filing.
Response: The SDT thanks you for your comment. For the field trial, the minimum level of response needed uses a deterministic approach. The actual level of response required may be established in the final version of the standard using field trial information obtained. The project schedule adopted for the development of the BAL-003 standard has been approved by the FERC and includes filing a standard by May, 2012		

Organization	Yes or No	Question 3 Comment
Modifications to this schedule require both NERC and FERC approval.		
Midwest ISO Standards Collaborators	No	In general, we don't have significant issues with a standard that attempts to establish a minimum Frequency Response performance level. However, we caution the drafting team that the minimum level established needs to be determined based on an extensive data analysis based on the field trial, based on the Frequency Response Initiative Work Plan that NERC filed in response to the Commission's September 23 technical conference and based on the plan outlined in NERC's October 25, 2010 compliance filing.
Response: The SDT thanks you for your comment. For the field trial, the minimum level of response needed uses a deterministic approach. The actual level of response required may be established in the final version of the standard using field trial information obtained. The project schedule adopted for the development of the BAL-003 standard has been approved by the FERC and includes filing a standard by May, 2012. Modifications to this schedule require both NERC and FERC approval.		
We Energies	No	In general, we don't have significant issues with a standard that attempts to establish a minimum Frequency Response performance level. However, we caution the drafting team that the minimum level established needs to be determined based on an extensive data analysis, field trial data, the Frequency Response Initiative Work Plan that NERC filed in response to the Commission's September 23 technical conference, and the plan outlined in NERC's October 25, 2010 compliance filing.
Response: The SDT thanks you for your comment. For the field trial, the minimum level of response needed uses a deterministic approach. The actual level of response required may be established in the final version of the standard using field trial information obtained. The project schedule adopted for the development of the BAL-003 standard has been approved by the FERC and includes filing a standard by May, 2012. Modifications to this schedule require both NERC and FERC approval.		
LG&E and KU Energy	No	The proposed purpose statement as provided in this question is not the same as the purpose statement for BAL-003-1 as posted on the Project 2007-12 page of the NERC website. The posted purpose on the NERC website is:To require sufficient Frequency Response from the Balancing Authority to maintain Interconnection Frequency within predefined bounds by arresting frequency deviations and supporting frequency until the frequency is restored. To schedule and provide consistent methods for measuring Frequency Response and determining the Frequency Bias Setting.The version posted in the question appears to correct errors in the last sentence of the purpose statement given in the project page. We do not agree with the purpose statement as posted on the project page.In addition, we suggest the following edits to what appears to be a corrected purpose statement as provided in this question:To require sufficient Frequency Response from the Balancing Authority to maintain Interconnection Frequency within predefined bounds by arresting frequency deviations due to contingencies on the interconnected BES and supporting frequency until the frequency is restored to schedule. To provide consistent methods for measuring Frequency Response and determining the Frequency Bias Setting. As NERC/FERC has differentiated Frequency Response from Frequency Regulation, the standards

Organization	Yes or No	Question 3 Comment
		addressing Frequency Response should clearly be related to unplanned contingencies occurring on the interconnected BES.
Response: The SDT believes adequate Frequency Response is important during both normal and emergency operations however it is easier to measure Frequency Response during a contingency which is why the SDT favors this rationale.		
IRC Standards Review Committee	No	If this is really intended to be a Field Trial, it should be written as such and the standard should not be developed or promulgated until the Field Trial has accomplished its purpose and the performance criteria and measures have been determined. We request that the results of the Field Trial should be published and discussed BEFORE any changes are made. The standard should be put into place later; it is premature at this time. Since this is to be a data gathering process to be used to determine appropriate performance parameters, the purpose statement of the Field Trial should be changed to read as follows:To determine require sufficient Frequency Response arranged by from the Balancing Authority to maintain Interconnection Frequency within predefined bounds by responding to and arresting frequency deviations and supporting frequency until the frequency is restored to schedule. To identify and establish provide consistent methods for measuring Frequency Response and determining the Frequency Bias Setting and Frequency Response Obligation.We should not write the new standard and its requirements until this Field Trial work has been accomplished; to do so possibly would result in difficulty changing the standard requirements based upon Field Trial results. Further, while we do not have any issue with the general intent of the scope statement, we have a difficulty seeing the BA being the only entity held responsible for maintaining interconnection frequency and arresting frequency deviations. When there is a sudden and sizable change to system resource or demand, the first response to a frequency deviation caused by this change would be the generators' governors. This will provide a mitigating effect for the immediate seconds up to minutes. The frequency bias setting will then kick in to supplement the mitigation need. The governors are owned by the Generator Owners; the BAs do not own these facilities and hence can do little to address frequency response during this initial period.To hold only the BA responsible for maintaining interconnection frequency and arresting frequency deviations would be inappropriate. The industry needs to have a discussion to determine who should be held responsible for providing governor responses immediately following an event, and by what mechanism, and for implementing additional measures thereafter. We suggest that BAL-003 development be withheld until this discussion takes place and a decision is made on who and how the governor response shall be provided.
Response: The original SAR was for data collection. The SDT developed a supplemental SAR to address the FERC directives. The project schedule adopted for the development of the BAL-003 standard has been approved by the FERC and includes filing a standard by May, 2012. Modifications to this schedule require both NERC and FERC approval. This issue concerning the BA being the only entity being held responsible has been discussed and the SDT understands your concern. However, governor droop requirements, dead-band settings and governor operation are outside the scope of the project approved SAR. The SDT believes that the Generator Verification		

Organization	Yes or No	Question 3 Comment
standards will help address these concerns. The SDT encourages entities to develop a SAR to address generators. The purpose of the standard is to establish a minimum Frequency Response threshold that prevents unreliable BES operation. This issue concerning the BA being the only entity being held responsible has been discussed and the SDT understands your concern. However, governor droop requirements, dead-band settings and governor operation are outside the scope of the project approved SAR. The SDT believes that the Generator Verification standards will help address these concerns. The SDT encourages entities to develop a SAR to address generators.		
ISO New Engand Inc.	No	If this is really intended to be a Field Trial, it should be written as such and the standard should not be developed or promulgated until the Field Trial has accomplished its purpose and the performance criteria and measures have been determined. The standard should be put into place later; it is premature at this time. Since this is to be a data gathering process to be used to determine appropriate performance parameters, the purpose statement of the Field Trial should be changed to read as follows:To determinerequire sufficient Frequency Response arranged by from the Balancing Authority to maintain Interconnection Frequency within predefined bounds by responding to and arresting frequency deviations and supporting frequency until the frequency is restored to schedule. To identify and establishprovide consistent methods for measuring Frequency Response and determining the Frequency Bias Setting and Frequency Response Obligation.We should not write the new standard and its requirements until this Field Trial work has been accomplished; to do so possibly would result in difficulty changing the standard requirements based upon Field Trial results. Further, while we do not have any issue with the general intent of the scope statement, we have a difficulty seeing the BA being the only entity held responsible for maintaining interconnection frequency and arresting frequency deviations. When there is a sudden and sizable change to system resource or demand, the first response to a frequency deviation caused by this change would be the generators' governors. This will provide a mitigating effect for the immediate seconds up to minutes. The frequency bias setting will then kick in to supplement the mitigation need. The governors are owned by the Generator Owners; the BAs do not own these facilities and hence can do little to address frequency response during this initial period.To hold only the BA responsible for maintaining interconnection frequency and arresting frequency deviations would be inappropriate. The industry needs to have a discussion to determine who should be held responsible for providing governor responses immediately following an event, and by what mechanism, and for implementing additional measures thereafter. We suggest that BAL-003 development be withheld until this discussion takes place and a decision is made on who and how the governor response shall be provided.
Response: The original SAR was for data collection. The SDT developed a supplemental SAR to address the FERC directives. This issue concerning the BA being the only entity being held responsible has been discussed and the SDT understands your concern. However, governor droop requirements, dead-band settings and governor operation are outside the scope of the project approved SAR. The SDT believes that the Generator Verification standards will help address these concerns. The SDT encourages entities to develop a SAR to address generators. The project schedule adopted for the development of the BAL-003 standard has been approved by the FERC and includes filing a standard by May, 2012.		

Organization	Yes or No	Question 3 Comment
Modifications to this schedule require both NERC and FERC approval. The purpose of the standard is to establish a minimum Frequency Response threshold that prevents unreliable BES operation. This issue concerning the BA being the only entity being held responsible has been discussed and the SDT understands your concern. However, governor droop requirements, dead-band settings and governor operation are outside the scope of the project approved SAR. The SDT believes that the Generator Verification standards will help address these concerns. The SDT encourages entities to develop a SAR to address generators.		
ERCOT	No	If this is really intended to be a Field Trial, it should be written as such and the standard should not be developed or promulgated until the Field Trial has accomplished its purpose and the performance criteria and measures have been determined. We request that the results of the Field Trial should be published and discussed BEFORE any changes are made. The standard should be put into place later; it is premature at this time. Since this is to be a data gathering process to be used to determine appropriate performance parameters, the purpose statement of the Field Trial should be changed to read as follows:To determine require sufficient Frequency Response arranged by from the Balancing Authority to maintain Interconnection Frequency within predefined bounds by responding to and arresting frequency deviations and supporting frequency until the frequency is restored to schedule. To identify and establish provide consistent methods for measuring Frequency Response and determining the Frequency Bias Setting and Frequency Response Obligation.We should not write the new standard and its requirements until this Field Trial work has been accomplished; to do so possibly would result in difficulty changing the standard requirements based upon Field Trial results. Further, while we do not have any issue with the general intent of the scope statement, we have a difficulty seeing the BA being the only entity held responsible for maintaining interconnection frequency and arresting frequency deviations. When there is a sudden and sizable change to system resource or demand, the first response to a frequency deviation caused by this change would be the generators' governors. This will provide a mitigating effect for the immediate seconds up to minutes. The frequency bias setting will then kick in to supplement the mitigation need. The governors are owned by the Generator Owners; the BAs do not own these facilities and hence can do little to address frequency response during this initial period.To hold only the BA responsible for maintaining interconnection frequency and arresting frequency deviations would be inappropriate. The industry needs to have a discussion to determine who should be held responsible for providing governor responses immediately following an event, and by what mechanism, and for implementing additional measures thereafter. We suggest that BAL-003 development be withheld until this discussion takes place and a decision is made on who and how the governor response shall be provided.
Response: The original SAR was for data collection. The SDT developed a supplemental SAR to address the FERC directives. The project schedule adopted for the development of the BAL-003 standard has been approved by the FERC and includes filing a standard by May, 2012. Modifications to this schedule require both NERC and FERC approval.		

Organization	Yes or No	Question 3 Comment
The purpose of the standard is to establish a minimum Frequency Response threshold that prevents unreliable BES operation. This issue concerning the BA being the only entity being held responsible has been discussed and the SDT understands your concern. However, governor droop requirements, dead-band settings and governor operation are outside the scope of the project approved SAR. The SDT believes that the Generator Verification standards will help address these concerns. The SDT encourages entities to develop a SAR to address generators.		
Kansas City Power & Light	No	This purpose statement presumes that each Balancing Authority (BA) will have generation online to meet a predetermined frequency response obligation. There are many small BA's that do not have any generation online and rely on load regulation agreements and energy agreements to provide their energy needs during parts of the year. This purpose statement would not allow a BA to operate without generation online.
Response: The purpose statement does not mandate generation dispatch for Frequency Response. This standard only prescribes a minimum Frequency Response obligation for reliable BES operations. Each entity must determine how to meet this obligation using existing resources and agreements.		
NIPSCO	No	Yes, "Interconnection frequency", small "f".
Response: The SDT thanks you for this comment and has corrected the error.		
American Electric Power	No	AEP believes the statement should read "To require sufficient Frequency Response from governors and AGC of Generators within the Balancing Authority to maintain Interconnection Frequency within predefined bounds by arresting frequency deviations and supporting frequency until the frequency is restored to schedule.To provide consistent methods for measuring Frequency Response from governors and AGC of Generators within the Balancing Authority for determining the overall Frequency Bias Setting threshold.Since Generators are directly responsible for response, applicability must be added to Generator Operators.
Response: The drafting team disagrees with this recommendation because the FERC Order 693 requires a technology neutral performance standard for the purpose of providing Frequency Response.		
Patterson Consulting, Inc.	No	The purpose should not expect Frequency Response to maintain frequency beyond a few minutes, perhaps 15 minutes for example. This purpose statement suggests the requirements will be "...to maintain Interconnection Frequency within predefined bounds by arresting frequency deviations and support frequency until the frequency is restored to schedule..." The phrase "until the frequency is restored to schedule" is problematic since regulation must bring frequency to schedule. Frequency Response, and the associated requirements, should not be expected to substitute for poor regulation beyond the first few minutes.
Response: The focus of the standard is to establish sustainable primary frequency control which can seamlessly coordinate with secondary frequency control for maintaining system frequency.		

Organization	Yes or No	Question 3 Comment
Independent Electricity System Operator	No	We do not have any issue with the general intent of the scope statement, but have a difficulty in seeing the BA being the only entity held responsible for maintaining interconnection frequency and arresting frequency deviations. When there is a sudden and sizable change to system resource or demand, the system frequency will change. The first response to such deviation would be the generators' governors. This will provide a mitigating effect for the immediate seconds up to minutes. The frequency bias setting will then kick in to supplement the mitigation need. To hold only the BA responsible for maintaining interconnection frequency arresting frequency deviations would be only part of the solution. The industry needs to have a discussion to determine who should be held responsible for providing governor responses, and by what mechanism. We suggest that BAL-003 development be withheld until this discussion takes place and a decision is made on who and how the governor response shall be provided.
Response: The SDT thanks you for your comment. This issue concerning the BA being the only entity being held responsible has been discussed and the SDT understands your concern. However, governor droop requirements, dead-band settings and governor operation are outside the scope of the project approved SAR. The SDT believes that the Generator Verification standards will help address these concerns. The SDT encourages entities to develop a SAR to address generators. For the field trial, the minimum level of response needed uses a deterministic approach. The actual level of response required may be established in the final version of the standard using field trial information obtained. The SDT does not agree with your comment concerning withholding the development of a standard addressing Frequency Response. The development of a standard addressing Frequency Response was identified in FERC Order 693. FERC further directed the ERO to finalize a standard addressing Frequency Response in an order in February 2010 within six (6) months which they later granted an extension. The project schedule adopted for the development of the BAL-003 standard has been approved by the FERC and includes filing a standard by May, 2012. Modifications to this schedule would require both NERC and FERC approval.		
ENBALA Power Networks	Yes	ENBALA strongly agrees that a Frequency Response standard is necessary to ensure reliable operation of the bulk power system. We fully support all efforts to understand the declining trend, and the development of accurate models, of Frequency Response in each Interconnection.
Response: The SDT thanks you for your affirmative response and clarifying comment.		
Manitoba Hydro	Yes	The new more likely improved method of measuring Frequency Response is welcome. This should be an improvement over the existing methods of using 1% of projected peak load, or average of DCS events. Calculating projected peaks leave lots of room for error and limiting calculations to only DCS events likely does not reflect accurate BIAS.

Organization	Yes or No	Question 3 Comment
Response: The SDT thanks you for your affirmative response and clarifying comment.		
Alberta Electric System Operator	Yes	The purpose statement mentioned arresting deviation, restored to schedule and frequency bias setting, which are all at different time frames. The AESO suggests that NERC provide some clarification of the relationships for the different time frames.
Response: The SDT thanks you for your affirmative response and clarifying comment. Refer to Attachment A for clarification of the relationships for the different time frames.		
Duke Energy	Yes	
Seattle City Light	Yes	
Santee Cooper	Yes	
FirstEnergy	Yes	
Bonneville Power Administration	Yes	
SPP Standards Development	Yes	
SERC OC Standards Review Group	Yes	
Arizona Public Service Company	Yes	
Southern Company	Yes	
Progress Energy	Yes	
NorthWestern Energy	Yes	
Energy Mark, Inc.	Yes	
Beacon Power Corporation	Yes	

Organization	Yes or No	Question 3 Comment
Westar Energy	Yes	
FMPP	Yes	
EKPC	Yes	
South Carolina Electric and Gas	Yes	
Associated Electric Cooperative, Inc.	Yes	
Northeast Power Coordinating Council		Refer to the response to Question 17.
Response: Please refer to the SDT response to Question 17.		

4. **Requirement 1 identifies a minimum level of Frequency Response.**

R1. Each Balancing Authority shall achieve a Frequency Response Measure (FRM) (as detailed in Attachment A and calculated on FRS Form 1) that is equal to or more negative than its Frequency Response Obligation (FRO).

Do you agree with the concept that a Balancing Authority should be required to achieve a minimum level of Frequency Response and the method for measurement? If not, please explain in the comment area.

Summary Consideration: Most commenters supported the concept however a significant majority did not agree with the method for measurement. In general commenters indicated the sample size of 25 events for determining FRM is too small; insufficient information was provided to address the use of variable bias; the FRM and FRO definitions were unclear with questionable determination methods; and the standard should reference Reserve Sharing Groups. Some commenters also indicated that the measure may not apply to a single BA interconnection; that the draft standard dictated how compliance is provided with respect to Attachment A and FRS Form 1 references; that requirements would not allow a BA to operate without generation online; and expressed concern that the BA may not own and operate resources yet will still have the compliance obligation.

The SDT is currently evaluating a probabilistic method for determining the FRO. After consideration of industry comments, the SDT converted Attachment A into two documents - a calculation methodology included with the standard, and a separate supporting document providing requirement rationale. The SDT revised the definitions for FRO & FRM; incorporated Reserve Sharing Groups into the draft standard; modified FRS Form 1 to allow for adjustments; and clarified how an entity is to show compliance. The SDT also provided an explanation addressing the use of Variable Bias and provided an administrative procedure for the ERO's FRO determination.

R1. Each Balancing Authority or Reserve Sharing Group (RSG) shall achieve an annual Frequency Response Measure (FRM) (as detailed in Attachment A and calculated on FRS Form 1) that is equal to or more negative than its Frequency Response Obligation (FRO) to ensure that sufficient Frequency Response is provided by each BA or RSG to maintain an adequate level of Frequency Response in the Interconnection.

Organization	Yes or No	Question 4 Comment
Santee Cooper	No	The concept seems reasonable but since the measure of compliance (FRM) is determined only after the 25 events are identified; it is a lagging indicator. The BA may have to ensure it measures all frequency excursions and develops its own leading indicator to ensure compliance following year end.
Response: The SDT agrees that the measure is a lagging indicator and recommends that the list of reportable events be posted on a quarterly basis.		
LG&E and KU Energy	No	The concept seems reasonable but since the measure of compliance (FRM) is determined only after the 25 events are identified; it is a lagging indicator. The BA may have to ensure it measures all frequency

Organization	Yes or No	Question 4 Comment
		excursions and develops its own leading indicator to ensure compliance following year end. A sample CPS bounds report should be considered, perhaps based on 2010 numbers, to demonstrate how FRM submitted would translate to FRO frequency bias settings and how it will affect the L10 values
Response: The SDT agrees that the measure is a lagging indicator and recommends that the list of reportable events be posted on a quarterly basis. The SDT will provide samples to illustrate the interaction of FRO, FRM, and frequency bias settings at the conclusion of the field trial.		
SERC OC Standards Review Group	No	The concept seems reasonable but since the measure of compliance (FRM) is determined only after the 25 events are identified; it is a lagging indicator. The BA may have to ensure it measures all frequency excursions and develops its own leading indicator to ensure compliance following year end. A sample CPS bounds report should be considered, perhaps based on 2010 numbers, to demonstrate how FRM submitted would translate to FRO frequency bias settings and how it will affect the L10 values.
Response: The SDT agrees that the measure is a lagging indicator and recommends that the list of reportable events be posted on a quarterly basis. The SDT will provide samples to illustrate the interaction of FRO, FRM, and frequency bias settings at the conclusion of the field trial.		
South Carolina Electric and Gas	No	The concept seems reasonable but since the measure of compliance (FRM) is determined only after the 25 events are identified; it is a lagging indicator. The BA may have to ensure it measures all frequency excursions and develops its own leading indicator to ensure compliance following year end. A sample CPS bounds report should be considered, perhaps based on 2010 numbers, to demonstrate how FRM submitted would translate to FRO frequency bias settings and how it will affect the L10 values.
Response: The SDT agrees that the measure is a lagging indicator and recommends that the list of reportable events be posted on a quarterly basis. The SDT will provide samples to illustrate the interaction of FRO, FRM, and frequency bias settings at the conclusion of the field trial.		
MRO's NERC Standards Review Subcommittee	No	In general, we don't have significant issues with a standard that attempts to establish a minimum frequency response performance level. However, we caution the drafting team that the minimum level established needs to be determined based on an extensive data analysis based on the field trial, based on the Frequency Response Initiative Work Plan that NERC filed in response to the Commission's September 23 technical conference and based on the plan outline in NERC's October 25, 2010 compliance filing. The effects of the nonconforming load should be considered in the calculation of the frequency response obligation in order to get accurate results.
Response: The minimum level of response selected for the field trial uses a deterministic approach. The actual level of response specified in the final version of the draft standard may be based on analysis of data obtained from the field trial.		

Organization	Yes or No	Question 4 Comment
The SDT is using a FERC approved project schedule to develop the BAL-003 standard and includes filing a standard by May, 2012.. Any modification to the project schedule will require both NERC and FERC approval. The deterministic allocation method does not consider the effects of nonconforming load.		
Midwest ISO Standards Collaborators	No	In general, we don't have significant issues with a standard that attempts to establish a minimum frequency response performance level. However, we caution the drafting team that the minimum level established needs to be determined based on an extensive data analysis based on the field trial, based on the Frequency Response Initiative Work Plan that NERC filed in response to the Commission's September 23 technical conference and based on the plan outline in NERC's October 25, 2010 compliance filing.
Response: The minimum level of response selected for the field trial uses a deterministic approach. The actual level of response specified in the final version of the draft standard may be based on analysis of data obtained from the field trial. The SDT is using a FERC approved project schedule to develop the BAL-003 standard and includes filing a standard by May, 2012.. Any modification to the project schedule will require both NERC and FERC approval.		
We Energies	No	In general, we don't have significant issues with a standard that attempts to establish a minimum frequency response performance level. However, we caution the drafting team that the minimum level established needs to be determined based on an extensive data analysis, field trial data, the Frequency Response Initiative Work Plan that NERC filed in response to the Commission's September 23 technical conference, and the plan outline in NERC's October 25, 2010 compliance filing.
Response: The minimum level of response selected for the field trial uses a deterministic approach. The actual level of response specified in the final version of the draft standard may be based on analysis of data obtained from the field trial. The SDT is using a FERC approved project schedule to develop the BAL-003 standard and includes filing a standard by May, 2012.. Any modification to the project schedule will require both NERC and FERC approval.		
Bonneville Power Administration	No	BPA agrees that there should be a minimum level of Frequency Response, but disagree with the way the measure is obtained in the requirement. o R1 - BPA suggests replacing "achieve" with "calculate". Achieve: indicates it is a performance. o R1 - BPA does not agree with the requirements in Attachment A not being in the standard. These should not be modified without full review and voting by members. o R1 - BPA believes that there should be more description on Variable Bias. What variable bias number should we use: average, minimum, peak for the event? BPA feels that the peak bias of each event would be appropriate.
Response: The SDT believes the intent of the standard is for each BA to "achieve" its Frequency Response Obligation.		

Organization	Yes or No	Question 4 Comment
The SDT is not incorporating additional standard requirements by means of Attachment A information however the SDT recognizes the need to convert Attachment A into two documents. The first document will remain part of the standard as Attachment A and describe the calculation methodology utilized. The second document will explain the rationale for the requirements as supplemental standard information. Variable frequency bias settings are determined by Balancing Authorities using a calculation based on present operating conditions. The SDT agrees Variable Bias requires more description and will review this concern during the field trial.		
IRC Standards Review Committee	No	The SRC agrees that a Frequency Response of some minimum level for each Interconnection should be achieved. However, the measure as described does not apply to all Interconnections. It does not apply to single BA Interconnections such as ERCOT and Hydro Quebec. This requirement should be added later-not included now; and it should clarify what the BA must do and what the response providers must do. BAs do not own and operate the resources. An entity which does own or operate the resources may also be registered as a BA, but an entity which does not own or operate resources may also be registered as a BA. Therefore, it is important to detail what a BA must do and also to detail what the resource owner or operator must do. The resource owner may be registered as a GO or a TO or even a DP. The resource operator may be registered as a GOP, a TOP, or a LSE. The BA must establish an operations plan, using data provided to it by the resource owners and or operators, that will meet the performance requirements. The BA must then deploy the proper amount of response through AGC or verbal instructions to supplement the automatic responses that the resources will provide, must calculate the actual responses after-the-fact, and report the performance as required. The resources must, as standards already provide, comply with the deployments and instructions provided by the BA. However, if an entity which is functioning as a BA does not own its resources, nor does it directly operate those resources, the BA cannot ensure the achievement. The standard must not create an organizational or contractual arrangement that dictates how the compliance is provided. It should state what must be done, not how. If entities choose to write and enter into such arrangements, that should be permissible, but not required. Specific to R1, the wording does not correspond to the figures shown in the FRS (Form 1) in that the FRM (the median) is -14.5 whereas the FRO is -15.8. The FRO is more negative than the FRM, which does not seem to correspond to what's stipulated in R1 (FRM to be equal or more negative than its FRO).
Response: This standard is intended to apply to all Interconnections. The SDT has modified the definition for FRO to read, "The Balancing Authority's share of the required Frequency Response needed for the reliable operation of an Interconnection." The standard does not dictate a particular generation dispatch strategy. The standard only prescribes a minimum obligation. The entity must determine how to meet this minimum obligation. FRS Form 1 has been revised to allow for adjustments.		
ERCOT	No	The SRC agrees that a Frequency Response of some minimum level for each Interconnection should be achieved. However, the measure as described does not apply to all Interconnections. It does not apply to

Organization	Yes or No	Question 4 Comment
		single BA Interconnections such as ERCOT and Hydro Quebec. This requirement should be added later-not included now; and it should clarify what the BA must do and what the response providers must do. BAs do not own and operate the resources. An entity which does own or operate the resources may also be registered as a BA, but an entity which does not own or operate resources may also be registered as a BA. Therefore, it is important to detail what a BA must do and also to detail what the resource owner or operator must do. The resource owner may be registered as a GO or a TO or even a DP. The resource operator may be registered as a GOP, a TOP, or a LSE. The BA must establish an operations plan, using data provided to it by the resource owners and or operators, that will meet the performance requirements. The BA must then deploy the proper amount of response through AGC or verbal instructions to supplement the automatic responses that the resources will provide, must calculate the actual responses after-the-fact, and report the performance as required. The resources must, as standards already provide, comply with the deployments and instructions provided by the BA. However, if an entity which is functioning as a BA does not own its resources, nor does it directly operate those resources, the BA cannot ensure the achievement. The standard must not create an organizational or contractual arrangement that dictates how the compliance is provided. It should state what must be done, not how. If entities choose to write and enter into such arrangements, that should be permissible, but not required. Specific to R1, the wording does not correspond to the figures shown in the FRS (Form 1) in that the FRM (the median) is -14.5 whereas the FRO is -15.8. The FRO is more negative than the FRM, which does not seem to correspond to what's stipulated in R1 (FRM to be equal or more negative than its FRO).
Response: This standard is intended to apply to all Interconnections. The SDT has modified the definition for FRO to read, "The Balancing Authority's share of the required Frequency Response needed for the reliable operation of an Interconnection." The standard does not dictate a particular generation dispatch strategy. The standard only prescribes a minimum obligation. The entity must determine how to meet this minimum obligation. FRS Form 1 has been revised to allow for adjustments.		
Kansas City Power & Light	No	This requirement presumes that each Balancing Authority (BA) will have generation online to meet a predetermined frequency response obligation. There are many small BA's that do not have any generation online and rely on load regulation agreements and energy agreements to provide their energy needs during parts of the year. This requirement would not allow a BA to operate without generation online. Under Requirement 1, item 2a in Attachment A suggests governor deadband as 36MHz (Megahertz). Suggest what is intended is 36mHz (millihertz). The Frequency Response Obligation determination for the interconnection as described in Attachment A is a crude method and will result in obligations that will exceed the FRO that is intended. This will result in additional cost to BA's that is unnecessary to achieve the purpose of maintaining sufficient generation online to arrest frequency degradation events caused by loss of generating resources.

Organization	Yes or No	Question 4 Comment
		The current NERC method for calculating a BA's actual frequency response are inaccurate and provide misleading guidance in the actual frequency response of a BA. These methods need considerable improvement before any attempts to hold a BA to an expected level of frequency response as this proposal has stated.
Response: The standard does not dictate a particular generation dispatch strategy. The standard only prescribes a minimum obligation. The entity must determine how to meet this minimum obligation. The SDT has removed the reference to governor deadband. The minimum level of response selected for the field trial uses a deterministic approach. The actual level of response specified in the final version of the draft standard may be based on analysis of data obtained from the field trial. The SDT is also evaluating a probabilistic method for determining the FRO. The SDT has modified FRS Form 1 to correctly calculate Frequency Response.		
Southern Company	No	Comments: Proposed Standard Comment 1: BAL-003-1, Requirement R1. The requirement should be made less prescriptive by removing references to Attachment A and FRS Form 1. The responsible entity should understand the fundamental and basic requirement - to achieve a Frequency Response Measure. Where the methodology is specified or how the BA is supposed to achieve it should be a matter of compliance and/or implementation and not a part of the basic requirement. Proposed language is as follows: Each Balancing Authority shall achieve a Frequency Response Measure (FRM) that is equal to or more negative than its Frequency Response Obligation (FRO).
Response: The SDT believes that Requirement 1 needs to reference FRS Form 1 in order for the calculation methodology to be consistent for all interconnections and has removed the reference to Attachment A. The SDT has also revised FRS Form 1 to correctly calculate Frequency Response and to allow for adjustments.		
Progress Energy	No	Progress Energy believes the Eastern Interconnection does not have the same issues with frequency experienced in the other two interconnections, and that load response is significant enough in the interconnection to arrest and stabilize frequency as long as BAs do not withdraw that effect (accurate biasing of the ACE equation). We also believe this standard should reference standrd PRC-024 related to accurate relay settings to allow out of bounds operations related to frequency and voltage deviations.
Response: Under certain system conditions the response of frequency sensitive load to a frequency excursion may be sufficient to arrest and stabilize frequency following an event. The eastern interconnection may also demonstrate greater stability as compared to the other interconnections. However, frequency stability is not assured to be achieved in this manner for all system conditions, even for the eastern interconnection irrespective of Frequency Bias setting accuracy. The intent of BAL-003 is independent of PRC-024 intent. Specifically the purpose of BAL-003 is to better match a Balancing Authority's Frequency Bias Setting to its Frequency Response Characteristic, which should also reduce the probability for UFLS activation. The purpose of PRC-024 is to ensure generation remains		

Organization	Yes or No	Question 4 Comment
connected during a tolerable frequency or voltage excursion. Furthermore, consideration of voltage deviations is outside the scope of the approved project.		
NIPSCO	No	Yes and no, similar to BAL-002 I think this should read "Each Balancing Authority or Reserve Sharing Group shall ....., With so many BA's I believe the RSGs will be play a big role in this compliance ... This comment applies to only R1,
Response: The SDT has revised Requirement R1 to reference Reserve Sharing Groups.		
NorthWestern Energy	No	A Balancing Authority's frequency response is based upon a "median" value calculated from analyzing multiple events. Frequency response during some of these events is better than others, depending on the system conditions at the time and the amount system loading and unloaded generation online at the time of the event. Given these circumstances a BA's actual response could vary by event (better or worse than median), thus compliance measurement per event to a frequency response obligation based on the median response (over multiple events) could put BA's in non-compliant situations unjustly.
Response: The SDT agrees that compliance should not be based on an individual event but based on a series of events.		
Energy Mark, Inc.	No	Comment 9: I agree that each BA should be required to provide a minimum level of Frequency Response to provide for its share of the total Frequency Response required for interconnection reliability. Comment 10: I also agree with the methods used to measure SEFRD subject to my comments on FRS Form 1. Comment 11: I do not agree that the method suggested for setting the FRO will achieve the desired goal of maintaining interconnection reliability. The measurement method offered only evaluates the supply of Frequency Response. It does not evaluate the demand (need) for Frequency Response. Since frequency error is the difference between the demand and supply any effective measure for maintaining reliability due to frequency error must include both the demand and supply parts of this balance. As a consequence, the method will be blind to changes (good or bad) in the demand for Frequency Response. Changes in the demand for Frequency Response will require subsequent changes in the supply for Frequency Response that this standard fails to address until the following year and leaves the interconnection at risk for unreliable operation. Comment 12: The requirements associated with Frequency Response as defined in this standard will not assure interconnection reliability. Frequency Response is a two part service. The first part of this service is the rate at which energy is supplied in proportion to frequency error. This first part is commonly represented as the Frequency Response and the corresponding Frequency Bias Setting. The second part of the service is the amount of capacity that the BA stands ready to supply at this stated proportion in response to frequency error. Failure to effectively specify and measure the amount of capacity that the BA stands ready to supply at the stated proportion could put the interconnection at reliability risk when the required amount of capacity is

Organization	Yes or No	Question 4 Comment
		not included in the operating plan.
Response: Comment 11 - The FRO provides a target for ensuring robust frequency response is achieved by all Balancing Authorities. Both FRO and FRM values are considered by the algorithm determining the Frequency Bias Setting for the next year. While there is mutual dependence between supply and demand with respect to frequency response, the resultant frequency deviation is more important than the cause as it is the effect on system operations realized that determines the magnitude of control response required for reliability. It is expected robust frequency control will yield smaller frequency deviations during events and in turn require less incremental control response than currently realized for maintaining frequency. Comment 12 – Capacity is an important yet independent consideration. First, responsive robust control is necessary. Next, the Frequency Bias Setting must better approximate the Frequency Response Characteristic for improved control response. Adequate capacity is an implicit assumption for reliable grid operation.		
Hydro-Quebec TransEnergie	No	The proposed method is good to measure frequency response at point "B". However, point "C" is not taken in consideration in this measure. As for the FRO, a N-2 criteria is more stringent for an Interconnection with less units than a large Interconnection. The risk associated with coincidental events is much higher in a large Interconnection. For this reason, we believe that N-1 criteria should be considered for a small Interconnection like Quebec.
Response: The SDT agrees that the size of an Interconnection can make a difference in Frequency Response. This standard is intended to apply to all Interconnections. The SDT has modified the definition for FRO. The definition now reads "The Balancing Authority's share of the required Frequency Response needed for the reliable operation of an Interconnection." A smaller Interconnection can and should request a variance if needed.		
Westar Energy	No	The lagging measure is a concern. The ERO should be required to provide an updated proposed/possible list of frequency events monthly so BA's can determine their FRM through out the year so corrective action can be taken if needed.Prior year events should be excluded (just to get to 25 events). This could result in begin non-compliant twice for the same events.
Response: The SDT recommends posting selected events quarterly to give BAs time to evaluate their compliance. The SDT has evaluated the method for assessing compliance and has determined compliance is best demonstrated on a quarterly basis using a rolling 12 months data period.		
FMPP	No	The proposed Requirement 1 states: Each Balancing Authority shall achieve a Frequency Response Measure (FRM) (as detailed in Attachment A and calculated on FRS Form 1) that is equal to or more negative than its Frequency Response Obligation (FRO).Attachment A states that if a year occurs in which there are not 25 events that meet the remaining criteria below, then the most recent 25 events (as defined below) will be used for determination of an entity's compliance with the FRM requirement and storage of SEFRD. Problem - by using events from last year to determine an entity's compliance with a Requirement for this year puts the entity in double jeopardy for last year's events, which were already used for compliance for last year.

Organization	Yes or No	Question 4 Comment
Response: The SDT recommends posting selected events quarterly to give BAs time to evaluate their compliance. The SDT has evaluated the method for assessing compliance and has determined compliance is best demonstrated on a quarterly basis using a rolling 12 months data period.		
EKPC	No	The method for measurement is not detailed. Also, the method indicates a lagging indicator. Hows is the BA to ensure its compliance through the year?
Response: FRS Form 1 now details the measurement method. An entity can use the Criteria for Selecting Events to confirm compliance during the year. The SDT recommends posting selected events quarterly to give BAs time to evaluate their compliance.		
ISO New Engand Inc.	No	We have a difficulty seeing the BA being the only entity held responsible for maintaining interconnection frequency and arresting frequency deviations. When there is a sudden and sizable change to system resource or demand, the first response to a frequency deviation caused by this change would be the generators' governors. This will provide a mitigating effect for the immediate seconds up to minutes. The frequency bias setting will then kick in to supplement the mitigation need. The governors are owned by the Generator Owners; the BAs do not own these facilities and hence can do little to address frequency response during this initial period.
Response: While the SDT has described possible methods for obtaining Frequency Response compliance with this standard, the SDT is not prescribing a particular method for entities to implement. Governor operation is outside the scope of the approved project SAR. Any entity may submit a SAR request to modify or create a standard.		
American Electric Power	No	Between the definition and the requirement in Attachment A, it is unclear if FRM is a reliability-supported, performance-based measure, or instead, if it is a calculated number based on previous performance. As written, it is unclear if this is a performance-based requirement, or simply a calculation that should be utilized in some way. In any event, the requirement needs to be re-written to clarify its intent.
Response: The SDT has modified the definition of FRM to read "The median of all the Frequency Response observations reported annually on FRS Form 1."		
Duke Energy	No	Duke Energy agrees that a BA should be required to achieve a minimum level of Frequency Response, however Duke Energy believes the method for measurement needs improvement - please see comments to 1 and 2 above.Duke Energy agrees with the concept that a Balancing Authority should be required to achieve a minimum level of Frequency Response however the method for measurement should also allow exclusion of certain events, such as when the frequency deviation is associated with the BA's contingent loss of generation, or when an event is coincident with a significant change in ramped interchange. It is not clear how the FRO will be determined - Duke Energy believes that the industry should agree on the methodology which would be used for the ERO to determine the response desired for the Interconnection and

Organization	Yes or No	Question 4 Comment
		how the allocation for the FRO would be determined for each Balancing Authority. The calculation of FRO allocation (in Attachment 1) is not clear on whether the peak load and generation data used is historic data or forecasted data. It is also not clear how the assignment of the FRO would accommodate a mid-year change in Balancing Authority size or other attribute that could change the calculated response. Duke Energy questions if a BA providing better response than its allocated FRO in any year should be held to achieving that in the following year - Duke Energy believes that should be the decision of the BA if it chooses to achieve more than the minimum requirement applied to others.
Response: The FRS Form 1 has been modified to allow for adjustments (not exclusions) to the load and generation. The Industry will agree on the methodology for determining the FRO by submitting approval ballots on the standard. The SDT recognizes the need to convert Attachment A into two documents. The first document will remain part of the standard as Attachment A and describe the calculation methodology utilized. The second document will explain the rationale for the requirements as supplemental standard information. The FR SDT agrees that mid-year changes need to be addressed and will review this issue during the field trial. A BA's FRO is not based on the previous year's compliance. FRO is determined using the methodology described in Attachment A.		
Patterson Consulting, Inc.	No	Requiring a Balancing Authority to provide Frequency Response and measuring that Frequency Response consistently, is critical to maintaining reliability. The requirement is long overdue and the concept is a good one. The method for measurement in FRS Form 1 is not consistent with the definition of FRM. The desired "averaging" of input data over specific time ranges by the Balancing Authority as it completes FRS Form 1 appears only in the background and instructions for FRS Form 1. Since this "instruction" document will not be a part of the standard, it is not obvious that Balancing Authority's will be compelled to provide consistent data. Therefore, the standard will fail to achieve the stated purpose of providing "...consistent methods for measuring Frequency Response...". Attachment A, other than the section providing guidance regarding event selection, appears to be explanatory, contextual, and instructional in content. These aspects are important, but should not be requirements. Attachment A should include only the event selection process and calculations associated with requirements, including an explanation of what is necessary if variable Frequency Bias Settings are implemented. If other "requirements" are included in Attachment A, they should be moved to the standard. FRS Form 1 should be an attachment to the standard as this form contains and performs the required calculations. The remaining information in Attachment A should become either a standalone (technical) document, or be combined with information such as "FRS Form 1 Background and Instructions" and renamed. As further clarification regarding the ambiguity identified in the previous paragraph, Attachment A

Organization	Yes or No	Question 4 Comment
		could be interpreted as additional requirements on the Balancing Authority, ERO, or both. The language and scope is not sufficiently clear to identify whether statements are informative or requirements. This lack of clarity makes it impossible for entities to identify requirements, acquire appropriate tools and resources related to requirements, and to provide suitable performance to meet requirements. For example, the statement "A final listing of official events to be used in the calculation will be available from NERC by December 10 each year." may be intended as a requirement rather than a statement suggesting a typical schedule. Further, if the previous statement is a typical schedule, then the statement "The ERO will use the following criteria for the selection of events to be analyzed." could be interpreted as merely the typical process to be used, but not a binding one.
Response: The SDT has modified FRS Form 1 to allow for adjustments. The SDT has modified the Attachment A documentation to clarify the calculation methodology. The SDT has modified the Requirements and added measures to clarify how an entity is to show compliance.		
Alberta Electric System Operator	Yes	The AESO agrees that there should be certain minimum requirement(s) of Frequency Response. In Attachment A, it mentioned that it will be based on the protection criteria and Point C, and the FRM is determined based on the settled deviation. The AESO suggests that the SDT describe how the FRM be related with the FRO as they are determined by different time frames. The AESO suggests NERC investigate the measure and method of separate FRM / FRO for different time frames, or provide technical evidence that the proposed FRM / FRO can also address the technical concerns in different time frames.
Response: The FRO is a determined value providing a target for ensuring robust frequency response is achieved by all Balancing Authorities. The FRM is the medium value of observations for the time period. The intent is for FRM to always be equal or more negative than the FRO, signifying robust control resulting in proper frequency response. As such, the determination timeframes does not have to be the same for each value.		
Independent Electricity System Operator	Yes	We agree with the BA being one of the responsible entities to achieve a minimum level of FR, and the method of measurement. However, R1 does not correspond to the figures shown in the FRS (Form 1) in that the FRM (the median) is -14.5 whereas the FRO is -15.8. The FRO is more negative than the FRM, which does not seem to correspond to what's stipulated in R1 (FRM to be equal or more negative than its FRO).
Response: FRS Form 1 has been modified to correct calculations and to allow for adjustments (not exclusions) to the load and generation.		
Arizona Public Service Company	Yes	What is meant by discretely administered determination, under the heading "Frequency Obligation and Allocation" of Attachment A? Please explain.
Response: The SDT has provided an administrative procedure for the ERO to follow in Attachment A.		

Organization	Yes or No	Question 4 Comment
ENBALA Power Networks	Yes	ENBALA does believe that a BA should be responsible for a minimum level of Frequency Response as calculated on Form 1 and reflected in its FRO. Furthermore, we feel that additional data collected on the frequency nadir, such as the metric suggested in the recent Lawrence Berkeley National Laboratory of nadir-based frequency response, would be useful in assessing the current inertial response capabilities and level of risk for under-frequency load shedding.
Response: The FRO is a determined value providing a target for ensuring robust frequency response is achieved by all Balancing Authorities. The FRM is the medium value of observations for the time period. The intent is for FRM to always be equal or more negative than the FRO, signifying robust control resulting in proper frequency response. As such, the determination timeframes does not have to be the same for each value.		
Beacon Power Corporation	Yes	The concept of requiring each Balancing Authority to achieve some level of Frequency Response and calculate it consistently is appropriate and necessary.
Response: The SDT thanks you for your affirmative response and clarifying comment.		
SPP Standards Development	Yes	
Seattle City Light	Yes	
Manitoba Hydro	Yes	
Associated Electric Cooperative, Inc.	Yes	
Northeast Power Coordinating Council		Refer to the response to Question 17.
Response: Please refer to the SDT response to Question 17.		

5. ***Requirement 2 identifies when the Balancing Authority must implement its Frequency Bias Setting.***

R2. Each Balancing Authority shall implement the Frequency Bias Setting (fixed or variable) provided by the ERO into its Area Control Error (ACE) calculation beginning on the date specified by the ERO to ensure effective coordinated secondary control, using the results from the calculation methodology detailed in Attachment A.

Do you agree with this implementation? If not, please explain in the comment area.

Summary Consideration: The majority of the commenters did not agree with the implementation plan specified in Requirement R2. Many of the comments received echo concerns raised in comments for question 4 such as the Attachment A calculation methodology is not clear; there was insufficient information provided to address the use of variable bias, and FRO determination was questionable. Several commenters were concerned with the role assigned to the ERO, questioning how the ERO will use the FRM to determine the required BA Frequency Bias Setting and if the ERO was the correct entity to perform this action. Commenters also expressed concerns with performing an FRM analysis at the end of the year over the holiday period, suggesting the implementation time should be increased from one month to two months. Some commenters also expressed concern that CPS and L10 compliance may be adversely affected by the requirements proposed for calculating the Frequency Bias Setting.

In response to the comments received from industry, the SDT has revised Attachment A to clarify the calculation methodology; revised Requirement R2 to clarify how an entity implements the Frequency Bias Setting provided by the ERO; and also modified FRS Form 1 to allow for adjustments. Regarding FRO determination, the SDT is using a deterministic approach and also evaluating a probabilistic method. With respect to ERO actions, the SDT is evaluating whether modifications to the NERC Rules of Procedure are necessary to ensure the ERO provides the necessary support. The SDT also will develop a second draft standard attachment, Attachment B, to define the methodology for lowering the minimum Frequency Bias Setting required, including maintaining a safety margin.

R2. Each Balancing Authority not participating in Overlap Regulation Service shall implement the Frequency Bias Setting (fixed or variable) validated by the ERO into its Area Control Error (ACE) calculation beginning on the date specified by the ERO to ensure effectively coordinated Tie Line Bias.

Organization	Yes or No	Question 5 Comment
Santee Cooper	No	It is not clear what the methodology (should be method) is in Attachment A. Is the frequency bias setting the BA's prior year FRM with a minimum value being a percentage of estimated yearly peak load or upcoming year maximum generation? What does "provided by the ERO" mean? Perhaps it should be verified or approved by the ERO (NERC).

Organization	Yes or No	Question 5 Comment
Response: Attachment A has been revised to clarify the calculation methodology. Requirement R2 has been revised for clarity and now reads, "Each Balancing Authority not participating in Overlap Regulation Service shall implement the Frequency Bias Setting (fixed or variable) validated by the ERO, into its Area Control Error (ACE) calculation beginning on the date specified by the ERO to ensure effectively coordinated Tie Line Bias control."		
LG&E and KU Energy	No	It is not clear what the methodology (should be method) is in Attachment A. Is the frequency bias setting the BA's prior year FRM with a minimum value being a percentage of estimated yearly peak load or upcoming year maximum generation? What does "provided by the ERO" mean? Perhaps it should be verified or approved by the ERO (NERC).
Response: Attachment A has been revised to clarify the calculation methodology. Requirement R2 has been revised for clarity and now reads, "Each Balancing Authority not participating in Overlap Regulation Service shall implement the Frequency Bias Setting (fixed or variable) validated by the ERO, into its Area Control Error (ACE) calculation beginning on the date specified by the ERO to ensure effectively coordinated Tie Line Bias control."		
SERC OC Standards Review Group	No	It is not clear what the methodology (should be method) is in Attachment A. Is the frequency bias setting the BA's prior year FRM with a minimum value being a percentage of estimated yearly peak load or upcoming year maximum generation? What does "provided by the ERO" mean? Perhaps it should be verified or approved by the ERO (NERC).
Response: Attachment A has been revised to clarify the calculation methodology. Requirement R2 has been revised for clarity and now reads, "Each Balancing Authority not participating in Overlap Regulation Service shall implement the Frequency Bias Setting (fixed or variable) validated by the ERO, into its Area Control Error (ACE) calculation beginning on the date specified by the ERO to ensure effectively coordinated Tie Line Bias control."		
South Carolina Electric and Gas	No	It is not clear what the methodology (should be method) is in Attachment A. Is the frequency bias setting the BA's prior year FRM with a minimum value being a percentage of estimated yearly peak load or upcoming year maximum generation? What does "provided by the ERO" mean? Perhaps it should be verified or approved by the ERO (NERC). We suggest defining the date as by the end of the first business day following the deadline for Frequency Bias Setting implementation.
Response: Attachment A has been revised to clarify the calculation methodology. Requirement R2 has been revised for clarity and now reads, "Each Balancing Authority not participating in Overlap Regulation Service shall implement the Frequency Bias Setting (fixed or variable) validated by the ERO, into its Area Control Error (ACE) calculation beginning on the date specified by the ERO to ensure		

Organization	Yes or No	Question 5 Comment
effectively coordinated Tie Line Bias control." The SDT does not believe the suggestion to define the date is necessary since there is language in the standard stating the ERO will allow sufficient time to implement the Frequency Bias Setting.		
MRO's NERC Standards Review Subcommittee	No	Flexibility established in the date is better than the existing currently defined date in the standards. It is better to allow the ERO to specify the date to allow some flexibility in implementation. It appears that the responsible for identifying Frequency Bias Setting is being removed from the Balancing Authority. There is an implied obligation that the ERO will determine the Frequency Bias Setting but it is not stated explicitly. Thus, we are left wondering who has the responsibility for determining the Frequency Bias Setting. Frequency Response of the interconnection is constantly changing. As a result, the Frequency Bias Setting will never match the Frequency Response exactly. It is better to overbias than underbias to prevent withdrawal of frequency response by AGC. Historically, the 1% floor for frequency bias setting was chosen to ensure that BAs are always over-biased. The standard needs to allow some margin in the frequency bias setting to ensure that the bias setting is overbiased.
Response: The SDT has modified the language in Requirement R2 to provide further clarity. The Requirement now reads "Each Balancing Authority not participating in Overlap Regulation Service shall implement the Frequency Bias Setting (fixed or variable) validated by the ERO, into its Area Control Error (ACE) calculation beginning on the date specified by the ERO to ensure effectively coordinated Tie Line Bias control." The SDT agrees that over-bias is better than under-bias and has added Attachment B to define the methodology to lower the minimum Frequency Bias Setting and provide a safety margin.		
Midwest ISO Standards Collaborators	No	Flexibility established in the date is better than the existing currently defined date in the standards. It is better to allow the ERO to specify the date to allow some flexibility in implementation. It appears that the responsible for identifying Frequency Bias Setting is being removed from the Balancing Authority. There is an implied obligation that the ERO will determine the Frequency Bias Setting but it is not stated explicitly. Thus, we are left wondering who has the responsibility for determining the Frequency Bias Setting. Frequency Response of the interconnection is constantly changing. As a result, the Frequency Bias Setting will never match the Frequency Response exactly. It is better to overbias than underbias to prevent withdrawal of frequency response by AGC. Historically, the 1% floor for frequency bias setting was chosen to ensure that BAs are always over-biased. The standard needs to allow some margin in the frequency bias setting to ensure that the bias setting is overbiased.
Response: The SDT has modified the language in Requirement R2 to provide further clarity. The Requirement now reads "Each Balancing Authority not participating in Overlap Regulation Service shall implement the Frequency Bias Setting (fixed or variable) validated by the ERO, into its Area Control Error (ACE) calculation beginning on the date specified by the ERO to ensure effectively coordinated Tie Line Bias control." The SDT agrees that over-bias is better than under-bias and has added Attachment B to define the methodology to lower the minimum Frequency Bias Setting		

Organization	Yes or No	Question 5 Comment
and provide a safety margin.		
We Energies	No	Flexibility established in the date is better than the existing currently defined date in the standards. It is better to allow the ERO to specify the date to allow some flexibility in implementation. It appears that the responsibility for identifying Frequency Bias Setting is being removed from the Balancing Authority. There is an implied obligation that the ERO will determine the Frequency Bias Setting but it is not stated explicitly. Thus, we are left wondering who has the responsibility for determining the Frequency Bias Setting. Frequency Response of the interconnection is constantly changing. As a result, the Frequency Bias Setting will never match the Frequency Response exactly. It is better to over-bias than under-bias to prevent withdrawal of frequency response by AGC. Historically, the 1% floor for frequency bias setting was chosen to ensure that BAs are always over-biased. The standard needs to allow some margin in the frequency bias setting to ensure that the bias setting is over-biased.
Response: The SDT has modified the language in Requirement R2 to provide further clarity. The Requirement now reads "Each Balancing Authority not participating in Overlap Regulation Service shall implement the Frequency Bias Setting (fixed or variable) validated by the ERO, into its Area Control Error (ACE) calculation beginning on the date specified by the ERO to ensure effectively coordinated Tie Line Bias control." The SDT agrees that over-bias is better than under-bias and has added Attachment B to define the methodology to lower the minimum Frequency Bias Setting and provide a safety margin.		
FirstEnergy	No	We cannot agree at this time since Attachment A of the materials posted do not include sufficient details regarding the calculations used. Furthermore, there is no obligation imposed on the ERO to provide neither a reasonable time frame for implementation of the Frequency Bias Setting nor a requirement for the ERO to follow the methodology detailed in Attachment A. The team should consider adding a requirement for the ERO or clarifying where this obligation is covered in NERC's Rules of Procedure.
Response: Attachment A has been revised to clarify the calculation methodology. The SDT is evaluating if a modification to the NERC Rules of Procedure to obligate the ERO to perform the tasks identified in the standard is necessary.		
Bonneville Power Administration	No	R2 - BPA believes that the ERO should not be providing the BA the Frequency Bias Settings for the BA. R2 points to Attachment A as having the calculation methodology, but there is no methodology spelled out in Attachment A, there are simply data requirements, delta frequency that will be included in surveys, tools to be used, etc. The statement 'natural frequency response' is in Attachment A many times, but it is never spelled out. What is meant by this phrase. This differs dramatically depending on when the event occurs due to different generating patterns, different types of load (frequency responsive versus not frequency responsive), etc.

Organization	Yes or No	Question 5 Comment
		The methodology needs to spell out how this will be taken into account when calculating the correct frequency bias. Secondly, how would this be done for variable bias?
Response: Requirement R2 has been revised for clarity and now reads, "Each Balancing Authority not participating in Overlap Regulation Service shall implement the Frequency Bias Setting (fixed or variable) validated by the ERO, into its Area Control Error (ACE) calculation beginning on the date specified by the ERO to ensure effectively coordinated Tie Line Bias control." Attachment A has been revised to clarify the calculation methodology. The SDT agrees that over-bias is better than under-bias and has added Attachment B to define the methodology to lower the minimum Frequency Bias Setting and provide a safety margin. Variable frequency bias settings are determined by Balancing Authorities using a calculation based on present operating conditions. The SDT will provide additional and sufficient direction related to variable bias after review of this issue during the field trial. The term "natural frequency response" is no longer in Attachment A but it is used in the new Background Document. The SDT believes that this term is describing the response for any individual event and if calculated the statistical summation of multiple events. This term is more a work of art and not science and therefore is not capitalized or defined.		
SPP Standards Development	No	We would suggest ending the sentence at the second ERO, deleting the phrase '...to ensure effective coordinated secondary control, using the results from the calculation methodology detailed in Attachment A.' This phrase is more of an explanation of why this is being done rather than a part of an actual requirement.
Response: The SDT believes this language provides additional clarity and should remain as is. The SDT has removed the reference to Attachment A.		
IRC Standards Review Committee	No	It is not clear how the ERO uses the FRM to determine the required Frequency Bias Settings. Please clarify. Also, it should not be necessary for the ERO to do the determination for all the Interconnections. There are already in place methods for this by the existing ERCOT and WECC Interconnections. The SRC suggests that the ERO may not be the appropriate technical entity. The ERO may be the appropriate entity to serve as the receiver of the forms and analyze results for the Eastern Interconnection, but existing processes are already in place elsewhere. It should be sufficient that those processes continue and submit copies of Form 1 to the ERO. This may also be appropriate for Hydro Quebec. In addition, whichever entity determines the Frequency Bias Setting must provide implementation time for the BAs to implement the settings. The proposed language says only that the BA shall implement it on the date specified, but it doesn't address the need for that date to include some implementation time.
Response: The SDT is not suggesting that the ERO determine the Frequency Bias Settings. The SDT has modified the language in Requirement R2 to clarify the		

Organization	Yes or No	Question 5 Comment
role of the ERO. The Requirement now reads "Each Balancing Authority not participating in Overlap Regulation Service shall implement the Frequency Bias Setting (fixed or variable) validated by the ERO, into its Area Control Error (ACE) calculation beginning on the date specified by the ERO to ensure effectively coordinated Tie Line Bias control." The SDT disagrees that the standard should independently address each Interconnection, and believes it is necessary to have a common methodology applicable to each Interconnection. An entity can request a variance and justify why deviation from the methodology adopted is necessary. The SDT is evaluating if a modification to the NERC Rules of Procedure to obligate the ERO to perform the tasks identified in the standard is necessary and will also define implementation timing.		
ERCOT	No	It is not clear how the ERO uses the FRM to determine the required Frequency Bias Settings. It should not be necessary for the ERO to do the determination for all the Interconnections. There are already in place methods for this by the existing ERCOT and WECC Interconnections. The SRC suggests that the ERO may not be the appropriate technical entity. The ERO may be the appropriate entity to serve as the receiver of the forms and analyze results for the Eastern Interconnection, but existing processes are already in place elsewhere. It should be sufficient that those processes continue and submit copies of Form 1 to the ERO. This may also be appropriate for Hydro Quebec. In addition, whichever entity determines the Frequency Bias Setting must provide implementation time for the BAs to implement the settings. The proposed language says only that the BA shall implement it on the date specified, but it doesn't address the need for that date to include some implementation time.
Response: The SDT is not suggesting that the ERO determine the Frequency Bias Settings. The SDT has modified the language in Requirement R2 to clarify the role of the ERO. The Requirement now reads "Each Balancing Authority not participating in Overlap Regulation Service shall implement the Frequency Bias Setting (fixed or variable) validated by the ERO, into its Area Control Error (ACE) calculation beginning on the date specified by the ERO to ensure effectively coordinated Tie Line Bias control." The SDT disagrees that the standard should independently address each Interconnection, and believes it is necessary to have a common methodology applicable to each Interconnection. An entity can request a variance and justify why deviation from the methodology adopted is necessary. The SDT is evaluating if a modification to the NERC Rules of Procedure to obligate the ERO to perform the tasks identified in the standard is necessary and will also define implementation timing.		
Kansas City Power & Light	No	The Frequency Response Obligation determination for the interconnection as described in Attachment A is a crude method and will result in obligations that will exceed the FRO that is intended. This will result in additional cost to BA's that is unnecessary to achieve the purpose of maintaining sufficient generation online to arrest frequency degradation events caused by loss of generating resources. The current NERC method for calculating a BA's actual frequency response are inaccurate and provide misleading guidance in the actual frequency response of a BA. These methods need considerable improvement before any attempts to hold a BA to an expected level of frequency response as this proposal

Organization	Yes or No	Question 5 Comment
		has stated.
Response: The minimum level of response selected for the field trial uses a deterministic approach. The actual level of response specified in the final version of the draft standard may be based on analysis of data obtained from the field trial. The SDT is also evaluating a probabilistic method to determine the FRO. FRS Form 1 has been modified to correctly calculate Frequency Response.		
Southern Company	No	Comments: Comment 2: BAL-003-1, Requirement R2. The requirement should be made less prescriptive by removing references to the calculation methodology and Attachment A. The responsible entity should understand the fundamental and basic requirement - to implement the Frequency Bias Setting into its Areas Control Error calculation. Proposed language is as follows: Each Balancing Authority shall implement the Frequency Bias Setting (fixed or variable) provided by the ERO into its Area Control Error (ACE) calculation beginning on the date specified by the ERO to ensure effective coordinated secondary control. Comment 3: BAL-003-1, Requirement R2 and Section 1.4 Additional Compliance Information. The SDT should consider whether or not the ERO has compliance obligations pursuant to the obligations mentioned in the proposed Standard. Requirement R2, states that the ERO should provide the BA with the Frequency Bias Setting and the specified date to begin the calculation. The R1 Supplemental Information section states that the ERO is obligated to post the official list of events. The R2 Supplemental Information section states that the ERO is obligated to validate the FRM and Frequency Bias Settings and disseminate the Frequency Bias Settings Report along with the implementation date. These obligations should be confirmed and properly incorporated into Standard if appropriate.
Response: The SDT disagrees that the standard should independently address each Interconnection, and believes it is necessary to have a common methodology applicable to each Interconnection. An entity can request a variance and justify why deviation from the methodology adopted is necessary. The SDT is evaluating if a modification to the NERC Rules of Procedure to obligate the ERO to perform the tasks identified in the standard is necessary and will also define implementation timing.		
Energy Mark, Inc.	No	Comment 13: I agree that the BA shall implement the Frequency Bias Setting provided by the ERO into it Area Control Error (ACE) calculation beginning on the date specified by the ERO to ensure effective coordinated secondary control. Comment 14: I do not agree that the results from the calculation methodology detailed in Attachment A will provide the correct Frequency Bias Setting. My comments on the calculation methodology are included elsewhere in my comments on Attachment A and FRS Form 1.
Response: Comment 13 – The SDT thanks you for your affirmative comment. Note that based on comments from other stakeholders, the language in Requirement R2 was modified to state, "Each Balancing Authority not participating in Overlap Regulation Service shall implement the Frequency Bias Setting (fixed or variable) "validated" by the ERO, into its Area Control Error (ACE) calculation . . ."		

Organization	Yes or No	Question 5 Comment
Comment 14 - Please see the SDT response to your Attachment A and FRS Form 1 comments.		
EKPC	No	The method is not clear in Attachment A.
Response: Attachment A has been revised to clarify the calculation methodology.		
Seattle City Light	No	Currently a Balancing Authority has only about one month over holiday periods(December 10 to January 10) to assemble its data and calculate the Frequency Response Measure (FRM). Further, Attachment A requires the ERO to use at least 25 events for the calculation of FRM. Seattle City Light (SCL) believes that one month is insufficient time given the number of events required. So SCL recommends additional time, such as two months or to reduce the number of events to be included in annual reviews.
Response: The SDT recommends posting the selected events on a quarterly basis which should provide ample time for BAs to provide the information.		
American Electric Power	No	It appears this standard deviates from past practice for calculating frequency bias. It is unclear how this might affect the CPS Bounds L10 calculation.
Response: The Frequency Bias Setting calculation remains the same. The SDT is only modifying the "minimum Frequency Bias Setting" threshold. The SDT understands reducing the minimum Frequency Bias Setting will affect L10 and ACE values which is why the SDT proposes monitoring these parameters and undoing the modification if adverse results are realized.		
Duke Energy	No	Duke Energy believes that this needs to be restated. Will the ERO perform the calculations to determine each BA's Bias? Will the ERO provide ample time between publication of the settings and the date of implementation? If effective coordinated secondary control is desired, other related operational parameters (e.g., L10) need to be set at the same time. Since measurement and reporting of operational performance is primarily on a monthly basis (e.g., CPS1/CPS2), the implementation date should be on or near the first of a month, but during normal working hours (so that adequate support personnel are available).
Response: The SDT is not suggesting that the ERO determine the Frequency Bias Settings. The SDT has modified the language in Requirement R2 to clarify the role of the ERO. The Requirement now reads "Each Balancing Authority not participating in Overlap Regulation Service shall implement the Frequency Bias Setting (fixed or variable) validated by the ERO, into its Area Control Error (ACE) calculation beginning on the date specified by the ERO to ensure effectively coordinated Tie Line Bias control." The SDT is evaluating if a modification to the NERC Rules of Procedure to obligate the ERO to perform the tasks identified in the standard is necessary and will		

Organization	Yes or No	Question 5 Comment
also define implementation timing. The SDT understands reducing the minimum Frequency Bias Setting will affect L10 and ACE values which is why the SDT proposes monitoring these parameters and undoing the modification if adverse results are realized. The SDT is not proposing to change the methodology presently used to set the timing of the implementation of the Frequency Bias Setting.		
Patterson Consulting, Inc.	No	The concept of requiring a Balancing Authority to implement its Frequency Bias Setting at a specific time and using a specific calculation is meaningful. This requirement is not clearly worded, however. If the intent of Requirement 2 is to identify "...when the Balancing Authority must implement its Frequency Bias Setting..." the requirement should stop after "...on the date specified by the ERO." The remaining portion of the requirement explains the need for the requirement and should be moved to supporting material. Attachment A does not have a "calculation methodology" associated with the Frequency Bias Setting unless the language describing historical practice and the benefits of moving a Frequency Bias Setting closer to a Balancing Authority's natural Frequency Response are intended to constitute a "calculation methodology." FRS Form 1 has the "calculation methodology" of using the minimum (since the value is negative) of last year's FRM, next year's FRO, and percentage of next year's peak load or generation. Attachment A does not mention this methodology and the requirement does not mention FRS Form 1. The clause "..., using the results from the calculation methodology detailed in Attachment A." appears to place an obscure requirement on the ERO since the ERO is the entity providing the Frequency Bias Setting to be implemented by the Balancing Authority. If the ERO is intended to use the value from FRS Form 1, after verifying data and calculations, then state that expectation explicitly and clearly. Otherwise, the ERO could set Frequency Bias Settings in another manner after observing the Form 1 values. The requirement for the ERO to provide a Frequency Bias Setting to each Balancing Authority begs the question of how variable bias will be implemented. Historically, the Balancing Authority implements its algorithm with oversight from NERC (Resources Subcommittee). The manner and expectation for providing data and algorithms related to variable bias are inadequate.
Response: The SDT has modified the language in Requirement R2 to clarify the role of the ERO. The Requirement now reads "Each Balancing Authority not participating in Overlap Regulation Service shall implement the Frequency Bias Setting (fixed or variable) validated by the ERO, into its Area Control Error (ACE) calculation beginning on the date specified by the ERO to ensure effectively coordinated Tie Line Bias control." The SDT is evaluating if a modification to the NERC Rules of Procedure to obligate the ERO to perform the tasks identified in the standard is necessary and will also define implementation timing. Attachment A has been revised to clarify the calculation methodology. FRS Form 1 has been modified to correctly calculate Frequency Response and to allow for adjustments (not exclusions) to the load and generation. Variable frequency bias settings are determined by Balancing Authorities using a calculation based on present operating conditions. The SDT will provide		

Organization	Yes or No	Question 5 Comment
additional and sufficient direction related to variable bias after review of this issue during the field trial.		
Alberta Electric System Operator	Yes	The AESO suggests that the standard should provide a description on how the ERO would determine the frequency bias setting and the relation to the FRO.
Response: The SDT is not suggesting that the ERO determine the Frequency Bias Settings. The SDT has modified the language in Requirement R2 to clarify the role of the ERO. The Requirement now reads, "Each Balancing Authority not participating in Overlap Regulation Service shall implement the Frequency Bias Setting (fixed or variable) validated by the ERO, into its Area Control Error (ACE) calculation beginning on the date specified by the ERO to ensure effectively coordinated Tie Line Bias control." The SDT is evaluating if a modification to the NERC Rules of Procedure to obligate the ERO to perform the tasks identified in the standard is necessary and will also define implementation timing.		
NIPSCO	Yes	I guess the ERO will calculate the Bias, interesting.
Response: The SDT is not suggesting that the ERO determine the Frequency Bias Settings. The SDT has modified the language in Requirement R2 to clarify the role of the ERO. The Requirement now reads, "Each Balancing Authority not participating in Overlap Regulation Service shall implement the Frequency Bias Setting (fixed or variable) validated by the ERO, into its Area Control Error (ACE) calculation beginning on the date specified by the ERO to ensure effectively coordinated Tie Line Bias control."		
Manitoba Hydro	Yes	The implementation schedule seems reasonable.
Response: The SDT thanks you for your affirmative response and clarifying comment.		
Westar Energy	Yes	
FMPP	Yes	
Progress Energy	Yes	
ENBALA Power Networks	Yes	
NorthWestern Energy	Yes	
Independent Electricity System Operator	Yes	

Organization	Yes or No	Question 5 Comment
Arizona Public Service Company	Yes	
Northeast Power Coordinating Council		Refer to the response to Question 17.
Response: Please refer to the SDT response to Question 17.		

6. ***Requirement 3 mandates that a Balancing Authority operate its Automatic Generation Control (AGC) on Tie Line Bias unless it becomes adverse to the integrity of its system.***

   R3. Each Balancing Authority shall operate its Automatic Generation Control (AGC) on Tie Line Bias, unless such operation would have an Adverse Reliability Impact on the Balancing Authority's Area.

   Do you agree that a Balancing Authority should operate its AGC on Tie Line Bias unless it becomes adverse to its system? If not, please explain in the comment area below.

Summary Consideration: Approximately half of the comments received agreed that a Balancing Authority should operate its AGC in Tie Line Bias unless an Adverse Reliability Impact occurs. Many of the dissenters were concerned with the apparent conflict with BAL-005.1b Requirement R6, efforts of the Balancing Authority Reliability-based Controls (BARC) SDT with modifying BAL-005, and concern that the draft standard should not dictate an AGC operating control mode. Other commenters indicated the language of Requirement R3 needed to be revised for clarity and that the requirement could place a reporting burden on the Balancing Authorities. It was also noted that a single BA Interconnection does not operate AGC using Tie Line Bias mode.

In response to industry comments received, the SDT has revised Requirement R3 by adding Overlap Regulation Service language and allowing the AGC operating mode to be changed for an Adverse Reliability Impact.

R3. Each Balancing Authority not receiving Overlap Regulation Service shall operate its Automatic Generation Control (AGC) in Tie Line Bias mode to ensure effectively coordinated control, unless such operation would have an Adverse Reliability Impact on the Balancing Authority's Area.

Organization	Yes or No	Question 6 Comment
Santee Cooper	No	BAL-003-0, Requirement 3 requires operation of AGC on Tie Line Frequency Bias. BAL-005-0.1b, Requirement 6 requires the BA to compare total Net Interchange to total Net Scheduled Interchange plus Frequency Bias obligation to determine the Balancing Authority's ACE. We suggest that Requirement 3 be restated to "shall operate its Automatic Generation Control (AGC) on Tie Line Frequency Bias, unless ....."Tie Line bias is the (Ia-Is) term and frequency bias is the -10B(Fa-Fs) term.
Response: Requirement R3 has been revised for clarity and now reads "Each Balancing Authority not receiving Overlap Regulation Service shall operate its Automatic Generation Control (AGC) in Tie Line Bias mode to ensure effectively coordinated control, unless such operation would have an Adverse Reliability Impact on the Balancing Authority's Area."		

Organization	Yes or No	Question 6 Comment
LG&E and KU Energy	No	BAL-003-0, Requirement 3 requires operation of AGC on Tie Line Frequency Bias. BAL-005-0.1b, Requirement 6 requires the BA to compare total Net Interchange to total Net Scheduled Interchange plus Frequency Bias obligation to determine the Balancing Authority's ACE.We suggest that Requirement 3 be restated to "shall operate its Automatic Generation Control (AGC) on Tie Line Frequency Bias, unless ....."Tie Line bias is the (Ia-Is) term and frequency bias is the -10B(Fa-Fs) term. This should be coordinated with BARCSDT modifications to BAL-005.
Response: Requirement R3 has been revised for clarity and now reads "Each Balancing Authority not receiving Overlap Regulation Service shall operate its Automatic Generation Control (AGC) in Tie Line Bias mode to ensure effectively coordinated control, unless such operation would have an Adverse Reliability Impact on the Balancing Authority's Area." This standard is scheduled to be completed and filed with FERC prior to the BARC standard being completed. The SDT anticipates that work on the BARC standard will take into account the work completed on this standard.		
SERC OC Standards Review Group	No	BAL-003-0, Requirement 3 requires operation of AGC on Tie Line Frequency Bias. BAL-005-0.1b, Requirement 6 requires the BA to compare total Net Interchange to total Net Scheduled Interchange plus Frequency Bias obligation to determine the Balancing Authority's ACE.We suggest that Requirement 3 be restated to "shall operate its Automatic Generation Control (AGC) on Tie Line Frequency Bias, unless ....."Tie Line bias is the (Ia-Is) term and frequency bias is the -10B(Fa-Fs) term. This should be coordinated with BARCSDT modifications to BAL-005.
Response: Requirement R3 has been revised for clarity and now reads "Each Balancing Authority not receiving Overlap Regulation Service shall operate its Automatic Generation Control (AGC) in Tie Line Bias mode to ensure effectively coordinated control, unless such operation would have an Adverse Reliability Impact on the Balancing Authority's Area." This standard is scheduled to be completed and filed with FERC prior to the BARC standard being completed. The SDT anticipates that work on the BARC standard will take into account the work completed on this standard.		
South Carolina Electric and Gas	No	BAL-003-0, Requirement 3 requires operation of AGC on Tie Line Frequency Bias. BAL-005-0.1b, Requirement 6 requires the BA to compare total Net Interchange to total Net Scheduled Interchange plus Frequency Bias obligation to determine the Balancing Authority's ACE.We suggest that Requirement 3 be restated to "shall operate its Automatic Generation Control (AGC) on Tie Line Frequency Bias, unless ....."Tie Line bias is the (Ia-Is) term and frequency bias is the -10B(Fa-Fs) term. This should be coordinated with BARCSDT modifications to BAL-005.
Response: Requirement R3 has been revised for clarity and now reads "Each Balancing Authority not receiving Overlap Regulation Service shall operate its Automatic Generation Control (AGC) in Tie Line Bias mode to ensure effectively coordinated control, unless such operation would have an Adverse Reliability		

Organization	Yes or No	Question 6 Comment
Impact on the Balancing Authority's Area." This standard is scheduled to be completed and filed with FERC prior to the BARC standard being completed. The SDT anticipates that work on the BARC standard will take into account the work completed on this standard.		
Bonneville Power Administration	No	R3. BPA does not believe this standard should dictate the control mode for AGC. That is better suited to be in BAL-001 and should not be repeated in this standard - the ACE used for reporting is spelled out in BAL-001 R1 and is also discussed in BAL-005 R6. R3 should be removed from this standard, not modified to fit with what is stated in BAL-001 or BAL-005.
Response: This standard is proposed to go into effect prior to implementation of the BARC draft standard. A determination of which reliability standard should specify the AGC control mode used for system operations can be made once development of the BARC draft standard is completed. Requirement R3 has been revised for clarity and now reads "Each Balancing Authority not receiving Overlap Regulation Service shall operate its Automatic Generation Control (AGC) in Tie Line Bias mode to ensure effectively coordinated control, unless such operation would have an Adverse Reliability Impact on the Balancing Authority's Area."		
IRC Standards Review Committee	No	Single BA Interconnections do not operate on Tie Line Bias. The requirement should be modified to accommodate this or regional variances should be written by the SDT to address existing differences. In addition this requirement, as written, does not provide for momentary cessation of AGC for any reason, nor for reasonable system maintenance, repair, or updates. As written, it seems to say that any duration of operation off Tie Line Bias is unacceptable and, thus, would be a violation.
Response: The SDT agrees that a single BA Interconnection does not operate using Tie Line Bias mode. The "Additional Compliance Information" section has been revised to clarify this situation. The SDT disagrees that the Requirement does not allow for instances of not operating in Tie Line Bias mode. The revised Requirement states "Each Balancing Authority not receiving Overlap Regulation Service shall operate its Automatic Generation Control (AGC) in Tie Line Bias mode to ensure effectively coordinated control, unless such operation would have an Adverse Reliability Impact on the Balancing Authority's Area."		
ISO New Engand Inc.	No	Single BA Interconnections do not operate on Tie Line Bias. The requirement should be modified to accommodate this or regional variances should be written by the SDT to address existing differences. In addition this requirement, as written, does not provide for momentary cessation of AGC for any reason, nor for reasonable system maintenance, repair, or updates. As written, it seems to say that any duration of operation off Tie Line Bias is unacceptable and, thus, would be a violation.
Response: The SDT agrees that a single BA Interconnection does not operate using Tie Line Bias mode. The "Additional Compliance Information" section has been revised to clarify this situation.		

Organization	Yes or No	Question 6 Comment
The SDT disagrees that the Requirement does not allow for instances of not operating in Tie Line Bias mode. The revised Requirement states "Each Balancing Authority not receiving Overlap Regulation Service shall operate its Automatic Generation Control (AGC) in Tie Line Bias mode to ensure effectively coordinated control, unless such operation would have an Adverse Reliability Impact on the Balancing Authority's Area."		
ERCOT	No	Single BA Interconnections do not operate on Tie Line Bias. The requirement should be modified to accommodate this or regional variances should be written by the SDT to address existing differences. In addition this requirement, as written, does not provide for momentary cessation of AGC for any reason, nor for reasonable system maintenance, repair, or updates. As written, it seems to say that any duration of operation off Tie Line Bias is unacceptable and, thus, would be a violation.
Response: The SDT agrees that a single BA Interconnection does not operate using Tie Line Bias mode. The "Additional Compliance Information" section has been revised to clarify this situation. The SDT disagrees that the Requirement does not allow for instances of not operating in Tie Line Bias mode. The revised Requirement states "Each Balancing Authority not receiving Overlap Regulation Service shall operate its Automatic Generation Control (AGC) in Tie Line Bias mode to ensure effectively coordinated control, unless such operation would have an Adverse Reliability Impact on the Balancing Authority's Area."		
Kansas City Power & Light	No	The impact of operating in an inappropriate AGC control mode is bigger than the BA's own balancing area. The control of the area affects other BA's around a BA and if enough BA's are involved, can affect an interconnection. Recommend the requirement be modified to consider the reliability impact on its own balancing area, the balancing areas of adjacent BA's and the interconnection.
Response: The SDT agrees and has modified Requirement R3 to read, "Each Balancing Authority not receiving Overlap Regulation Service shall operate its Automatic Generation Control (AGC) in Tie Line Bias mode to ensure effectively coordinated control, unless such operation would have an Adverse Reliability Impact on the Balancing Authority's Area."		
Southern Company	No	Comments: Agree only to the extent that an accurate frequency measurement is available to the BA. If not frequency measurement is available, then that should be considered an adverse condition and thus TLB is not appropriate. In other words, one small BA maintaining TLB may not cause the condition in the Glossary definition of Adverse Reliability Impact but it is still not appropriate for them to stay on TLB.
Response: Requirement R3 has been revised for clarity and now reads "Each Balancing Authority not receiving Overlap Regulation Service shall operate its Automatic Generation Control (AGC) in Tie Line Bias mode to ensure effectively coordinated control, unless such operation would have an Adverse Reliability Impact on the Balancing Authority's Area." This standard is scheduled to be completed and filed with FERC prior to the BARC standard being completed. The SDT anticipates that work on the BARC standard will take into account the work completed on this standard.		

Organization	Yes or No	Question 6 Comment
NIPSCO	No	Yes, It was proposed that AGC be replaced by Automatic Resource Control (ARC) in the standards but did not pass. The SDT may want to monitor this related effort.
Response: The SDT is using approved definitions listed in the NERC Glossary of Terms. Changes to current NERC Glossary of Terms definition language not used in this standard would need to occur as a separate project.		
Energy Mark, Inc.	No	Comment 15: Requirement 3 as written is unenforceable because it is too difficult to define "unless such operation would have an Adverse Reliability Impact on the Balancing Authority's Area." Comment 16: What if operation out of Tie line Bias control does not have an Adverse Reliability Impact on the Balancing Authority's Area, but does have an Adverse Reliability Impact on another BA? Comment 17: A document follows that provides an initial starting justification for the elimination of this Requirement. See following "Requirements for AGC Operation, January 25, 2011."Requirements for AGC Operation, January 25, 2011 Introduction:As of the date of these comments there are two requirements in the NERC Standards that address the operation of AGC. • The first is in BAL-003-0.1b - Frequency Response and Bias, Requirement R3.R3. Each Balancing Authority shall operate its Automatic Generation Control (AGC) on Tie Line Frequency Bias, unless such operation is adverse to system or Interconnection reliability. • The second is in BAL-005-0.1b - Automatic Generation Control, Requirement R7.R7. The Balancing Authority shall operate AGC continuously unless such operation adversely impacts the reliability of the Interconnection. If AGC has become inoperative, the Balancing Authority shall use manual control to adjust generation to maintain the Net Scheduled Interchange. These requirements are misdirected and, for compliance purposes, they are difficult to measure effectively. This paper provides the technical basis for replacing these requirements with new requirements that will not only achieve the intent of these requirements, but do so in a more effective and measurable manner. Background: Automatic Generation Control (AGC) is a computer control system contained in the Control Center EMS that performs a number of critical functions related to the balancing function necessary to maintain frequency and associated reliability. Among the functions it performs are: 1) the collection of telemetered and local data useful for determining the appropriate control actions, 2) the calculation of Area Control Error (ACE), 3) determination of desired control actions that should be sent to those resources available for automatic dispatch, and

Organization	Yes or No	Question 6 Comment
		4) sending the actual control signals to implement that dispatch. Most AGC Systems have three basic modes of operation, 1) Tie-line Frequency Bias, 2) Constant Net Interchange and 3) Constant Frequency. The ACE Equation is the basis for all three modes of operation. • In the Tie-line Frequency Bias mode, all of the ACE Equation is used as an input to control action determination. • In the Constant Net Interchange mode, only the Tie-line Error portion of the ACE Equation is used as an input to control action determination. The Constant Net Interchange mode would normally be used when there is no information available to indicate interconnection frequency. • In the Constant Frequency mode, only the Frequency Bias portion of the ACE Equation is used as an input to control action determination. The Constant Frequency mode of operation would be used when the Tie-line Error is known to be misleading, inaccurate or unavailable. It is also used when there are no tie-lines in service as in the case of a single BA interconnection or during islanded operation.AGC Systems have been used in the industry since before the development of digital computers. Initially AGC Systems did little more than send instructions to generators based on evaluation of the ACE Equation. They have become more sophisticated since their inception and implement greater complexity in their evaluations of appropriate dispatch actions to the point that they include forecasting, reliability and economics within their algorithms. Modern AGC Systems determine control actions based on the collection of much more data than is included in the ACE Equation. This additional data includes: short-term load forecasts and forecast error estimates as influenced by weather; individual non-conforming load forecasts and forecast error; forecast interchange transaction information; generating unit ramp and response rates; generating unit economic operating points including valve position; generating unit incremental economic costs including start-up and maintenance; Hydro unit river flow limits as related to the operation of other units on the same waterway; energy storage capabilities and available energy; Inadvertent Interchange energy account balances; time error; and current control performance scores. As AGC Systems have evolved, the control mode in which they are operating, Tie-line Frequency Bias, Constant Net Interchange, or Constant Frequency, provides less and less information about the control actions that they implement. In a modern AGC System the control mode provides little information about how control actions are being determined and implemented. In fact, only someone experienced in AGC programming and implementation would have the knowledge necessary to determine whether or not an AGC System is providing reasonable control actions or control actions consistent with Tie-line Frequency Bias Control. Even someone with the necessary experience observing the operation of a modern AGC System for

Organization	Yes or No	Question 6 Comment
		a short period of time will be incapable of determining whether or not that system is providing effective or adequate control. Therefore, neither of the two requirements is effectively enforceable from a practical point of view. Perspective:A couple of examples are offered to add perspective to the problem. Example 1:R3 includes the requirement, "Each Balancing Authority shall operate its Automatic Generation Control (AGC) on Tie Line Frequency Bias, unless such operation is adverse to system or Interconnection reliability." There are three conditions when operation on Tie-line Frequency Bias control may be adverse to the system or Interconnection reliability. 1. The first is when the Tie-line Error data used in the ACE Equation is incorrect. The ACE Equation will be incorrect when there are errors in the Actual or Scheduled Tie-line flow values. This condition will occur when there is telemetry failure of one or more tie-lines, when there is an unidentified scheduling error, or when there is a separation that causes a tie-line metering point to be located on a separate island due to interconnection separation or islanding. Telemetry failure will be indicated by the quality bits associated with the Tie-line telemetry. If AGC is disabled to identify a scheduling error, there should be an operating log entry. If AGC is disabled because of a separation, there will also be a log entry. 2. The second is when the actual frequency is determined to be incorrect. If measured frequency is incorrect, this condition should be indicated by an operating log entry and transfer to the redundant frequency device to provide measured frequency. When the actual frequency fails, this condition will be indicated by the quality bits associated with the measured frequency value and transfer to the redundant frequency device to provide measured frequency. 3. The third is when operation of AGC would provide control different from the desired control to address some emergency condition in the BA or elsewhere on the interconnection. If the operation of AGC would be adverse to system or Interconnection reliability and is disabled for this reason, this condition should be indicated by an operating log entry.In all cases, there should be a record of the reason for the use of other than Tie-line Frequency Bias control and records indicating the reason for the use of other control modes. In all cases, other than the third indicated above, an error in the value of ACE is the reason for not using Tie-line Bias Control and the quality bits for ACE or ACE component data should provide a reasonable explanation for the condition. The third case occurs with such infrequency that there should be no need for a special rule to address this condition. Example 2:R7 includes the requirement, "...If AGC has become inoperative, the Balancing Authority shall use manual control to adjust generation to maintain the Net Scheduled Interchange." Cases have been observed of an AGC System that does not perform as well as the manual dispatch used when the AGC System is inoperative. If a BA has a CPS1 score of 120% when using AGC and a CPS1 score of 125% when performing manual dispatch, should that BA be penalized for not having its AGC continuously operating? What is the goal? Is the goal to operate on AGC regardless of the result or is the goal to operate in a manner

Organization	Yes or No	Question 6 Comment
		that provides the best measured control? Alternatives:Since these requirements are not effectively measurable or enforceable, can a requirement or requirements be written to provide an equivalent to the intent of the old requirements addressing AGC operation?The industry has three alternatives to address this issue: 1. Retain requirements that are directed at the AGC System understanding that they are effectively not measureable or enforceable. 2. Eliminate requirements that are directed at the AGC System with the understanding that they were not contributing to reliability. 3. Determine an alternative method to evaluate, measure and enforce a requirement that will achieve a goal similar to the goal originally intended by the implementation of the AGC System requirements. Elimination of the requirement is an appropriate solution. However, if it is determined that a replacement measure is required, then the solution to this problem lies with the third alternative above. Solution:There is already a requirement that effectively enforces the intent of the above requirements. Instead of requiring the BA to control in a particular manner, CPS1, BAAL and DCS require the BA to achieve specific results with their control actions. All three measures require the BA to calculate ACE using Tie-line Frequency Bias for determination of their Reporting ACE. The requirements specify that at least 50% of the data must be valid for the one-minute average data to be included in the measures. The requirements for redundant frequency measurement devices assure that the BA will have the actual frequency data available to perform the necessary calculations. The data retention requirements specify the data they must retain to demonstrate that their control achieved the stated goals. Finally, this approach is consistent with the White House Executive Order on Improving Regulation and Regulatory Review in Section 1(b)(4) stating that regulatory agencies must: “to the extent feasible, specify performance objectives, rather than specifying the behavior or manner of compliance that the regulated entities must adopt;...”

Response: Comment 15 & 16: Requirement R3 has been revised for clarity and now reads “Each Balancing Authority not receiving Overlap Regulation Service shall operate its Automatic Generation Control (AGC) in Tie Line Bias mode to ensure effectively coordinated control, unless such operation would have an Adverse Reliability Impact on the Balancing Authority’s Area.”

This standard is scheduled to be completed and filed with FERC prior to the BARC standard being completed. The SDT anticipates that work on the BARC standard will take into account the work completed on this standard.

Comment 17: The SDT recognizes that from a compliance perspective it can be difficult to ascertain if an Adverse Reliability Impact exists. Nonetheless, the SDT is very concerned with adversely affecting primary Frequency Response when operating without AGC. The SDT believes revised language using NERC glossary defined terms will support proper compliance enforcement. It is expected entities will provide an explanation each time AGC Tie Line Bias mode is not used for

Organization	Yes or No	Question 6 Comment
the compliance auditor to assess.		
EKPC	No	Tie line bias is calculated using (NAI-NSI) while frequency bias is -10B(FA-FS).
Response: Requirement R3 has been revised for clarity and now reads "Each Balancing Authority not receiving Overlap Regulation Service shall operate its Automatic Generation Control (AGC) in Tie Line Bias mode to ensure effectively coordinated control, unless such operation would have an Adverse Reliability Impact on the Balancing Authority's Area."		
Duke Energy	No	Duke Energy agrees to the simple statement posed in the question; however, the requirement goes beyond that by using a defined term, Adverse Reliability Impact, which has a relatively narrow focus on extreme conditions. If a single BA lost a significant amount of its tie-line telemetry or its frequency sources, cascading outages and/or grid separation would not necessarily be imminent but it would be imprudent to remain in Tie Line Bias mode. Go back to the original language for the requirement - "Each Balancing Authority shall operate its Automatic Generation Control (AGC) on Tie Line Frequency Bias, unless such operation is adverse to system or Interconnection reliability."
Response: The SDT has revised Requirement R3 language and believes the use of NERC glossary defined terms in the Requirement provides necessary clarity for compliance.		
Patterson Consulting, Inc.	No	While this requirement is in the existing standard, it places a significant reporting burden on a Balancing Authority to demonstrate compliance during audits for little reliability gain. In addition for single Balancing Authority interconnections, operating in this AGC mode is functionally equivalent to operating in flat frequency mode. This may cause some interconnections to seek a variance, just to avoid compliance complications. Perhaps this requirement could be replaced with a requirement for Balancing Authorities to contribute to frequency performance as well as balance commitments and resources, or to calculate the ACE it uses to report in other standards in a specific manner. As written, it could be interpreted to create a violation when AGC suspends or is offline.
Response: The SDT has taken into consideration the reporting burden on the Balancing Authority to demonstrate compliance. It is expected that entities will provide an explanation each time AGC Tie Line Bias mode is not used for the compliance auditor to assess. The SDT agrees that a single BA Interconnection does not operate using Tie Line Bias mode. The "Additional Compliance Information" section has been revised to clarify this situation. Requirement R3 has been revised for clarity and now reads "Each Balancing Authority not receiving Overlap Regulation Service shall operate its Automatic Generation Control (AGC) in Tie Line Bias mode to ensure effectively coordinated control, unless such operation would have an Adverse Reliability Impact on the Balancing Authority's Area." This standard is scheduled to be completed and filed with FERC prior to the BARC standard being completed. The SDT anticipates that work on the BARC		

Organization	Yes or No	Question 6 Comment
standard will take into account the work completed on this standard.		
FirstEnergy	Yes	Although we mostly agree with the requirement, we believe it can be improved. We suggest that the team add wording in the requirement to allow for brief periods where meters or communication channels fail and trip the AGC off Tie Line Bias. In most areas, if merely one BA trips off bias it would not have an adverse affect on BES reliability and furthermore, the BA can take alternative measures for these periods such as manual AGC. We suggest the team add wording similar to the second sentence of requirement R7 of BAL-005 which states: "If AGC has become inoperative, the Balancing Authority shall use manual control to adjust generation to maintain the Net Scheduled Interchange."
Response: Requirement R3 has been revised for clarity and now reads "Each Balancing Authority not receiving Overlap Regulation Service shall operate its Automatic Generation Control (AGC) in Tie Line Bias mode to ensure effectively coordinated control, unless such operation would have an Adverse Reliability Impact on the Balancing Authority's Area." This standard is scheduled to be completed and filed with FERC prior to the BARC standard being completed. The SDT anticipates that work on the BARC standard will take into account the work completed on this standard.		
Arizona Public Service Company	Yes	As long as Appendix 1 interpretation remains in effect for WECC Auto Time Error Payback. WECC BAs operate in Tie-Line and Time.
Response: The SDT thanks you for your affirmative response and clarifying comment.		
Hydro-Quebec TransEnergie	Yes	However the "Tie Line Bias" AGC mode is not appropriate for a Single Balancing Authority operating in an Interconnection. HQT uses the Flat Frequency mode.
Response: The SDT thanks you for your affirmative response and clarifying comment. The SDT agrees that a single BA Interconnection does not operate using Tie Line Bias mode. The "Additional Compliance Information" section has been revised to clarify this situation. Requirement R3 has been revised for clarity and now reads "Each Balancing Authority not receiving Overlap Regulation Service shall operate its Automatic Generation Control (AGC) in Tie Line Bias mode to ensure effectively coordinated control, unless such operation would have an Adverse Reliability Impact on the Balancing Authority's Area." This standard is scheduled to be completed and filed with FERC prior to the BARC standard being completed. The SDT anticipates that work on the BARC standard will take into account the work completed on this standard.		
Beacon Power Corporation	Yes	As R3 has not significantly changed, will the Interpretation of Requirement 3 from BAL-003-0.1b still be applicable to BAL-003-1?

Organization	Yes or No	Question 6 Comment
Response: The SDT thanks you for your affirmative response and clarifying comment. When this standard is approved and implemented it will replace all previous standards and interpretations.		
Westar Energy	Yes	
FMPP	Yes	
Seattle City Light	Yes	
Manitoba Hydro	Yes	
We Energies	Yes	
American Electric Power	Yes	
SPP Standards Development	Yes	
Midwest ISO Standards Collaborators	Yes	
MRO's NERC Standards Review Subcommittee	Yes	
Alberta Electric System Operator	Yes	
Independent Electricity System Operator	Yes	
NorthWestern Energy	Yes	
Progress Energy	Yes	
ENBALA Power Networks	Yes	
Northeast Power Coordinating Council		Refer to the response to Question 17.

Organization	Yes or No	Question 6 Comment
Response: Please refer to our response to Question 17.		

7. *Do you agree with the proposed Implementation Plan for this standard? If not, please explain in the comment area.*

Summary Consideration: The majority of the comments received stated that they did not agree with the proposed implementation plan for this standard. The main concerns were that the implementation plan would take several years to fully implement, that adjustment to the Frequency Bias Setting could not occur without first modifying the existing BAL-003-0.1b standard, and a preference for aligning implementation plan effective dates with the regulatory approval date. Several commenters expressed concern regarding the accuracy and clarity of Attachment A and how field testing efforts integrated into the implementation plan. One commenter observed that it would be ideal for the standard to require the use of variable bias.

In response to industry comments the SDT has revised Attachment A for correctness and clarity; changed all references in the standard and associated documents for BAL-003 to read "BAL-003-0.1b"; and removed the table showing the annual reduction schedule for the minimum bias setting. The SDT has provided a revised plan for reducing the minimum Frequency Bias Setting - the ERO will monitor the results of the reductions and make necessary corrections. Details for the reduction plan have been provided as Attachment B to the standard.

Organization	Yes or No	Question 7 Comment
Santee Cooper	No	The implementation plan has specific dates for reducing the bias settings currently defined in Requirement 5 over several years. Perhaps these dates should not be specific but tied to months following regulatory approval. Attachment A should be modified to match what is in the proposed standard. The values currently shown as percent "of peak/0.1 Hz" should be changed to percent of estimated yearly peak demand per 0.1 Hz change. For BAs that do not serve native load, percent "of upcoming years maximum generation/0.1 Hz should be changed to percent of its estimated maximum generation level in the coming year/0.1 Hz change.
Response: The SDT believes that the affect reducing the minimum bias setting will have on frequency, including unintended consequences, will not be observable for meaningful analysis over a short-time interval which is why the implementation plan specifies reducing the bias setting on an annual basis. The SDT deleted the section of the Implementation Plan that referenced "of peak/0.1 Hz".		
LG&E and KU Energy	No	The implementation plan has specific dates for reducing the bias settings currently defined in Requirement 5 over several years. Perhaps these dates should not be specific but tied to months following regulatory approval. Attachment A should be modified to match what is in the proposed standard. The values currently shown as percent "of peak/0.1 Hz" should be changed to percent of estimated yearly peak demand per 0.1 Hz change. For BAs that do not serve native load, percent "of upcoming years maximum generation/0.1 Hz should be changed to percent of its estimated maximum generation level in the coming year/0.1 Hz change

Organization	Yes or No	Question 7 Comment
Response: The SDT believes that the affect reducing the minimum bias setting will have on frequency, including unintended consequences, will not be observable for meaningful analysis over a short-time interval. The SDT deleted the section of the Implementation Plan that referenced "of peak/0.1 Hz".		
South Carolina Electric and Gas	No	The implementation plan has specific dates for reducing the bias settings currently defined in Requirement 5 over several years. Perhaps these dates should not be specific but tied to months following regulatory approval. Attachment A should be modified to match what is in the proposed standard. The values currently shown as percent "of peak/0.1 Hz" should be changed to percent of estimated yearly peak demand per 0.1 Hz change. For BAs that do not serve native load, percent "of upcoming years maximum generation/0.1 Hz should be changed to percent of its estimated maximum generation level in the coming year/0.1 Hz change.
Response: The SDT believes that the affect reducing the minimum bias setting will have on frequency, including unintended consequences, will not be observable for meaningful analysis over a short-time interval. The SDT deleted the section of the Implementation Plan that referenced "of peak/0.1 Hz".		
MRO's NERC Standards Review Subcommittee	No	We agree with the plan to phase out BAL-003-0.1b R5 over a period of years rather than abruptly terminate it because it will take several years to assess the impact. We recommend a wording change to the implementation plan. Please change 'BAL-003-0 Requirement 5 should be retired as outlined in the following table," to "BAL-003-0.1b Requirement 5 should be phased out by reducing the minimum frequency bias setting per the table."It is not clear if the minimum frequency bias setting can be modified without modifying the existing BAL-003-0.1b standard. Is this being accomplished through the field trial? The implementation plan makes no mention of a field trial. It should. Please change all BAL-003-0 to BAL-003-0.1b.
Response: The SDT did change all references in the implementation plan for BAL-003-1 to read "BAL-003-0.1b." The SDT has removed the table showing the reduction schedule for the minimum bias setting. The SDT is proposing another method for reducing the minimum Frequency Bias Setting in which the ERO will monitor the results of the reduction and make necessary corrections. Please refer to Attachment B for reduction plan details.		
Midwest ISO Standards Collaborators	No	We agree with the plan to phase out BAL-003-0.1b R5 over a period of years rather than abruptly terminate it because it will take several years to assess the impact. We recommend a wording change to the implementation plan. Please change 'BAL-003-0 Requirement 5 should be retired as outlined in the following table," to "BAL-003-0.1b Requirement 5 should be phased out by reducing the minimum frequency bias setting per the table."It is not clear if the minimum frequency bias setting can be modified without modifying the existing BAL-003-0.1b standard. Is this being accomplished through the field trial? The implementation

Organization	Yes or No	Question 7 Comment
		plan makes no mention of a field trial. It should. Please change all BAL-003-0 to BAL-003-0.1b.
Response: The SDT has changed all references in the implementation plan for BAL-003-1 to read "BAL-003-0.1b." The SDT has removed the table showing the reduction schedule for the minimum bias setting. The SDT is proposing another method for reducing the minimum Frequency Bias Setting in which the ERO will monitor the results of the reduction and make necessary corrections. Please refer to Attachment B for reduction plan details.		
We Energies	No	We agree with the plan to phase out BAL-003-0.1b R5 over a period of years rather than abruptly terminate it because it will take several years to assess the impact. We recommend a wording change to the implementation plan. Please change 'BAL-003-0 Requirement 5 should be retired as outlined in the following table," to "BAL-003-0.1b Requirement 5 should be phased out by reducing the minimum frequency bias setting per the table."It is not clear if the minimum frequency bias setting can be modified without modifying the existing BAL-003-0.1b standard. Is this being accomplished through the field trial? The implementation plan makes no mention of a field trial. It should.Please change all BAL-003-0 to BAL-003-0.1b
Response: The SDT has changed all references in the implementation plan for BAL-003-1 to read "BAL-003-0.1b." The SDT has removed the table showing the reduction schedule for the minimum bias setting. The SDT is proposing another method for reducing the minimum Frequency Bias Setting in which the ERO will monitor the results of the reduction and make necessary corrections. Please refer to Attachment B for reduction plan details.		
FirstEnergy	No	We believe that the implementation plan should include information regarding the field trial and how it fits in with the phase-in implementation. It appears as though the field trial is being conducted based on 2010 data and will be concluded upon completion of the development of the standard but we think this could be clarified. Furthermore, as stated in the process manual, a field test "should include at a minimum the data collection and analysis or field test plan, the implementation schedule, and an expectation for periodic updates of the results." The field test information posted is not clear on the implementation schedule of the field test as well as when and how periodic updates will be available.
Response: The SDT has revised the plan for reducing the minimum Frequency Bias Setting. The plan is no longer tied to the Field Trial. The SDT has removed the table showing the reduction schedule for the minimum bias setting. The SDT is proposing another method for reducing the minimum Frequency Bias Setting in which the ERO will monitor the results of the reduction and make necessary corrections. Please refer to Attachment B for reduction plan details.		
Bonneville Power Administration	No	From a compliance perspective, it is administratively very burdensome to have portions of two different versions of a standard applicable at the same time, as specified in the Implementation Plan for BAL-003-1.

Organization	Yes or No	Question 7 Comment
		This type of structure adds an additional layer of complexity to all parts of the compliance administration process, as necessary to distinguish between the separate versions of the standard. Rather than create and prolong this type of situation over a 4 year time period, BPA asks that BAL-003-0 be retired in its entirety and that the contents of BAL-003-1 be expanded to also include R5, as specified in BAL-003-0. This change resolves the identified issues while also ensuring that all requirements of BAL-005 are in effect, as originally intended. The Implementation Plan for BAL-003-1 also includes a proposal to modify the specified limiting percentage of Native Load on a sliding scale over a 4 year time period. BAL-003-3 R5, as approved, explicitly specifies 1% as a minimum value for monthly average Frequency Bias Setting. As such, changing this value results in a change in the requirement itself. Instead of being done through an Implementation Plan, these types of changes should be made as specific modifications to the requirement in question. To resolve this issue, BPA asks that the sliding scale specified for percentage of peak load specified in the Implementation Plan be incorporated directly into BAL-003-1 as a part of the specified text of R5. This change meets the intended goal of applying a sliding scale to this value over time while assuring that the underlying change is implemented as a change to the requirement through the Standards Development Process.
Response: The SDT has added the R5 Requirement back into the proposed standard. The SDT has revised the plan for reducing the minimum Frequency Bias Setting. The plan is no longer tied to the Field Trial. The SDT has removed the table showing the reduction schedule for the minimum bias setting. The SDT is proposing another method for reducing the minimum Frequency Bias Setting in which the ERO will monitor the results of the reduction and make necessary correction. Please refer to Attachment B for reduction plan details.		
IRC Standards Review Committee	No	What is the technical basis for the phase-out schedule? Making the standard requirements effective earlier than the schedule shown could result in the unintended consequence of non-compliance enforcement for performance that is caused by the change rather than by the non-performance of the functional entity .Also, the effective dates given in the Implementation differ from those in the draft standard. Different requirement numbers are expressed in each. Some of the implementation steps (retiring R5 of BAL-003-0) presented in the implementation plan start as early as May 2011. We do not believe that the BAL-003-1 standard will be approved by the industry or the NERC BoT at that time and that does not even take into account regulatory approval (or 12 months after BoT adoption in those jurisdictions where no regulatory approval is required). How can a standard begins to phase out while the successor standard is not anywhere near becoming effective?If the SDT wants to propose a gradual replacement of the current R5, we would suggest that the phase-out steps be tied to the date that the standard becomes effective.
Response: The SDT has removed the table showing the reduction schedule for the minimum bias setting.		

Organization	Yes or No	Question 7 Comment
The SDT has corrected the mismatch between effective dates in the implementation plan and the standard. The SDT has added the R5 Requirement back into the proposed standard. The SDT has revised the plan for reducing the minimum Frequency Bias Setting. The plan is no longer tied to the Field Trial. The SDT believes that it is necessary to observe the affect each decrement to the present standard has during all four seasons to assure reliability is not adversely impacted. The SDT is proposing another method for reducing the minimum Frequency Bias Setting in which the ERO will monitor the results of the reduction and make necessary corrections. Please refer to Attachment B for reduction plan details.		
ERCOT	No	What is the technical basis for the phase-out schedule? Making the standard requirements effective earlier than the schedule shown could result in the unintended consequence of non-compliance enforcement for performance that is caused by the change rather than by the non-performance of the functional entity. Also, the effective dates given in the Implementation differ from those in the draft standard. Different requirement numbers are expressed in each. Some of the implementation steps (retiring R5 of BAL-003-0) presented in the implementation plan start as early as May 2011. We do not believe that the BAL-003-1 standard will be approved by the industry or the NERC BoT at that time and that does not even take into account regulatory approval (or 12 months after BoT adoption in those jurisdictions where no regulatory approval is required). How can a standard begins to phase out while the successor standard is not anywhere near becoming effective? If the SDT wants to propose a gradual replacement of the current R5, we would suggest that the phase-out steps be tied to the date that the standard becomes effective.
Response: The SDT has removed the table showing the reduction schedule for the minimum bias setting. The SDT has corrected the mismatch between effective dates in the implementation plan and the standard. The SDT has added the R5 Requirement back into the proposed standard. The SDT has revised the plan for reducing the minimum Frequency Bias Setting. The plan is no longer tied to the Field Trial. The SDT believes that it is necessary to observe the affect each decrement to the present standard has during all four seasons to assure reliability is not adversely impacted. The SDT is proposing another method for reducing the minimum Frequency Bias Setting in which the ERO will monitor the results of the reduction and make necessary corrections. Please refer to Attachment B for reduction plan details.		
Kansas City Power & Light	No	How can hard dates for the phasing out of the current R5 be in the implementation plan for a standard under development? The concept of phasing out R5 and phasing in R2 could be done, however, this would take considerable thought as to how to implement that. This current proposed implementation plan should be carefully reconsidered.

Organization	Yes or No	Question 7 Comment
Response: Thank you for your comments. The SDT has revised the plan for reducing the minimum Frequency Bias Setting. The plan is no longer tied to the Field Trial. The SDT has removed the table showing the reduction schedule for the minimum bias setting. The SDT believes that it is necessary to observe the affect each decrement to the present standard has during all four seasons to assure reliability is not adversely impacted. The SDT is proposing another method for reducing the minimum Frequency Bias Setting in which the ERO will monitor the results of the reduction and make necessary corrections. Please refer to Attachment B for reduction plan details.		
Progress Energy	No	We agree with the graduated implementation for the FRO portion of the standard, but feel NERC needs to loosen the minimum frequency bias requirement immediately so that it matches the newly required frequency response. There are also other areas within the EMS the besides BA's frequency bias that should be addressed such as secondary frequency response systems that should also be included in this standard. Additionally, if the industry was truly concerned with matching bias values to actual response, they would switch to variable frequency bias. Variable bias requires additional up front work along with general maintenance, but it truly is the best way to accurately bias the ACE equation.
Response: The SDT believes that gradually relaxing the present standard is the prudent way to proceed. The SDT believes that it is necessary to observe the affect each decrement to the present standard has during all four seasons to assure reliability is not adversely impacted. The SDT has revised the plan for reducing the minimum Frequency Bias Setting and is proposing another method for reducing the minimum Frequency Bias Setting in which the ERO will monitor the results of the reduction and make necessary corrections. Please refer to Attachment B for reduction plan details. The SDT agrees that use of a variable, non-linear bias setting is the best solution. We also agree with you that variable, non-linear bias setting would be a superior way to go.		
NIPSCO	No	"Effective Date" section at the top of the Standard does not match the Implementation plan; I think there is an R4 missing in the second part of 1.3 .In the implementation plan add RSG to "Compliance with the Standards" 5 year phase-in on removing the 1% is a good idea
Response: The SDT has corrected the errors noted. The SDT has revised the plan for reducing the minimum Frequency Bias Setting and is proposing another method for reducing the minimum Frequency Bias Setting in which the ERO will monitor the results of the reduction and make necessary corrections. Please refer to Attachment B for reduction plan details.		
Energy Mark, Inc.	No	Comment 18: The Proposed Effective Date in the implementation plan is inconsistent with the Effective Data in the Draft Standard. Comment 19: The completion of the implementation plan does not occur until 2015. This lengthy plan stems from a standard that only measures reliability annually and provides only an annual window for changing

Organization	Yes or No	Question 7 Comment
		parameters such as Minimum Frequency Response. Alternative methods that measure reliability more frequently could me implemented with a shorter implementation plan.
Response: The SDT has corrected the mismatch between effective dates in the implementation plan and the standard. The SDT believes that gradually relaxing the present standard is the prudent way to proceed. The SDT believes that it is necessary to observe the affect each decrement to the present standard has during all four seasons to assure reliability is not adversely impacted. The SDT has revised the plan for reducing the minimum Frequency Bias Setting and is proposing another method for reducing the minimum Frequency Bias Setting in which the ERO will monitor the results of the reduction and make necessary corrections. Please refer to Attachment B for reduction plan details.		
Beacon Power Corporation	No	Why is it appropriate to delay implementation of this standard for over 12 months after applicable approval? This seems an unnecessary delay considering the intent to operate under a field test. Similarly, delaying implementation of R2 for over 2 years seems unnecessary. Based on the suggested schedule for measuring FRM and implementing Frequency Bias Settings, there may be rationale to implement the standard on the first calendar year following approval. However, delays beyond the beginning of the next calendar year should require conclusive justification.
Response: The SDT believes that the affect reducing the minimum bias setting will have on frequency, including unintended consequences, will not be observable for meaningful analysis over a short-time interval. The SDT has added the R5 Requirement back into the proposed standard. The SDT has revised the plan for reducing the minimum Frequency Bias Setting. The plan is no longer tied to the Field Trial. The SDT has removed the table showing the reduction schedule for the minimum bias setting. The SDT believes that it is necessary to observe the affect each decrement to the present standard has during all four seasons to assure reliability is not adversely impacted. The SDT is proposing another method for reducing the minimum Frequency Bias Setting in which the ERO will monitor the results of the reduction and make necessary corrections. Please refer to Attachment B for reduction plan details.		
EKPC	No	Specific dates should be tied to regulatory approval.
Response: The SDT has revised the plan for reducing the minimum Frequency Bias Setting. The SDT has removed the table showing the reduction schedule for the minimum bias setting. The SDT believes that it is necessary to observe the affect each decrement to the present standard has during all four seasons to assure reliability is not adversely impacted. The SDT is proposing another method for reducing the minimum Frequency Bias Setting in which the ERO will monitor the results of the reduction and make necessary corrections. Please refer to Attachment B for reduction plan details.		

Organization	Yes or No	Question 7 Comment
ISO New Engand Inc.	No	We do not agree that a meaningful Implementation Plan can be developed until such time as the data gathering/field testing is completed. Therefore, we believe this Standard may be premature.
Response: The SDT has added the R5 Requirement back into the proposed standard. SDT has revised the plan for reducing the minimum Frequency Bias Setting. The plan is no longer tied to the Field Trial. The SDT has removed the table showing the reduction schedule for the minimum bias setting. The SDT believes that it is necessary to observe the affect each decrement to the present standard has during all four seasons to assure reliability is not adversely impacted. The SDT is proposing another method for reducing the minimum Frequency Bias Setting in which the ERO will monitor the results of the reduction and make necessary corrections. Please refer to Attachment B for reduction plan details. The SDT believes the revised plan is doable and prudent.		
American Electric Power	No	It is unprecedented that an implementation plan would require following some (but not all) requirement(s) within multiple versions of the same standard. This would make following the standard very difficult. Having to piece together multiple documents into a coherent requirement would be very difficult to achieve. There needs to be a definitive start and stop date for each version, rather than a phase in and phase out across multiple versions. We disagree with setting preselected dates beginning months away. Timing should be driven by applicable regulatory approval, as opposed to dates which appear to be arbitrarily selected. Going from 100% of the load-based, frequency bias calculation to 0% is unclear without correlating it to something else being phased in over time.It is very hard to follow how BAL-003-0 R5 relates to BAL-003-1. More work needs to be done by the SDT to explain how these relate to one another.
Response: The SDT has added the R5 Requirement back into the proposed standard. SDT has revised the plan for reducing the minimum Frequency Bias Setting. The plan is no longer tied to the Field Trial. The SDT has removed the table showing the reduction schedule for the minimum bias setting. The SDT believes that it is necessary to observe the affect each decrement to the present standard has during all four seasons to assure reliability is not adversely impacted. The SDT is proposing another method for reducing the minimum Frequency Bias Setting in which the ERO will monitor the results of the reduction and make necessary corrections. Please refer to Attachment B for reduction plan details. The SDT believes the revised plan is doable and prudent. Attachment A has been revised for clarity. FRS Form 1 has been revised to correct calculation errors and allow for adjustments.		
Duke Energy	No	Duke Energy does not agree with having prescribed dates for the gradual reduction of the minimum Frequency Bias Setting, as the implementation may drive significant issues which could delay, or halt the implementation at a certain level. It is not clear what process would be used to give the “go-ahead” to move to

Organization	Yes or No	Question 7 Comment
		the next level (agree?).
Response: The SDT has added the R5 Requirement back into the proposed standard. SDT has revised the plan for reducing the minimum Frequency Bias Setting. The plan is no longer tied to the Field Trial. The SDT has removed the table showing the reduction schedule for the minimum bias setting. The SDT believes that it is necessary to observe the affect each decrement to the present standard has during all four seasons to assure reliability is not adversely impacted. The SDT is proposing another method for reducing the minimum Frequency Bias Setting in which the ERO will monitor the results of the reduction and make necessary corrections. Please refer to Attachment B for reduction plan details. The SDT believes the revised plan is doable and prudent.		
Patterson Consulting, Inc.	No	The implementation plan should address implementing these requirements at the same time for all Balancing Authorities within an interconnection, regardless of regulatory approvals. The present implementation plan will require some Balancing Authorities within an interconnection to operate to the new standard while other Balancing Authorities operate to the old standard if multiple regulatory jurisdictions exist as they do within two interconnections. This could lead to uncoordinated and unreliable operation within an interconnection.
Response: The SDT does not believe that staggered implementation will lead to uncoordinated and unreliable operation within an interconnection because these changes affect secondary control. With regards to your comment concerning different "regulatory jurisdictions", this issue is outside the scope of the project approved SAR.		
Independent Electricity System Operator	No	We have a difficulty understanding the basis for some of the dates in the implementation plan.Some of the implementation steps (retiring R5 of BAL-003-0) start as early as May 2011. We do not believe that the BAL-003-1 standard will be approved by the industry or the NERC BoT at that time and that does not even take into account regulatory approval (or 12 months after BoT adoption in those jurisdictions where no regulatory approval is required). How can a standard begins to phase out while the successor standard is not anywhere near becoming effective?If the SDT wants to propose a gradual replacement of the current R5, we would suggest that the phase-out steps be tied to the date that the standard becomes effective.
Response: The SDT has added the R5 Requirement back into the proposed standard. SDT has revised the plan for reducing the minimum Frequency Bias Setting. The plan is no longer tied to the Field Trial. The SDT has removed the table showing the reduction schedule for the minimum bias setting. The SDT believes that it is necessary to observe the affect each decrement to the present standard has during all four seasons to assure reliability is not adversely impacted. The SDT is proposing another method for reducing the minimum Frequency Bias Setting in which the ERO will monitor the results of the reduction and make		

Organization	Yes or No	Question 7 Comment
necessary corrections. Please refer to Attachment B for reduction plan details. The SDT believes the revised plan is doable and prudent.		
Southern Company	Yes	We did not want to vote on Question 7, but clicked 'yes' in error.
Response: The SDT thanks you for your clarifying comment.		
Westar Energy	Yes	Yes, if field testing validates the standard.
Response: The SDT thanks you for your affirmative response and clarifying comment. SDT has revised the plan for reducing the minimum Frequency Bias Setting. The plan is no longer tied to the Field Trial. The SDT has removed the table showing the reduction schedule for the minimum bias setting. The SDT believes that it is necessary to observe the affect each decrement to the present standard has during all four seasons to assure reliability is not adversely impacted. The SDT is proposing another method for reducing the minimum Frequency Bias Setting in which the ERO will monitor the results of the reduction and make necessary corrections. Please refer to Attachment B for reduction plan details. The SDT believes the revised plan is doable and prudent.		
Associated Electric Cooperative, Inc.	Yes	
NorthWestern Energy	Yes	
ENBALA Power Networks	Yes	
SPP Standards Development	Yes	
Seattle City Light	Yes	
Manitoba Hydro	Yes	
SERC OC Standards Review Group		The implementation plan has specific dates for reducing the bias settings currently defined in Requirement 5 over several years. Perhaps these dates should not be specific but tied to months following regulatory approval. Attachment A should be modified to match what is in the proposed standard. The values currently shown as percent “of peak/0.1 Hz” should be changed to percent of estimated yearly peak demand per 0.1 Hz change. For BAs that do not serve native load, percent “of upcoming years maximum generation/0.1 Hz should be changed to percent of its estimated maximum generation level in the coming year/0.1 Hz change.

Organization	Yes or No	Question 7 Comment
Response: The SDT has added the R5 Requirement back into the proposed standard. SDT has revised the plan for reducing the minimum Frequency Bias Setting. The plan is no longer tied to the Field Trial. The SDT has removed the table showing the reduction schedule for the minimum bias setting. The SDT believes that it is necessary to observe the affect each decrement to the present standard has during all four seasons to assure reliability is not adversely impacted. The SDT is proposing another method for reducing the minimum Frequency Bias Setting in which the ERO will monitor the results of the reduction and make necessary corrections. Please refer to Attachment B for reduction plan details. The SDT believes the revised plan is doable and prudent. Attachment A has been revised for clarity.		
Arizona Public Service Company		AZPS has a few questions: 1) has frequency performance been affected by the on-going RBC field trial, 2) what steps will be taken to isolate this field trial from the effects of the RBC field trial, 3) will the frequency bias reduction to 0.8% of peak load include a CPS2 grace-period for thos BAs not involved in the RBC field trial?
Response: 1) The Frequency Response SDT cannot respond on RBS field trial matters. 2) This standard is meant to addresses primary control and the settings of the bias which would have an impact on the measures of the RBS field trial. SDT has revised the plan for reducing the minimum Frequency Bias Setting. The plan is no longer tied to the Field Trial. The SDT has removed the table showing the reduction schedule for the minimum bias setting. The SDT believes that it is necessary to observe the affect each decrement to the present standard has during all four seasons to assure reliability is not adversely impacted. The SDT is proposing another method for reducing the minimum Frequency Bias Setting in which the ERO will monitor the results of the reduction and make necessary corrections. Please refer to Attachment B for reduction plan details. The SDT believes the revised plan is doable and prudent. 3) The Frequency Response SDT anticipates the RBC field trial will be concluded when this standard takes effect. The SDT is proposing that standards requirements take effect for all entities within a regulatory jurisdiction at the same time.		
Northeast Power Coordinating Council		Refer to the response to Question 17.
Response: Please refer to the SDT response to Question 17.		

8. ***This standard proposes to eliminate the 1% minimum Frequency Bias over a period of 4 years as outlined in the Implementation Plan. Do you agree that the elimination of the 1% minimum will bring Frequency Bias closer or equal to natural Frequency Response? If not, please explain in the comment area.***

Summary Consideration: Comments received indicate commenters are divided over whether elimination of the 1% minimum will bring Frequency Bias closer or equal to the natural Frequency Response. Many commenters indicated that the Frequency Bias Setting will never match the Frequency Response and that it is far better for reliability to over bias than under bias. Commenters also expressed concern with how the Frequency Response Obligation (FRO) will be calculated; the rationale for the phase out schedule; and the impact this proposal will have on secondary control.

The FR SDT refined language to indicate it is better to have a somewhat over bias condition, provided additional details on how the FRO is calculated, explained the rationale for the phase out schedule proposed; including developing a reasonable, practical and accurate measurement for natural Frequency Response.

Organization	Yes or No	Question 8 Comment
MRO's NERC Standards Review Subcommittee	No	We do note that the question asks if we disagree with eliminating Frequency Bias over a four year period. The requirement actually applies to Frequency Bias Setting. This is important because there has been confusion in some regulatory filings over the Frequency Response versus Frequency Bias Setting. Our comments below assume that Frequency Bias Setting was intended to be used in the question since it is what is in the BAL-003-0.1b R5. We do not question the plan to change the minimum Frequency Bias Setting over a period of 4 years per se in attempt to optimize AGC response by matching the Frequency Response of the system. However, Frequency Response of the interconnection is constantly changing. As a result, the Frequency Bias Setting will never match the Frequency Response exactly. It is better to overbias that underbias to prevent withdrawal of frequency response by AGC. Historically, the 1% floor for Frequency Bias Setting was chosen to ensure that BAs are always over-biased. The standard needs to allow some margin in the Frequency Bias Setting to ensure that the bias setting is overbiased.
Response: The SDT agrees with your clarification that the 1% minimum applies to the Frequency Bias Setting. We also agree to evaluate the need to be somewhat (as opposed to extremely) over-biased. For example, if a Balancing Authority's observed Frequency Response was .4% of its annual forecasted peak load then, at a minimum, a value such as .1% would be added to the Frequency Bias setting to make it less likely that the Frequency Response will be counteracted by AGC actions.		
Midwest ISO Standards Collaborators	No	We do note that the question asks if we disagree with eliminating Frequency Bias over a four year period. The requirement actually applies to Frequency Bias Setting. This is important because there has been confusion in some regulatory filings over the Frequency Response versus Frequency Bias Setting. Our

Organization	Yes or No	Question 8 Comment
		comments below assume that Frequency Bias Setting was intended to be used in the question since it is what is in the BAL-003-0.1b R5.We do not question the plan to change the minimum Frequency Bias Setting over a period of 4 years per se in attempt to optimize AGC response by matching the Frequency Response of the system. However, frequency Response of the interconnection is constantly changing. As a result, the Frequency Bias Setting will never match the Frequency Response exactly. It is better to overbias that underbias to prevent withdrawal of frequency response by AGC. Historically, the 1% floor for Frequency Bias Setting was chosen to ensure that BAs are always over-biased. The standard needs to allow some margin in the Frequency Bias Setting to ensure that the bias setting is overbiased.
Response: The SDT agrees with your clarification that the 1% minimum applies to the Frequency Bias Setting. We also agree to evaluate the need to be somewhat (as opposed to extremely) over-biased. For example, if a Balancing Authority's observed Frequency Response was .4% of its annual forecasted peak load then, at a minimum, a value such as .1% would be added to the Frequency Bias setting to make it less likely that the Frequency Response will be counteracted by AGC actions.		
We Energies	No	We do note that the question asks if we disagree with eliminating Frequency Bias over a four year period. The requirement actually applies to Frequency Bias Setting. This is important because there has been confusion in some regulatory filings over the Frequency Response versus Frequency Bias Setting. Our comments below assume that Frequency Bias Setting was intended to be used in the question since it is what is in the BAL-003-0.1b R5.We do not question the plan to change the minimum Frequency Bias Setting over a period of 4 years per se in an attempt to optimize AGC response by matching the Frequency Response of the system. However, frequency Response of the interconnection is constantly changing. As a result, the Frequency Bias Setting will never match the Frequency Response exactly. It is better to over-bias than under-bias to prevent withdrawal of frequency response by AGC. Historically, the 1% floor for Frequency Bias Setting was chosen to ensure that BAs are always over-biased. The standard needs to allow some margin in the Frequency Bias Setting to ensure that the bias setting is over-biased
Response: The SDT agrees with your clarification that the 1% minimum applies to the Frequency Bias Setting. We also agree to evaluate the need to be somewhat (as opposed to extremely) over-biased. For example, if a Balancing Authority's observed Frequency Response was .4% of its annual forecasted peak load then, at a minimum, a value such as .1% would be added to the Frequency Bias setting to make it less likely that the Frequency Response will be counteracted by AGC actions.		
Bonneville Power Administration	No	Until the calculations used for FRO are spelled out and how natural Frequency Response is to be measured, BPA cannot agree that elimination of the 1% minimum will bring Frequecy Bias closer or equal to natural Frequency Response.
Response: The SDT has provided clarification in Attachment A, Attachment B and the Background Documents.		
IRC Standards Review	No	Please provide the technical basis for the 4-year phase-out schedule.

Organization	Yes or No	Question 8 Comment
Committee		The SRC suggests that incremental changes should be made and evaluated to determine whether they are indeed beneficial before additional changes are made. Until a standard is defined, it is not appropriate to set an implementation date on the transition. Also, please clarify that the process is to gather data, analyze that data to determine what has been the actual frequency response, and then to determine the Frequency Bias Settings to be closer to or equal to the natural frequency response, and is not saying that the next actual frequency response must equal the Frequency Bias Setting that the ERO has assigned. There is a subtle difference here that must be clarified in order to avoid the unintended consequence of "punishing" an entity for not providing a response equal to the Frequency Bias Setting.
Response: The technical basis for the phase out schedule is to allow time to evaluate how each Frequency Bias Setting change impacts both reliability and control criteria CPS1 and CPS2 performance. The intent of the Implementation Plan proposed was to evaluate the effectiveness of each setting change before additional refinement to the Frequency Bias Setting is made and incorporated into the AGC algorithm. This has been removed from the Implementation Plan. The SDT has chosen an alternate method for reducing the minimum Frequency Bias Setting. Standard language is not intended to penalize entities for not providing a response equal to its Frequency Bias Setting. The intent of the standard is to establish a Frequency Response Obligation (FRO) representing the minimum response required for reliable interconnected operations. The Frequency Bias Setting can differ from the determined FRO value as appropriate for reliability for which compliance will only evaluate if the Frequency Bias Setting is refined correctly and implemented in a timely manner.		
ERCOT	No	Please provide the technical basis for the 4-year phase-out schedule. The SRC suggests that incremental changes should be made and evaluated to determine whether they are indeed beneficial before additional changes are made. Until a standard is defined, it is not appropriate to set an implementation date on the transition. Also, please clarify that the process is to gather data, analyze that data to determine what has been the actual frequency response, and then to determine the Frequency Bias Settings to be closer to or equal to the natural frequency response, and is not saying that the next actual frequency response must equal the Frequency Bias Setting that the ERO has assigned. There is a subtle difference here that must be clarified in order to avoid the unintended consequence of "punishing" an entity for not providing a response equal to the Frequency Bias Setting.
Response: The technical basis for the phase out schedule is to allow time to evaluate how each Frequency Bias Setting change impacts both reliability and control criteria CPS1 and CPS2 performance. The intent of the Implementation Plan proposed was to evaluate the effectiveness of each setting change before additional refinement to the Frequency Bias Setting is made and incorporated into the AGC algorithm. This has been removed from the Implementation Plan. The SDT has chosen an alternate method for		

Organization	Yes or No	Question 8 Comment
reducing the minimum Frequency Bias Setting. Standard language is not intended to penalize entities for not providing a response equal to its Frequency Bias Setting. The intent of the standard is to establish a Frequency Response Obligation (FRO) representing the minimum response required for reliable interconnected operations. The Frequency Bias Setting can differ from the determined FRO value as appropriate for reliability for which compliance will only evaluate if the Frequency Bias Setting is refined correctly and implemented in a timely manner.		
Kansas City Power & Light	No	Simply eliminating the minimum frequency response and establishing an FRO obligation for each BA will not result in a knowledge that a BA has moved closer to its natural frequency response. First, there is an underlying assumption that the FRO dictated for the BA will be "matched" by a BA's resources to achieve a natural response close the FRO and until improved methods of calculating a BA's actual frequency response are developed, there will be no accurate way of determining if a natural response is close to the FRO obligation.
Response: The intent of the first sentence in the comment above is not clear. There is no underlying assumption that natural response will match the frequency response obligation. However, the compliance process will provide a stimulus to the BA to achieve at least that level of frequency response. The FR SDT is expending considerable effort to develop a reasonably accurate measurement of natural response, and is in the process of choosing among several promising metrics.		
NorthWestern Energy	No	Page 2 implies that there is currently too much frequency response based on the 1% of peak demand method of establishing frequency bias. Even though NWE does not use the 1% method, NWE feels that the 1% minimum has been a tried and true method of providing frequency response in the Western Interconnection. Without the 1% minimum (and BA's using a natural response less than the 1%), the total interconnection frequency response would decrease according to research. This would lead to decreased interconnection bias, causing other operational issues, such as lower L10 values and possible CPS2 compliance factors.
Response: The opening sentence of this comment appears to be a misstatement. The FR SDT believes a gap exists between the natural Frequency Response and the Frequency Bias Settings calculated based on the 1% of peak demand criteria, resulting in excessive and unnecessary regulation occurring that is related to high frequency conditions following DCS events and other circumstances. The FR SDT agrees that a reduction in the 1% of peak demand criteria for the Frequency Bias Setting can adversely affect the overall Interconnection Frequency Bias Setting, L10 values, and possibly CPS 2 compliance also.		
Westar Energy	No	The 1% requirement should be phased out with the implementation of this standard.
Response: The technical basis for the phase out schedule is to allow time to evaluate how each Frequency Bias Setting change impacts both reliability and control criteria CPS1 and CPS2 performance.		
FMPP	No	There still needs to a floor value; 1% may not be the correct value, but zero is not the correct floor.

Organization	Yes or No	Question 8 Comment
Response: The floor will not be zero. Each Balancing Authority will have a required FRO contribution reflective of the natural Frequency Response in its Frequency Bias Setting.		
American Electric Power	No	Please see response to question 7.
Response: Please see our response to Question 7.		
Duke Energy	No	Duke Energy agrees that a gradual reduction (in magnitude) of the minimum as part of the field test is needed to determine what is the "right" amount of response needed, but the changes cannot be done in a vacuum. Duke Energy continues to be concerned with the impact that the changes to the Frequency Bias Setting ("FBS") will have on the bounds guiding secondary control (CPS1, CPS2 and the draft Balancing Authority ACE Limit or "BAAL" currently under a Field Trial under NERC Project 2010-14). Eastern Interconnection Frequency Response: For those not familiar with the work of the FRRSDT or the NERC Resources Subcommittee around Frequency Response, the estimated response for the Eastern Interconnection on average appears to be less than half of the Interconnection's total FBS in magnitude today. If the decision was made to hold Frequency Response at its current level, this standard could result in the FBS being reduced for many, if not most, Balancing Authorities to about half of what it is today. The FRO allocation would eventually drive what the minimum FBS needs to be, with the FBS needing to be greater than or equal to the FRO, or perhaps FRM, in magnitude at a minimum. Estimating the impact: To look further into the secondary control performance implications of BAs using a reduced FBS, Duke Energy took four sample months of clock-minute data for twelve BAs, cut the Interconnection total and each BA's FBS in half, recalculated each BA's clock-minute ACE taking out half of the bias component, and then calculated CPS1, CPS2 and BAAL estimated performance based upon those changes. Recognizing that the secondary control and resulting ACE of the BAs would be different and dependent upon the standards to be met, the results were not intended to estimate what the performance of the BAs would be, but were intended to help indicate where the problem areas existed based upon today's operation measured to a tighter control criteria. Impact on CPS1 and BAAL: The two bounds that are frequency-dependent, CPS1 and the draft BAAL, are cut in half for any given frequency by cutting the FBS in half. For CPS1 the impact of reducing the FBS looked reasonable with the results leaning toward overall improvement in CPS1 for almost half or better of the BAs (5 of 12, 8 of 12, 6 of 12, and 12 of 12) for the given months even with the tighter bounds, but more analysis may be needed. Though CPS1 looks manageable, the sample set did not include small BAs, and some BAs already in the 100-120% range appeared more at risk. For BAAL the longest duration of ACE exceeding the low or high BAAL stayed the same or got worse in all cases. As with today where the BAAL bounds get wider as frequency gets closer to 60 Hz where the majority of operation occurs, the additional flexibility of operation is offset by the BAAL bounds getting tighter than the CPS2 limits as frequency deviates farther from 60 Hz. With BAAL cut in half for this scenario, compliance will be more challenging and costly to manage to not exceed 30 minutes for any event. One of the

Organization	Yes or No	Question 8 Comment
		unknowns is whether the Frequency Trigger Limit for the BAAL calculation will stay where it's at or be lowered, as the current value was based upon UFLS at 59.82 Hz, rather than today's UFLS of 59.7 Hz. The BARCSDT under NERC Project 2010-14 has more work ahead before any changes can be proposed.Impact on CPS2: Though the industry is not seeing a reliability need to tighten secondary control in normal operation, the industry can't avoid such "tightening" with CPS2 limits directly dependent upon the FBS of the Balancing Authority and total FBS of the Interconnection. For the four months reviewed where CPS2 limits were cut in half, if one looked at the results individually the drop in CPS2 performance across the twelve BAs ranged from 2.6% to 33.8%, 4% to 33.5%, 3.8% to 37.8%, and 3.1% to 35.1%, with a median of 19.4%, 18.4%, 20.3% and 18.9% for the four months. Noting that CPS2 performance must be 90% or greater on a monthly basis, improving CPS2 performance by even 10% translates to over 70 hours of operation in a month where additional secondary generation control and other actions may be required. Duke Energy notes also that with less error in the ACE, the results indicate that the distribution of ten-minute events exceeding L10 would move closer toward the 50-50 chance that CPS2 will be forcing control action even though the ACE is in support of the Interconnection frequency (results showing the average moving from 27-34% to 39-43% of the ten-minute periods exceeded when in support of Interconnection frequency).Conclusion: Duke Energy does not believe there is a reliability need pushing the industry to tighten secondary control to the degree discussed above simply as a result of reducing the Frequency Bias Setting. If the calculated Frequency Response of the Interconnection stayed at its current level, what would be the justification for tightening the secondary control requirements of CPS1, CPS2 and the proposed BAAL? Duke Energy supports taking more of the error out of the ACE equation by having the FBS closer to the estimated Frequency Response of the Balancing Authority, however, Duke Energy does not believe the result should be a significant increase in secondary control costs to meet the CPS1, CPS2, or draft BAAL requirements.
Response: The SDT appreciates receiving this analysis of the impact Frequency Bias setting can have on secondary control. Please continue to analyze and share this technical data to the extent possible with the SDT. The SDT will perform comparable analyses during the field trial for determining the proper balance between having less "over control" than is perceived with respect to possibly increasing the secondary control cost incurred by individual Balancing Authorities because a smaller Frequency Bias Setting is utilized.		
Alberta Electric System Operator	No	The standard seems to propose to replace the 1% minimum frequency bias with the new proposed FRO. The AESO finds it difficult to comment on if it is not clear on how the FRO is determined.
Response: The Frequency Response Obligation is used for determining if there is sufficient primary Frequency Response for reliability. The minimum Frequency Bias Setting to be used in AGC will have a floor value needed to assure reliable control, and can be different than the Frequency Response Obligation. The SDT has modified Attachment A to provide additional clarity regarding the calculation methodologies.		
Independent Electricity System Operator	Yes	We do not have an opinion on the proposed elimination but do have a difficulty understanding the phase-out plan. Please see our comments under Q7, above.

Organization	Yes or No	Question 8 Comment
Response: The FR SDT has created Attachment B to provide clarifying language for the phase-out plan. Please refer to the SDT response to question #7.		
SPP Standards Development	Yes	While we agree that we think such a change will move the industry in the right direction, we have nothing upon which to base that opinion. On the other hand, the 1% minimum does provide a safety net for the interconnection. Moving away from the minimum requirement over a 4-year period should give us the necessary operating experience to become more confident in our numbers.
Response: The goal of the phase-out plan is to determine the best Frequency Bias Setting floor value to use for reliability that is based on a measured and cautionary approach.		
Southern Company	Yes	Comments: Agree only to the extent that the natural Frequency response can be accurately determined.
Response: The FR SDT is investing considerable effort on behalf of industry to develop a reasonable, practical and accurate measurement of natural frequency response and also a process for choosing the best of several promising metrics.		
Progress Energy	Yes	We have seen actual system operations harmed by the current, excessive biasing requirement on several occasions.
Response: The SDT thanks you for your affirmative response and clarifying comment.		
NIPSCO	Yes	Obviously it will bring it closer. The 4 year phase-in is a great idea.
Response: The SDT thanks you for your affirmative response and clarifying comment..		
Manitoba Hydro	Yes	Yes, the removal of the 1% of projected peak load which has a large window of probability for error should improve BIAS calculations.
Response: The SDT thanks you for your affirmative response and clarifying comment.		
Patterson Consulting, Inc.	Yes	Moving Frequency Bias Settings closer to natural Frequency Response is critical to improving observation, reporting, and control.
Response: The SDT thanks you for your affirmative response and clarifying comment.		
South Carolina Electric and Gas	Yes	

Organization	Yes or No	Question 8 Comment
EKPC	Yes	
Energy Mark, Inc.	Yes	
Beacon Power Corporation	Yes	
ENBALA Power Networks	Yes	
SERC OC Standards Review Group	Yes	
FirstEnergy	Yes	
Santee Cooper	Yes	
LG&E and KU Energy	Yes	
Arizona Public Service Company	Yes	
Seattle City Light	Yes	
ISO New Engand Inc.		With .4% peak load being a typical actual frequency response lately for Balancing Authorities, the 1% of peak load to .8% of peak load transition seems prudent. Perhaps a further reduction to .6% may be useful as well, but lesser floors may in effect result in AGC too often canceling out the primary frequency response being provided.
Response: The SDT thanks you for your clarifying comment.		
Associated Electric Cooperative, Inc.		I agree with this emerging standard's recognizing that the arbitrary 1% of peak-load should be refined by being lowered to better reflect each BA's expected frequency response.
Response: The SDT thanks you for your clarifying comment.		
Northeast Power Coordinating Council		Refer to the response to Question 17.

Organization	Yes or No	Question 8 Comment
Response: Please refer to the SDT response to Question 17.		

9. ***Do you agree with the drafting team that this standard should be field tested? If not, please explain in the comment area.***

Summary Consideration: The majority of the commenters agreed that this standard should be field tested. Most commenters indicated that the implementation plan should include information regarding the field trial and also be coordinated with the field trial schedule. Individual commenters suggested that the field trial is not required if detailed calculations and definitions were provided to entities for implementations and the field trial should not serve as a pre-established standard.

In response to industry feedback received, the SDT is presently field testing the methodologies for calculating FRM and FRO. The reduction of the Frequency Bias Setting is no longer part of the field trial. The SDT has defined a process for the ERO to follow to reduce the minimum Frequency Bias Setting once this proposed standard has been approved..

Organization	Yes or No	Question 9 Comment
FirstEnergy	No	We believe that the implementation plan should include information regarding the field trial and how it fits in with the phase-in implementation. It appears as though the field trial is being conducted based on 2010 data and will be concluded upon completion of the development of the standard but we think this could be clarified. Furthermore, as stated in the process manual, a field test "should include at a minimum the data collection and analysis or field test plan, the implementation schedule, and an expectation for periodic updates of the results." The field test information posted is not clear on the implementation schedule of the field test as well as when and how periodic updates will be available.
Response: Requirement R5 has been inserted back into the proposed standard. SDT has revised the plan for reducing the minimum Frequency Bias Setting. The plan is no longer tied to the Field Trial. The SDT has removed the table showing the reduction schedule for the minimum bias setting. The SDT is proposing another method for reducing the minimum Frequency Bias Setting in which the ERO will monitor the results of the reduction and make necessary corrections. Please refer to Attachment B for reduction plan details.		
Bonneville Power Administration	No	BPA believes that this standard as written should not be field tested. The calculations to be used to set frequency bias must be spelled out in detail and the definition of natural Frequency Response under multiple loading conditions must also be detailed. Once these conditions have been adequately met, there will not be a need for a field trial.
Response: Requirement R5 has been inserted back into the proposed standard. SDT has revised the plan for reducing the minimum Frequency Bias Setting. The plan is no longer tied to the Field Trial. The SDT has removed the table showing the reduction schedule for the minimum bias setting. The SDT is proposing another method for reducing the minimum Frequency Bias Setting in which the ERO will monitor the results of the reduction and make necessary corrections.		

Organization	Yes or No	Question 9 Comment
Please refer to Attachment B for reduction plan details.		
MRO's NERC Standards Review Subcommittee	Yes	The field test is not identified in the implementation plan. It should be.
Response: The SDT thanks you for your affirmative response and clarifying comment. Requirement R5 has been inserted back into the proposed standard. SDT has revised the plan for reducing the minimum Frequency Bias Setting. The plan is no longer tied to the Field Trial. The SDT has removed the table showing the reduction schedule for the minimum bias setting. The SDT is proposing another method for reducing the minimum Frequency Bias Setting in which the ERO will monitor the results of the reduction and make necessary correction. Please refer to Attachment B for reduction plan details.		
Midwest ISO Standards Collaborators	Yes	The field test is not identified in the implementation plan. It should be.
Response: The SDT thanks you for your affirmative response and clarifying comment. Requirement R5 has been inserted back into the proposed standard. SDT has revised the plan for reducing the minimum Frequency Bias Setting. The plan is no longer tied to the Field Trial. The SDT has removed the table showing the reduction schedule for the minimum bias setting. The SDT is proposing another method for reducing the minimum Frequency Bias Setting in which the ERO will monitor the results of the reduction and make necessary corrections. Please refer to Attachment B for reduction plan details.		
SPP Standards Development	Yes	Field testing will provide an opportunity to learn as we move forward with the standard. Modifications can be made as experience is gained and knowledge is acquired.
Response: The SDT thanks you for your affirmative response and clarifying comment. Requirement R5 has been inserted back into the proposed standard. SDT has revised the plan for reducing the minimum Frequency Bias Setting. The plan is no longer tied to the Field Trial. The SDT has removed the table showing the reduction schedule for the minimum bias setting. The SDT is proposing another method for reducing the minimum Frequency Bias Setting in which the ERO will monitor the results of the reduction and make necessary correction. Please refer to Attachment B for reduction plan details.		
IRC Standards Review Committee	Yes	A Field Test, sometimes called a Field Trial, is appropriate to identify and establish methods, but it should be a Field Trial, not a pre-established standard. The standard should be put into place later after the technical determinations have been accomplished. The time required for the field test should be taken into account when developing the implementation plan, especially the phase-out plan for R5.

Organization	Yes or No	Question 9 Comment
Response: The SDT thanks you for your affirmative response and clarifying comment. Requirement R5 has been inserted back into the proposed standard. SDT has revised the plan for reducing the minimum Frequency Bias Setting. The plan is no longer tied to the Field Trial. The SDT has removed the table showing the reduction schedule for the minimum bias setting. The SDT is proposing another method for reducing the minimum Frequency Bias Setting in which the ERO will monitor the results of the reduction and make necessary corrections. Please refer to Attachment B for reduction plan details.		
ERCOT	Yes	A Field Test, sometimes called a Field Trial, is appropriate to identify and establish methods, but it should be a Field Trial, not a pre-established standard. The standard should be put into place later after the technical determinations have been accomplished. The time required for the field test should be taken into account when developing the implementation plan, especially the phase-out plan for R5.
Response: The SDT thanks you for your affirmative response and clarifying comment. Requirement R5 has been inserted back into the proposed standard. SDT has revised the plan for reducing the minimum Frequency Bias Setting. The plan is no longer tied to the Field Trial. The SDT has removed the table showing the reduction schedule for the minimum bias setting. The SDT is proposing another method for reducing the minimum Frequency Bias Setting in which the ERO will monitor the results of the reduction and make necessary corrections. Please refer to Attachment B for reduction plan details.		
ISO New Engand Inc.	Yes	A Field Test, sometimes called a Field Trial, is appropriate to identify and establish methods, but it should be a Field Trial, not a pre-established standard. The standard should be put into place later after the technical determinations have been accomplished.
Response: The SDT thanks you for your affirmative response and clarifying comment. Requirement R5 has been inserted back into the proposed standard. SDT has revised the plan for reducing the minimum Frequency Bias Setting. The plan is no longer tied to the Field Trial. The SDT has removed the table showing the reduction schedule for the minimum bias setting. The SDT is proposing another method for reducing the minimum Frequency Bias Setting in which the ERO will monitor the results of the reduction and make necessary corrections. Please refer to Attachment B for reduction plan details.		
Arizona Public Service Company	Yes	What criteria will be used to evaluate the field trial? What constitutes acceptable/non-acceptable results? [see also, comments to question 7]
Response: Please refer to our comments for Question 7.		
Progress Energy	Yes	This plan should be field tested, although it feels as though this is less of a "field test" based on engineering judgement and more of trial and error testing. This problem should be studied to determine what is necessary

Organization	Yes or No	Question 9 Comment
		to manage system frequency within desired limits for the worst single contingency during the period of time the system is most vulnerable (minimum load). The result should be spread proportionally to all BAs in the interconnection, and those BAs should respond to and bias their ACE equation by the required value.
Response: The SDT thanks you for your affirmative response and clarifying comment. Requirement R5 has been inserted back into the proposed standard. SDT has revised the plan for reducing the minimum Frequency Bias Setting. The plan is no longer tied to the Field Trial. The SDT has removed the table showing the reduction schedule for the minimum bias setting. The SDT is proposing another method for reducing the minimum Frequency Bias Setting in which the ERO will monitor the results of the reduction and make necessary corrections. Please refer to Attachment B for reduction plan details. Attachment A has been revised to clarify the calculation methodology.		
NIPSCO	Yes	Great idea
Response: The SDT thanks you for your affirmative response and clarifying comment.		
Westar Energy	Yes	This is a major change and field testing is required to valid the standard and allow for revisions based on testing results
Response: The SDT thanks you for your affirmative response and clarifying comment. Requirement R5 has been inserted back into the proposed standard. SDT has revised the plan for reducing the minimum Frequency Bias Setting. The plan is no longer tied to the Field Trial. The SDT has removed the table showing the reduction schedule for the minimum bias setting. The SDT is proposing another method for reducing the minimum Frequency Bias Setting in which the ERO will monitor the results of the reduction and make necessary corrections. Please refer to Attachment B for reduction plan details.		
Manitoba Hydro	Yes	Yes, to ensure the eastern interconnection frequency health does improve with these new methods and if it does each BA will have a more accurate and fair BIAS setting.
Response: The SDT thanks you for your affirmative response and clarifying comment. Requirement R5 has been inserted back into the proposed standard. SDT has revised the plan for reducing the minimum Frequency Bias Setting. The plan is no longer tied to the Field Trial. The SDT has removed the table showing the reduction schedule for the minimum bias setting. The SDT is proposing another method for reducing the minimum Frequency Bias Setting in which the ERO will monitor the results of the reduction and make necessary corrections. Please refer to Attachment B for reduction plan details.		
American Electric Power	Yes	The changes proposed should be thoroughly tested before any implementation.

Organization	Yes or No	Question 9 Comment
Response: The SDT thanks you for your affirmative response and clarifying comment. Requirement R5 has been inserted back into the proposed standard. SDT has revised the plan for reducing the minimum Frequency Bias Setting. The plan is no longer tied to the Field Trial. The SDT has removed the table showing the reduction schedule for the minimum bias setting. The SDT is proposing another method for reducing the minimum Frequency Bias Setting in which the ERO will monitor the results of the reduction and make necessary corrections. Please refer to Attachment B for reduction plan details.		
Patterson Consulting, Inc.	Yes	A field test will provide valuable refinment and verification of parameters, and should identify unexpected ramifications.
Response: The SDT thanks you for your affirmative response and clarifying comment. Requirement R5 has been inserted back into the proposed standard. SDT has revised the plan for reducing the minimum Frequency Bias Setting. The plan is no longer tied to the Field Trial. The SDT has removed the table showing the reduction schedule for the minimum bias setting. The SDT is proposing another method for reducing the minimum Frequency Bias Setting in which the ERO will monitor the results of the reduction and make necessary corrections. Please refer to Attachment B for reduction plan details.		
South Carolina Electric and Gas	Yes	We do agree that a field test should take place but more details on the field test would be helpful.
Response: The SDT thanks you for your affirmative response and clarifying comment. Requirement R5 has been inserted back into the proposed standard. SDT has revised the plan for reducing the minimum Frequency Bias Setting. The plan is no longer tied to the Field Trial. The SDT has removed the table showing the reduction schedule for the minimum bias setting. The SDT is proposing another method for reducing the minimum Frequency Bias Setting in which the ERO will monitor the results of the reduction and make necessary corrections. Please refer to Attachment B for reduction plan details.		
Independent Electricity System Operator	Yes	The time required for the field test should be taken into account when developing the implementation plan, especially the phase-out plan for R5.
Response: The SDT thanks you for your affirmative response and clarifying comment. Requirement R5 has been inserted back into the proposed standard. SDT has revised the plan for reducing the minimum Frequency Bias Setting. The plan is no longer tied to the Field Trial. The SDT has removed the table showing the reduction schedule for the minimum bias setting. The SDT is proposing another method for reducing the minimum Frequency Bias Setting in which the ERO will monitor the results of the reduction and make necessary corrections. Please refer to Attachment B for reduction plan details.		
Santee Cooper	Yes	

Organization	Yes or No	Question 9 Comment
LG&E and KU Energy	Yes	
SERC OC Standards Review Group	Yes	
Kansas City Power & Light	Yes	
Southern Company	Yes	
ENBALA Power Networks	Yes	
NorthWestern Energy	Yes	
Energy Mark, Inc.	Yes	
FMPP	Yes	
EKPC	Yes	
We Energies	Yes	
Alberta Electric System Operator	Yes	
Duke Energy	Yes	
Seattle City Light	Yes	
Northeast Power Coordinating Council		Refer to the response to Question 17.
Response: Please refer to our response to Question 17.		

10. ***Attachment A of the proposed standard describes the criteria for selecting events to be analyzed. Do you agree with the criteria as described in Attached A? If not, please explain in the comment area.***

Summary Consideration: Comments received indicate the majority of commenters agree with having criteria for selecting events to be analyzed and requested clarification on the rationale for the criteria proposed. Research performed by the FRR SDT indicates analysis using 25 events and mean frequency data values will result in stable, consistent results.

Many commenters also expressed concern that the selection criteria was too stringent; that criteria language would omit selection of events worth reviewing; that Balancing Authorities should have flexibility in choosing which event data is selected and also have ability to modify submitted data for ensuring accuracy; and that using event data from the prior year could create double jeopardy. The intent for frequency values selected is to ensure most generators responsive to the interconnection will experience a governor response. The FRR SDT also agrees that interconnection subject matter experts and Balancing Authorities require the flexibility to select noteworthy events of interest, flexibility to identify which events to include or exclude for analysis, and allowance for modifying data for quality and other relevant concerns. The FRR SDT also believes that in those years where 25 acceptable events do not exist, stability and consistency concerns outweigh any adverse impacts from utilizing a few events from the previous year for analysis and that actual impact on current year results will be negligible.

After reviewing comments, the FRR SDT has revised Attachment A language for clarity. The team separated the rationale into a separate document and also revised Form-1.

Organization	Yes or No	Question 10 Comment
Santee Cooper	No	In Attachment A, item 2.b. states that “The time from the start of the rapid change in frequency until the point at which Frequency has largely stabilized should be less than 18 seconds.” It appears that this statement was to ensure that frequency is rapidly decaying; however, frequency could continue to decay beyond 18 seconds and should still be considered an event. Item 3 states that point A is calculated as “an average” is this considered to be an average of all samples or selected samples. Also, we would like to know how the different thresholds for the interconnections were determined. We are also concerned with how the threshold would affect compliance to the standard if it was ever required to be measured on an event basis, particularly those events close to the threshold dead-band settings. Words such as “assumed” should be avoided. Please explain how the number of 25 events was determined for the list of frequency events and explain how those events will be distributed throughout the year (i.e., on and off-peak, and seasonal).

Organization	Yes or No	Question 10 Comment
		Events that meet the selection criteria should be posted by the ERO on a monthly basis. This will allow BAs to evaluate their performance throughout the year.
Response: The intent for using the words "largely stabilized" in the sentence provides desired flexibility for selecting events for analysis. For example, if frequency drops from 60 Hz to 59.94 Hz in 6 seconds and then continues to decay to 59.935 Hz over the next 20 seconds; then this event would be selected for analysis. With respect to point A, all available samples for the time window specified are averaged. The number of samples obtained for averaging will be determined by the Balancing Authority's EMS scan rate. Each Interconnection threshold will be determined by subject matter experts who have knowledge of the historical events being analyzed, CERTS research and field trial results. It is not the intent of this standard to seek compliance on a per event basis especially since data quality issues make this type of analysis difficult to validate. Analysis of metrics being considered by the SDT shows the median or mean frequency data analyzed will converge to a stable state using only 20 event samples obtained for the year being reviewed. The SDT expects the sample set to include seasonal, on-peak, and off-peak events that satisfy the selection criteria specified. The SDT proposes posting event data on a quarterly basis so Balancing Authorities can periodically analyze data during the year. Attachment A has been divided into two separate documents; a revised Attachment A containing the calculation methodology and a Background Document explaining the development rationale for the standard's requirements and measures.		
Bonneville Power Administration	No	BPA does not agree with the criteria described in the attachment. 36 mHz is not a large enough deviation to adequately measure frequency response. There is no need to go to that small of a deviation in order to insure that 25 events are found over the course of a year.
Response: The FR SDT will consult with WECC subject matter experts to refine the frequency deviation selection criteria for the western interconnection. Keep in mind the selection threshold will be adjusted over time, as supported by evidence, to ensure reasonable selection criteria is utilized.		
SPP Standards Development	No	While Criteria 5 allows for the ERO to exclude 'non-conforming' SEFRD points there isn't a mechanism provided that instructs us on how to exclude those points in FRS Form 1. Would we be required to reach out for an additional point to get us back to 25 if a point is excluded? Who excludes the point in question? Is it the BA or is it the ERO? Will the ERO have sufficient knowledge to exclude the point in question? In Critieria 2.a. the first sentence should read "The frequency deviation (Point A minus Point C) must exceed...". Also, 36 MHz should be 36 mHz.
Response: The SDT has developed a new version of FRS Form 1, and it clarifies the process of how a Balancing Authority excludes an event. The ERO will not		

Organization	Yes or No	Question 10 Comment
exclude events. The Balancing Authority would not be required to replace an excluded event with another event since analysis of metrics being considered by the SDT shows the median or mean frequency data analyzed will converge to a stable state using only 20 event samples obtained for the year being reviewed. Analysis also shows that the median value is more consistent than the mean value when the sample set includes data for an event that otherwise should have been excluded from the analysis. The SDT thanks you for catching the typographical error referencing 36 mHz. The SDT has revised Attachment A and this value is no longer referenced..		
IRC Standards Review Committee	No	The criteria for events selection are acceptable, but the criteria stated in Attachment A for performance required by the FRO is too stringent. Criteria requiring avoidance of Point C encroachment on step 1 of the UFLS program is more stringent than proven performance that now exists. To make this change will be very costly and will not provide for a commensurate increase in reliability.
Response: FRO values have not yet been selected. The intent is to choose FRO values that are necessary for the reliability of each interconnection.		
ERCOT	No	The criteria for events selection are acceptable, but the criteria stated in Attachment A for performance required by the FRO is too stringent. Criteria requiring avoidance of Point C encroachment on step 1 of the UFLS program is more stringent than proven performance that now exists. To make this change will be very costly and will not provide for a commensurate increase in reliability.
Response: FRO values have not yet been selected. The intent is to choose FRO values that are necessary for the reliability of each interconnection.		
Southern Company	No	Comments: Selecting events just outside the governor deadband (e.g. 36 mHz in the EI) is not a good idea in that it assumes too much precision in the response by governors at the deadband boundary. This will result in a less accurate natural Frequency Response calculation for those large events where knowing an accurate Frequency Response value is most critical. In other words the event selection “deadband” should be somewhat larger than the Governor deadband even those this will result in somewhat fewer events in the final set.
Response: The intent is to choose among the largest frequency deviation events to obtain a meaningful sample set for analysis accuracy. The FR SDT is open to suggestions to refine the selection criteria for each interconnection. A balance needs to be established between having an inadequate sample resulting in less computational accuracy versus having a sample that is not representative of actual response occurring for the larger frequency deviation events of concern.		
Progress Energy	No	It should be explicitly stated that point C must be outside the standard frequency deviation deadband referenced from 60.0 Hz, not a deviation of more than the frequency deviation deadband from the pre-disturbance frequency. Most of the new electronic govenors operate with a 60 Hz center instead of changes in frequency relative to the current value.

Organization	Yes or No	Question 10 Comment
		Additionally, the first limit under number 2 should be 36 mHz, not 36 MHz as they are a factor of 10^9 different. Lastly, the event selection criteria listed in Attachment A uses the frequency as measured at Point C to qualify an event, in an effort to ensure that the deviation exceeds the governor deadband. However, Point C is an instantaneous point which will differ in value within the interconnect based on how close the loss of generation is to the measuring point due to the elasticity of frequency across the interconnect during the inertial response. Therefore, local readings by the BA should be allowed to exempt a specific event if the local frequency did not exceed 36 mHz.
Response: It is expected that the selection criteria will yield events with Point C that clearly exceed the generator governor deadband and result in a response action. While the distance between the measuring point and the loss of generation location will cause different Point C (and other) frequency values being measured at different system locations, the variation in Point C frequency values among the different locations will not be significant for most events or most Balancing Authorities. Keep in mind each Balancing Authority will use its EMS local frequency data for determining sample points A and B. The FR SDT anticipates selecting events that will not require the Balancing Authority to exclude events because of local frequency values measured. The FR SDT will consider high local frequency as a possible selection criteria exclusion factor in the next revision of Form 1.		
NorthWestern Energy	No	Should state " The Point C value is the minimum of frequency samples and should be within 8 seconds after the start of the rapid change". NWE feels some instances could be more than 8 seconds and "should" would allow for this if it occurred.
Response: The original intent was to exclude such events however the SDT understands some of these events may provide interesting and valuable information. Language proposed would give subject matter experts selecting the events necessary leeway to include such events. The SDT will consider changing "shall" language to give subject matter experts more flexibility with selecting events.		
Hydro-Quebec TransEnergie	No	The criteria to determine what should be considered as a frequency event should be defined by Interconnection. For example, HQT has no dead band on governors; therefore the 36 mHz is not applicable. If more than 25 events occurred within a year, will they all be selected or only a set of 25 will be? Who will perform this selection and base on what criteria.
Response: Event selection criteria will be specified on an interconnection basis after consulting with subject matter experts for that interconnection. Selected events will be chosen by subject matter experts for that interconnection.		
Westar Energy	No	The lagging measure is a concern. The ERO should be required to provide an updated proposed/possible list of frequency events monthly so BA's can determine their FRM through out the year so corrective action can be taken if needed. Prior year events should be excluded (just to get to 25 events). This could result in begin non-compliant twice for the same events. If a BA is over performing in the first of the year and adjusts in the second half of the

Organization	Yes or No	Question 10 Comment
		year then those second half of the year events are used in the next year, it could cause an inappropriate violation. BA's need the ability to exclude some events based on measure issues with specific events including scan rates, unusual intermittent resource changes, non-conforming load, unusual ramping of load or interchange during the event.
Response: Based on comments received from industry, the SDT proposes posting event data on a quarterly basis so Balancing Authorities can periodically analyze data during the year. Generally, each Balancing Authority will have 25 acceptable events occur each calendar year. Using a few events from the preceding year is not expected to adversely affect accuracy of analysis results. The SDT is re-evaluating exclusionary criteria and is also developing a process to permit reasonable adjustments to an event for atypical circumstances.		
FMPP	No	Attachment A states that if a year occurs in which there are not 25 events that meet the remaining criteria below, then the most recent 25 events (as defined below) will be used for determination of an entity's compliance with the FRM requirement and storage of SEFRD. Problem - by using events from last year to determine an entity's compliance with a Requirement for this year puts the entity in double jeopardy for last year's events, which were already used for compliance for last year. Attachment A states that events occurring during periods in which either significant interchange schedule ramping or load ramping is likely, should be excluded if other events are available for measurement purposes. Questions - What is significant?How can the ERO determine significant interchange schedule ramping is likely?Likely for how many BAs?It would be better to define significant and let the BA exclude any events that meet this definition, since each BA will be ramping differently. Since SEFRD is defined as the individual sample of event data from a Balancing Authority which represents the change in Net Actual Interchange (NIA), divided by the change in frequency, expressed in MW/0.1Hz, whenever a BA includes an event with a "significant" change in NIA due to a large interchange schedule ramp, the FRM is totally skewed, and should not be included. If other events are available means that if other events are not available then an entity's compliance is going to be based on an event or events that has been skewed for the BA by significant interchange schedule ramp.
Response: Generally, each Balancing Authority will have 25 acceptable events occur each calendar year. Using a few events from the preceding year is not expected to adversely affect accuracy of analysis results. The SDT is re-evaluating exclusionary criteria and is also developing a process to permit reasonable adjustments to an event for atypical circumstances. The SDT does not expect subject matter experts will select events with rapid load change or large schedule change activity. Large schedule changes typically occur between 7 AM and 8 AM, and 10 PM and 11 PM, with 10 minute ramps across the top of the hour. Having Balancing Authorities exclude these kinds of events could be problematic because balancing areas are different in size from one Balancing Authority to the next. The SDT has developed a manual correction capability for the sampling process which, when used in conjunction with median value rationale, should minimize the impact data skewing tendencies may have on analysis results.		

Organization	Yes or No	Question 10 Comment
American Electric Power	No	Attachment A only appears to be attempting to address the frequency bias setting for AGC portion of overall frequency response without addressing the governor response portion issue. Attachment A still tries to address the issue solely at the Balancing Authority level without addressing criteria at the Generator & Generator Operator levels. WECC has stated through previously submitted comments from its three extensive validation result tests on frequency response with respect to 5% droop for a 0.1 Hz frequency deviation that actual response would be 2.5 times greater if the proper governor response actually occurred. The studies also showed only 40% of the governors effectively responded. Extensive test result studies such as WECC's should not be ignored. Attachment A criteria does not address the lack of frequency response from contributing factors associated with actual governor response, impact of droop setting, amount of BA generation actually on-line at time of event, maximum loading of generation and amount of BA imported interchange to meet load.
Response: The need for an accompanying generation SAR has been discussed and is outside of the current FR SDT scope. Verification of generator governor response is important. The FR SDT encourages entities to continue studying generator governor response and related contributing factors cited.		
Patterson Consulting, Inc.	No	I agree that criteria for event selection are needed, although these criteria appear to be unnecessarily subjective. Items 1 and 2 are appropriate. However, item 3 seems to eliminate many events that should be reviewed. For example, item 3 would eliminate any event with an initial frequency that is not 60 Hz, depending on the subjective determination of "near" and "relatively steady." Similarly, items 5 and 6 add more subjectivity to the selection of events, but may be necessary. It is not clear that criteria listed in Attachment A are required to be used since much other content appears to be explanatory, contextual, and instructional. These explanatory, contextual, and instructional aspects are important, but should not be requirements. Attachment A should be limited to event selection and calculations necessary to support the stated requirements. Instructional, etc. information should be moved to another document. If other "requirements" are included in Attachment A, they should be moved to the standard. FRS Form 1 should be an attachment as this form contains and performs the required calculations. The remaining information in Attachment A should become either a standalone (technical) document, or be combined with information such as "FRS Form 1 Background and Instructions" and renamed. As further clarification regarding the ambiguity identified in the previous paragraphs, Attachment A could be interpreted as additional requirements on the Balancing Authority, ERO, or both. The language and scope are not sufficiently clear to identify whether statements are informative or requirements. This lack of clarity makes it impossible for entities to identify requirements, acquire appropriate tools and resources related to requirements, and to provide suitable performance to meet requirements. For example, the statement "A final listing of official events to be used in the calculation will be available from NERC by December 10 each year." may be intended as a requirement rather than a statement suggesting a typical schedule. Further, if the

Organization	Yes or No	Question 10 Comment
		previous statement is a typical schedule, then the statement "The ERO will use the following criteria for the selection of events to be analyzed." could be interpreted as merely the typical process to be used, but not a binding one. In short, the purpose and intention of Attachment A is not communicated unambiguously.
Response: Item 3 was intended as guidance to give subject matter experts flexibility in choosing the best possible events for analysis. The SDT recognizes that in some years valid but less than ideal events from a selection criteria perspective may be chosen for analysis. The SDT will improve document clarity and also consider if it is prudent to make selection criteria hard or soft requirements. Attachment A has been divided into two separate documents; a revised Attachment A containing calculation methodology and a Background document explaining the development rationale for the standard requirements and measures.		
Xcel Energy	No	1) Using 25 events is likely excessive in the Western Interconnection. Several of the past few years have had less than 10 events. Given the extent to which generation is built and resource profiles change, projecting 25 events will include events in the bias calculation that are less reflective of the current generation profile and skew our bias results. 2) Calculating point A as "...an average over the period from -16 second to 0 seconds" for any event that meets the criteria set in Attachment A means that Point A will likely be within 1-2 mHz of 60 Hz, regardless of starting system conditions. This can cause data to be skewed, as the response will appear to be less if the frequency immediately before the event is further from 60 Hz than the average. Further, it requires additional data. If there is some corrupted data in the 16 seconds prior to the event, it may be required to throw out event data. The 16 seconds prior to the event is not useful data. 3) Point 5 addresses excluding events "...in which significant interchange schedule ramping or load ramping is likely..." Not only are the FRO and FRM definitions too vague, they require analysis of real time generation and load ramping that may not be realistic. Attachment A should likely include specific criteria for removing events, including lack of reasonable data and, as described here, significant schedule or load ramping, where "significant" is defined.
Response: The SDT has reviewed your concern and determined that the WECC would have sufficient event data to analyze. Keep in mind an ERO specified event can be excluded if data quality issues associated with FRS Form 1 exist. Also, manual adjustment to the actual net interchange value for schedule ramping can be performed for completing FRS Form 1. Event selection criteria will allow sufficient flexibility for subject matter experts to avoid periods of rapid load change (e.g., morning pickup and declining late evening load) and ten minute ramps across the top of the hour to the extent possible. The intention is to guide the subject matter experts in choosing the best data set available so that relatively few adjustments, if any, will be needed.		
LG&E and KU Energy	Yes	While we agree with the basic process, we would like to know how the different thresholds for the interconnections were determined. The review team is also concerned with how the threshold would affect compliance to the standard if it was ever required to be measured on an event basis, particularly those events close to the threshold dead-band settings. Words such as "assumed" should be avoided. Please explain how the number of 25 events was determined for the list of frequency events and explain how those events will be

Organization	Yes or No	Question 10 Comment
		distributed throughout the year (i.e., on and off-peak, and seasonal).The criteria in Attachment A should include how and where the arresting frequency is measured
Response: The SDT thanks you for your affirmative response and clarifying comments. The magnitude of the frequency change and the initial frequency values identified were selected to ensure that most generators responsive to the interconnection will exceed the governor frequency dead band limits. It is not the intent of this standard to seek compliance on a per event basis especially since data quality issues make this type of analysis difficult to validate. Analysis of metrics being considered by the SDT shows the median or mean frequency data analyzed will converge to a stable state using only 20 event samples obtained for the year being reviewed. The SDT expects the sample set to include seasonal, on-peak, and off-peak events that satisfy the selection criteria specified. Generally, subject matter experts will use high speed frequency recorder data to select events for analysis. Technology is now available that allows cross-checking data at multiple locations for the same event.		
SERC OC Standards Review Group	Yes	While we agree with the basic process, we would like to know how the different thresholds for the interconnections were determined. The review team is also concerned with how the threshold would affect compliance to the standard if it was ever required to be measured on an event basis, particularly those events close to the threshold dead-band settings. Words such as “assumed” should be avoided. Please explain how the number of 25 events was determined for the list of frequency events and explain how those events will be distributed throughout the year (i.e., on and off-peak, and seasonal).
Response: The SDT thanks you for your affirmative response and clarifying comment. The magnitude of the frequency change and the initial frequency values identified were selected to ensure that most generators responsive to the interconnection will exceed the governor frequency dead band limits. It is not the intent of this standard to seek compliance on a per event basis especially since data quality issues make this type of analysis difficult to validate. Analysis of metrics being considered by the FR SDT shows the median or mean frequency data analyzed will converge to a stable state using only 20 event samples obtained for the year being reviewed. The FR SDT expects the sample set to include seasonal, on-peak, and off-peak events that satisfy the selection criteria specified.		
South Carolina Electric and Gas	Yes	While we agree with the basic process, we would like to know how the different thresholds for the interconnections were determined. The review team is also concerned with how the threshold would affect compliance to the standard if it was ever required to be measured on an event basis, particularly those events close to the threshold dead-band settings. Words such as “assumed” should be avoided. Please explain how the number of 25 events was determined for the list of frequency events and explain how those events will be distributed throughout the year (i.e., on and off-peak, and seasonal).

Organization	Yes or No	Question 10 Comment
Response: The SDT thanks you for your affirmative response and clarifying comment. The magnitude of the frequency change and the initial frequency values identified were selected to ensure that most generators responsive to the interconnection will exceed the governor frequency dead band limits. It is not the intent of this standard to seek compliance on a per event basis especially since data quality issues make this type of analysis difficult to validate. Analysis of metrics being considered by the FR SDT shows the median or mean frequency data analyzed will converge to a stable state using only 20 event samples obtained for the year being reviewed. The FR SDT expects the sample set to include seasonal, on-peak, and off-peak events that satisfy the selection criteria specified.		
Arizona Public Service Company	Yes	AZPS would recommend using a lesser number of events and more severe events in the calculation.
Response: The SDT thanks you for your affirmative response and clarifying comment. A balance needs to be established between having an inadequate sample resulting in less computational accuracy versus having a sample that is not representative of actual response occurring for the larger frequency deviation events of concern.		
NIPSCO	Yes	Pretty good
Response: The SDT thanks you for your affirmative response and clarifying comment.		
EKPC	Yes	Please provide detailed information on the 25 events that will be chosen for the event.
Response: The SDT thanks you for your affirmative response and clarifying comment. Attachment A has been revised to include an improved detailed description of the criteria selection process. The magnitude of the frequency change and the initial frequency values identified were selected to ensure that most generators responsive to the interconnection will exceed the governor frequency dead band limits. It is not the intent of this standard to seek compliance on a per event basis especially since data quality issues make this type of analysis difficult to validate. Analysis of metrics being considered by the FR SDT shows the median or mean frequency data analyzed will converge to a stable state using only 20 event samples obtained for the year being reviewed. The FR SDT expects the sample set to include seasonal, on-peak, and off-peak events that satisfy the selection criteria specified.		
Manitoba Hydro	Yes	Yes, 25 events should be sufficient to determine the FRM, while not overburdening the resources performing the analysis.

Organization	Yes or No	Question 10 Comment
Response: The SDT thanks you for your affirmative response and clarifying comment.		
Duke Energy	Yes	
Seattle City Light	Yes	
We Energies	Yes	
Energy Mark, Inc.	Yes	
ENBALA Power Networks	Yes	
Kansas City Power & Light	Yes	
Midwest ISO Standards Collaborators	Yes	
FirstEnergy	Yes	
MRO's NERC Standards Review Subcommittee	Yes	
Alberta Electric System Operator		AESO suggests that the criteria should also consider including some frequency events where the BA has controlled separation from a region. In the case of Alberta, the frequency deviation is larger than most regional frequency deviations and provides a better measure on Frequency Response. Would the proposed standard permit for BA's to choose these events for inclusion in the determination of the frequency response?
Response: This is not a common occurrence. Very few Balancing Authorities operate in this manner. The expectation is events will be selected by the Balancing Authorities. The Balancing Authority may exclude events from consideration for specific conditions such as data quality issues.		
Northeast Power Coordinating Council		Refer to the response to Question 17.
Response: Please refer to the SDT response to Question 17.		

11. ***The proposed standard has a document attached to it that describes the SDT's reasoning for the Requirements (Attachment A - Frequency Response Background Document). Do you agree with the SDT that this document is useful and provides a clear understanding of the Requirements? If not, please explain in the comment area.***

Summary Consideration: Several of the commenters did not agree that the Attachment A – Frequency Response Background document in its current form was useful and provided a clear understanding of the Requirements. In general most commenters indicated that Attachment A required correction, greater clarity and did not adequately explain the calculation methodology. The SDT has split Attachment A into two separate documents, revised Attachment A to better explain the calculation methodology, and improved the document's clarity. The SDT also revised FRS Form 1 and the background document for clarity. Several commenters stated Requirement R2 needed additional explanation so the SDT revised Requirement R2. Several commenters also expressed concern the standard was not well defined as drafted so Requirement R5 was inserted back into the draft standard to resolve this concern. Another concern identified that language appeared to give the ERO a blank check to make changes to the standard without an industry vote. Other commenters requested a better explanation for how FRO is determined and why the median value is considered a reliable statistical measure for calculating FRM.

R2. Each Balancing Authority not participating in Overlap Regulation Service shall implement the Frequency Bias Setting (fixed or variable) validated by the ERO into its Area Control Error (ACE) calculation beginning on the date specified by the ERO to ensure effectively coordinated Tie Line Bias control.

R5. In order to ensure adequate control response, each Balancing Authority shall use a monthly average Frequency Bias Setting whose absolute value is at least equal to one of the following:

- The maximum percentage of the Balancing Authority Area's estimated yearly Peak Demand within its metered boundary per 0.1 Hz change as specified by the ERO in accordance with Attachment B.
- The minimum percentage of the Balancing Authority Area's estimated yearly peak generation for a generation-only Balancing Authority per 0.1 Hz change as specified by the ERO in accordance with Attachment B.

Organization	Yes or No	Question 11 Comment
MRO's NERC Standards Review Subcommittee	No	Overall, we agree that the document is helpful. However, we do believe additional explanation is necessary for Requirement 2. It appears that the responsibility for identifying Frequency Bias Setting is being removed from the Balancing Authority. There is an implied obligation that the ERO will determine the Frequency Bias

Organization	Yes or No	Question 11 Comment
		Setting but it is not stated explicitly. Thus, we are left wondering who has the responsibility for determining the Frequency Bias Setting. On page 3 in the last paragraph of the Frequency Response Obligation and Allocation section, we suggest expanding the explanation of why Frequency Response Obligation is based on (peak generation + peak load)/2. This will result in less responsibility of Frequency Response today for a generator only control area than there currently is. Since load does respond to frequency, we are not suggesting this is wrong. We think it simply needs to be expanded upon in the explanation. Does load contribute the same amount as generation? If not, perhaps the ratio of gen and load response to total response should be reflected in the calculation.
Response: The SDT is not suggesting that the ERO determine the Frequency Bias Settings. The SDT has modified the language in Requirement R2 to provide further clarity as to the role of the ERO. The Requirement now reads "Each Balancing Authority not participating in Overlap Regulation Service shall implement the Frequency Bias Setting (fixed or variable) validated by the ERO, into its Area Control Error (ACE) calculation beginning on the date specified by the ERO to ensure effectively coordinated Tie Line Bias control." The SDT believes that there is presently no obligation on the generator only BA and that the proposed FRO will place an obligation on the generator only BA. The SDT has modified Attachment A to provide additional clarity concerning the calculation methodology. The SDT believes that this is a methodology that is technologically neutral and provides an FRO allocation across all geographic areas.		
Midwest ISO Standards Collaborators	No	Overall, we agree that the document is helpful. However, we do believe additional explanation is necessary for Requirement 2. It appears that the responsibility for identifying Frequency Bias Setting is being removed from the Balancing Authority. There is an implied obligation that the ERO will determine the Frequency Bias Setting but it is not stated explicitly. Thus, we are left wondering who has the responsibility for determining the Frequency Bias Setting.On page 3 in the last paragraph of the Frequency Response Obligation and Allocation section, we suggest expanding the explanation of why Frequency Response Obligation is based on (peak generation + peak load)/2. This will result in less responsibility of Frequency Response today for a generator only control area than there currently is. Since load does respond to frequency, we are not suggesting this is wrong. We think it simply needs to be expanded upon in the explanation. Does load contribute the same amount as generation? If not, perhaps the ratio of gen and load response to total response should be reflected in the calculation.
Response: The SDT is not suggesting that the ERO determine the Frequency Bias Settings. The SDT has modified the language in Requirement R2 to provide further clarity as to the role of the ERO. The Requirement now reads "Each Balancing Authority not participating in Overlap Regulation Service shall implement the Frequency Bias Setting (fixed or variable) validated by the ERO, into its Area Control Error (ACE) calculation beginning on the date specified by the ERO to ensure effectively coordinated Tie Line Bias control." The SDT believes that there is presently no obligation on the generator only BA and that the proposed FRO will place an obligation on the generator only BA. The		

Organization	Yes or No	Question 11 Comment
SDT has modified Attachment A to provide additional clarity concerning the calculation methodology. The SDT believes that this is a methodology that is technologically neutral and provides an FRO allocation across all geographic areas.		
We Energies	No	Overall, we agree that the document is helpful. However, we do believe additional explanation is necessary for Requirement 2. It appears that the responsibility for identifying Frequency Bias Setting is being removed from the Balancing Authority. There is an implied obligation that the ERO will determine the Frequency Bias Setting but it is not stated explicitly. Thus, we are left wondering who has the responsibility for determining the Frequency Bias Setting.
Response: The SDT is not suggesting that the ERO determine the Frequency Bias Settings. The SDT has modified the language in Requirement R2 to provide further clarity as to the role of the ERO. The Requirement now reads "Each Balancing Authority not participating in Overlap Regulation Service shall implement the Frequency Bias Setting (fixed or variable) validated by the ERO, into its Area Control Error (ACE) calculation beginning on the date specified by the ERO to ensure effectively coordinated Tie Line Bias control."		
FirstEnergy	No	We believe that more work is needed on this document and the requirements to provide for more clarity.
Response: The SDT has modified the Background Document to provide additional clarity concerning the reasoning behind the proposed requirements.		
Bonneville Power Administration	No	Overall comment: Attachment A does not adequately spell out the methodology that is to be used to determine the correct frequency bias for a Balancing Authority. In order for this standard to go forward, the methodology must be explicitly spelled out and moved into the standard, not attached as a background document that can be changed without vote. o Frequency Bias Setting vs. Frequency Response o RAS events should not be excluded. These events are designed to not have response on the system, even though there may be some primary response. o Paragraph 1 - "each BA has one month" conflicts with the standard that says prior to January 10th or 45 days (1.4 Additional Compliance Information). o 2.a - BPA is assuming the Drafting Team meant 36 mHz. 36 mHz is very small and can be achieve during normal frequency deviations. Point C "within 8 seconds" must be moved to 10 to 12 second range in order to work in WECC. o 2.b - Why so far back on the -16 seconds? o Third from the last paragraph - BPA cannot support a standard that isn't well defined, doesn't adequately spell out the methodology behind the requirements and essentially gives the ERO a blank check to make

Organization	Yes or No	Question 11 Comment
		changes to the standard without a vote. o Second to last paragraph -If you have a poor responding BA control less than they are currently the better responding BA will respond more due to the lower interconnection frequency. This will punish the BAs that have good response and reward those that have poor response, depending on the methodology used to calculate correct frequency bias terms. o Frequency Bias Setting Floor - BPA cannot support a standard that isn't well defined and essentially gives the ERO a blank check to make changes to the standard without a vote. o Frequency Response Obligation and Allocation - BPA cannot support a standard that isn't well defined and essentially gives the ERO a blank check for assigning an FRO to each BA. If this is the method for defining FRO, then it should be included in the requirements section of the standard. However, this section does not spell out how the FRO will be calculated other than that it will be based on the (peak generation + peak load)/2. The full methodology for calculating the FRO must be detailed and put in the standard.
Response: The SDT has modified Attachment A and the Background Document to provide additional clarity concerning the calculation methodology and the reasoning behind the proposed requirements. The SDT has been advised by NERC Legal that an attachment explicitly referenced in a Reliability Standard Requirement is enforceable as part of that Requirement. The SDT has modified the FRS Form 1 to allow for adjustments. Any adjustment will have to be justified. The SDT has corrected the mistake in Paragraph 1. You are correct concerning the 36 mHZ and this has been corrected. The SDT is only using this to provide a minimum value for selection of events. The SDT has analyzed several different time periods for the Point A, Point B and Point C values. The SDT has chosen the time periods based on this analysis as detailed in Attachment A and FRS Form 1. The SDT is proposing to use -16 seconds in order to account for varying AGC scan rates to obtain an average. The SDT does not believe that there is any requirement presently in place that identifies good or poor responding BAs. The SDT further believes that a BA that is providing proper Frequency Response recognizes the importance and will continue to provide the necessary Frequency Response. Those BAs that are not providing adequate and sustained Frequency Response will be identified through the measure. The SDT disagrees with your comment that this proposed standard gives the ERO a "blank check" to modify the standard. The proposed standard is attempting to bring the Frequency Bias Setting and the natural Frequency Response closer together and not attempting to set a floor. The SDT has modified Attachment A to provide additional clarity concerning the calculation methodologies. The SDT has been advised by NERC Legal that an attachment explicitly referenced in a Reliability Standard Requirement is enforceable as part of that Requirement.		
SPP Standards Development	No	While we agree that Attachment A is useful, it hasn't quite got to the point where it clearly helps us understand the requirements as well as the calculations and other determinations that must accompany the standard.

Organization	Yes or No	Question 11 Comment
Response: The SDT recognizes this and has responded by revising FRS Form 1 and splitting Attachment A into two documents to better clarify the calculation methodology and the reasoning for the requirements.		
IRC Standards Review Committee	No	Attachment A is useful, but it does not provide a clear understanding of all topics and issues. This is evidenced by the questions and comments the SRC is submitting.
Response: The SDT recognizes this and have responded by revising FRS Form 1 and splitting Attachment A into two documents to better clarify the calculation methodology and the reasoning for the requirements.		
ERCOT	No	Attachment A is useful, but it does not provide a clear understanding of all topics and issues. This is evidenced by the questions and comments the SRC is submitting.
Response: The SDT recognizes this and have responded by revising FRS Form 1 and splitting Attachment A into two documents to better clarify the calculation methodology and the reasoning for the requirements.		
Southern Company	No	We did not want to vote on question 11 - clicked 'NO' in error Comments: Attachment A Comment 1: The initial draft of BAL-003 - Attachment A provides a range of valuable background details and historical information about Frequency Response. However, all of this information is not pertinent to the BAs ability to understand and comply with the Standard. The SDT should consider utilizing the Standards Processes Manual (page 39) which provides a detailed description of various alternatives to an attached supporting document. Document types include References, Guidance, Supplements, Training Material, Procedures, and White Papers. Comment 2: The Standards Processes Manual (page 39) makes clear that supporting “documents may explain or facilitate implementation of the standards but do not themselves contain mandatory requirements subject to compliance review.” Draft BAL-003 - Attachment A may be in contradiction to the Manual because it suggests mandatory requirements for the BA. Refer to page one where a statement provides that the BA must, within one month after receiving a listing of official events, assemble its data and calculate a Frequency Response Measure. This obligation is not stated in BAL-003 or the proposed BAL-003-1. The Manual explains that any mandatory requirements must be incorporated into the standard in the standards development process. The SDT should first evaluate whether or not this is a requirement and second, if alternative language may alleviate confusion.
Response: Attachment A has been split in to two documents. Attachment A now provides the calculation methodology to be used for the standard and a new document titled, “Frequency Response Standard Background Document”, that explains the reasoning for the requirements. The SDT has been advised by NERC Legal that an attachment explicitly referenced in a Reliability Standard Requirement is enforceable as part of that		

Organization	Yes or No	Question 11 Comment
Requirement.		
Progress Energy	No	While the attachment provided insite into the distribution of the FRO for each BA, it lacks clarity on whether the interconnection FRO is based on the largest category C event that occurred, or if this event is based on a study. Additionally, if the event is from actual data, what happens if the interconnection is shown to need less response than it currently has due to the response of frequency dependent loads. What happens to BAs that "have only load with no native generation" if they do not meet their FRO? Are they going to be required to meet their FRO through load managmenet schemes?
Response: Attachment A has been split in to two documents. Attachment A now provides the calculation methodology to be used for the standard and a new document titled, "Frequency Response Standard Background Document", that explains the reasoning for the requirements. These documents have also been revised for clarity. The SDT believes that a BA that is providing proper Frequency Response recognizes the importance and will continue to provide the necessary Frequency Response. Those BAs that are not providing adequate and sustained Frequency Response will be identified through the measure. The FRO is and will be determined based on the methodology detailed in Attachment A. If A BA does not meet the Requirements then it will be found noncompliant. The proposed standard is setting a minimum Frequency Response but not prescribing a method to meet the requirements. However, the SDT has identified methods of obtaining Frequency Response in the standard.		
NorthWestern Energy	No	A Balancing Authority's frequency response is based upon a "median" value calculated from analyzing multiple events. Frequency response during some of these events is better than others, depending on the system conditions at the time and the amount system loading and unloaded generation online at the time of the event. Given these circumstances a BA's actual response could vary by event (better or worse than median), thus compliance measurement per event to a frequency response obligation based on the median response (over multiple events) could put BA's in non-compliant situations unjustly.
Response: The SDT, in consultation with the NERC Frequency Response Initiative, has performed empirical studies that demonstrate the median is more resilient to data quality problems and statistical outliers.		
Energy Mark, Inc.	No	Comment 20: The document is useful, but it needs a number of modifications to provide a clear understanding of the Requirements.Frequency Bias Setting vs. Frequency Response Section: Comment 21: In bullet 1 the use of the word "storage" is unclear. Comment 22: In bullet 3, The two boxes indicating that the Point A and Point B values are averages should also indicate that the averaging periods for these calculations vary with the scan rate used to collect the data. The correct averaging periods were presented in a table from the NERC Reference Document Understand

Organization	Yes or No	Question 11 Comment
		and Calculating Frequency Response developed by Frequency Response Standard Drafting Team. These scan values used for averaging should be included in the instructions.Frequency Response Obligation and Allocation Section: Comment 23: In the second paragraph of this section there is no supporting analysis that indicates the level of reliability that the selection of "the largest category C event (N-2)." Without such analysis, there is no way to determine the level of reliability that will be supported by this "target contingency protection criteria." A reliability criterion that supports an unknown level of reliability is no reliability criteria at all. Comment 24: In paragraph four of this section, determination of the "administrative procedure to assign an FRO to each BA for the upcoming year" is removed from the stakeholders and given to the ERO and the NERC RS to determine. This is unacceptable in a stakeholder driven process without more information about how this determination will be made. Comment 25: In paragraph five of this section, an initial method is offered to determine the proportion of total Frequency Response that each BA will use as their FRO. This method is not influenced by the need for Frequency Response in any manner. It therefore, creates perverse incentives for BAs attempting to make decisions concerning Frequency Response and fails to meet the requirement that "A reliability standard shall neither mandate nor prohibit any specific market structure." This is explained in greater detail later in my comments in response to Questions 16 and 17.Methods of Obtaining Response Section: Comment 26: In the first paragraph, it is suggested that the Frequency Response Obligation could be fulfilled by participating in Reserve Sharing Group (RSG). RSGs were created because of the "non-coincident" nature of the need for Contingency Reserve among BAs. In creating RSGs, all of the BAs in the RSG could reduce the amount of Contingency Reserve that they individually held while still meeting the reliability requirements associated with recovering from disturbances. The savings achieved by reducing individual reserve and sharing reserves provided strong economic incentives to support the infrastructure to create, manage and operate these RSGs. Unlike Contingency Reserves, Frequency Responsive Reserves are always needed on a "coincident" basis because the frequency is the same throughout the interconnection. The strong economic incentives associated with the supply of Contingency Reserves by RSGs do not exist when considering the "coincident" need for Frequency Responsive Reserves. At best, there is only a small reduction in need for reserves on an event by event basis and that small effect is significantly reduced when the averaging period for event measurement is extended over time as the draft standard suggests, one year average measurement period for Frequency Response. Comment 27: In the second paragraph, it is suggested that the problem of obtaining Frequency Response be passed to the RSGs rather than addressing it directly in this standard or in other standards under development. In the distant past, the term "spinning reserve" was weakly related to the amount of Frequency Responsive reserve available. However, in current NERC standards there is no defined relationship between "spinning reserve" and Frequency Responsive Reserve. Therefore, there is no reason to pass this problem to RSGs. However, if an RSG, after investigating the provision of Frequency Response chose to address the problem, there should be no objection to an RSG taking responsibility of its members' Frequency Response

Organization	Yes or No	Question 11 Comment
		Obligations in a manner similar to a single BA. Comment 28: In the third paragraph, it is suggested that "as long as all BAs within the RSG use the same events for calculating FRM, BAs within the RSG may allocate a portion of their FRM to another RSG participant." When one considers that there are expected to be over 25 events in the annual calculation, the probability that all BAs in a RSG will have the data available for the same 25 events should be expected to be small, especially for large RSGs. Does selection of events for the RSG members in a manner to insure the same 25 events offer an opportunity to bias the sample?
Response: Comment 20 – Attachment A has been split into two documents. Attachment A now provides the calculation methodology to be used for the standard and a new document titled, "Frequency Response Standard Background Document", that explains the reasoning behind the requirements. These documents have also been revised to provide clarity. Comment 21 – The SDT has removed the reference to "storage" from the documents. Comment 22 – The SDT agrees and has included averaging periods based on AGC scan rates. Comment 23 – The SDT agrees that further development is needed in this area, and will review this issue during the field trial and provide more definitive analyses. Comment 24 – The SDT has revised Attachment A to clarify the calculation methodology. Comment 25 – The NERC Reliability Standards do not necessarily dictate "how" Requirements are satisfied. A market can be created by a region, sub-region, ISO, RTO or other entities as appropriate to facilitate compliance however the NERC Reliability Standards do not establish markets. Comments 26 & 27 & 28 – The SDT appreciates these observations and has taken these comments under consideration including modifying the standard regarding RSGs.		
FMPP	No	It is useful, but Attachment A is not clear.
Response: Attachment A has been split into two documents. Attachment A now provides the calculation methodology to be used for the standard and a new document titled, "Frequency Response Standard Background Document", that explains the reasoning for the requirements. These documents have also been revised for clarity.		
American Electric Power	No	As stated earlier, attempting to follow requirement(s) within multiple versions of the same standard would be very difficult. In addition, more examples should be provided.
Response: Requirement R5 has been inserted back into this version of the draft standard and should eliminate the concern of trying to operate using multiple versions of the same standard. This standard will replace all versions of BAL-003 currently in effect. The SDT has also revised Attachment A and FRS Form 1 to provide clarity.		

Organization	Yes or No	Question 11 Comment
Duke Energy	No	Attachment A is useful, however R2 of the standard references a "calculation methodology detailed in Attachment A" and it isn't clear to us what part of Attachment A is the methodology. Also, in Attachment A the term "Interconnection Frequency Response Obligation" is used, but the definition of FRO says it's a BA value, so that's inconsistent. Overall, we agree that the document is helpful; however, we do believe additional explanation is necessary for Requirement 2. It appears that the responsibility for identifying Frequency Bias Setting is being removed from the Balancing Authority. There is an implied obligation that the ERO will determine the Frequency Bias Setting but it is not stated explicitly. Under the proposed standard, who has the responsibility for determining the Frequency Bias Setting?
Response: The SDT has also revised Attachment A and FRS Form 1 to provide clarity. The SDT is not suggesting that the ERO determine the Frequency Bias Settings. The SDT has modified the language in Requirement R2 to provide further clarity as to the role of the ERO. The Requirement now reads "Each Balancing Authority not participating in Overlap Regulation Service shall implement the Frequency Bias Setting (fixed or variable) validated by the ERO, into its Area Control Error (ACE) calculation beginning on the date specified by the ERO to ensure effectively coordinated Tie Line Bias control."		
Patterson Consulting, Inc.	No	The historical, contextual, and instruction information is valuable and needs to be associated with this standard. This material should not be included in Attacment A, though, as described in previous responses. In addition, there are inconsistent use of definitions and terms in the document that should be corrected.
Response: Attachment A has been split into two documents. Attachment A now provides the calculation methodology to be used for the standard and a new document titled, Frequency Response Standard Background Document", that explains the reasoning for the requirements. These documents have also been revised to provide clarity.		
South Carolina Electric and Gas	Yes	It would be helpful to have a heading to transition from the criteria section to the reasoning section. Also, the title of attachment A should include "Frequency Response" before "Background Document."
Response: The SDT thanks you for your affirmative response and clarifying comment. Attachment A has been split into two documents. Attachment A now provides the calculation methodology to be used for the standard and a new document, titled, "Frequency Response Standard Background Document", that explains the reasoning for the requirements. These documents have also been revised to provide clarity.		
NIPSCO	Yes	Not sure if all the requirements need to be explained, we'll wait for future postings.

Organization	Yes or No	Question 11 Comment
Response: The SDT thanks you for your affirmative response and clarifying comment. Attachment A has been split into two documents. Attachment A now provides the calculation methodology to be used for the standard and a new document, titled, "Frequency Response Standard Background Document", that explains the reasoning for the requirements. These documents have also been revised to provide clarity.		
Westar Energy	Yes	The attachment should be updated as the proposed standard is revised and the standard becomes effective and field test results are available. The typical frequency response curve with points A,B and C should be included and therefore part of the standard.
Response: The SDT thanks you for your affirmative response and clarifying comment. Attachment A has been split into two documents. Attachment A now provides the calculation methodology to be used for the standard and a new document, titled, "Frequency Response Standard Background Document", that explains the reasoning for the requirements. These documents have also been revised to provide clarity. The SDT will evaluate and determine if additional modifications are necessary prior to posting for industry approval. The frequency curve points A, B and C are identified in FRS Form 1 and therefore are part of this standard.		
Manitoba Hydro	Yes	While Attachment A is useful, it could be improved by adding a graph to better illustrate Point A and C and the 4 second data sampling rate.
Response: The SDT thanks you for your affirmative response and clarifying comment. Attachment A has been split into two documents. Attachment A now provides the calculation methodology to be used for the standard and a new document, titled, "Frequency Response Standard Background Document", that explains the reasoning for the requirements. These documents have also been revised to provide clarity.		
Seattle City Light	Yes	
EKPC	Yes	
ENBALA Power Networks	Yes	
SERC OC Standards Review Group	Yes	
Kansas City Power & Light	Yes	

Organization	Yes or No	Question 11 Comment
Independent Electricity System Operator	Yes	
Santee Cooper	Yes	
LG&E and KU Energy	Yes	
Arizona Public Service Company		AZPS agrees it is useful, however, more clarity of how the FRO is determined and how the FRO differs from the FRM.
Response: The SDT thanks you for your comment. Attachment A has been split into two documents. Attachment A now provides the calculation methodology to be used for the standard and a new document, titled, "Frequency Response Standard Background Document", that explains the reasoning for the requirements. These documents have also been revised to provide clarity. The FRO is the minimum amount of Frequency Response needed to comply with this standard. The FRM is the measure of the Frequency response provided during an event.		
Alberta Electric System Operator		AESO suggests that this document should provide a clear description and discussion of the concerns, response measures at different aspects or time frames of frequency response (inertial response, governor response, AGC response; arresting deviation and settled deviation),and should provide technical evidence or reasons why the proposed standard can address the related concerns.
Response: The SDT thanks you for your clarifying comment. Attachment A has been split into two documents. Attachment A now provides the calculation methodology to be used for the standard and a new document, titled, "Frequency Response Standard Background Document", that explains the reasoning for the requirements. These documents have also been revised to provide clarity.		
ISO New Engand Inc.		Attachment A is useful, but it does not provide a clear understanding of all topics and issues.
Response: The SDT thanks you for your clarifying comment. Attachment A has been split into two documents. Attachment A now provides the calculation methodology to be used for the standard and a new document, titled, "Frequency Response Standard Background Document", that explains the reasoning for the requirements. These documents have also been revised to provide clarity.		

Organization	Yes or No	Question 11 Comment
Northeast Power Coordinating Council		Refer to the response to Question 17.
Response: Please refer to our response to Question 17.		

12. ***The proposed standard requires the use of FRS Form 1 for calculating a Balancing Authority's FRM. Do you agree with the SDT that this is the proper method to calculate its FRM? If not, please explain in the comment area and if possible provide an alternate method to calculate FRM.***

Summary Consideration: Several of the commenters agreed that the calculation in FRS Form 1 is the proper method for calculating the FRM. Many commenters expressed concern that the FRM calculation method was simplistic, did not capture all contributing factors, and that use of the median value may result in a determination of noncompliance for otherwise compliant conditions. Regarding FRS Form 1, many calculation errors were identified and several commenters indicated that the information provided was neither clear nor complete. There was general consensus for conducting a field trial during which consideration of other statistical methods will be evaluated by the SDT. A few commenters believe that the 1% of peak formula currently in use should be maintained. Another comment indicated that certain events including contingent Balancing Authority events should not be used for the calculation. One commenter indicated more study is needed to determine how to account for energy flowing across a Balancing Authority's Area since this flow could affect frequency response. Concern was also expressed indicating there is not a reliability basis or replacement for addressing the AGC Frequency Response phase out approach for Requirement R5.

In response to industry comments the SDT has revised FRS Form 1 (including calculations) to allow for adjustments to the calculations. The SDT affirms that the median is the preferred measure for eliminating statistical outliers which have a tendency to skew analysis results. Other statistical methods will be considered by the SDT during the field trial. The SDT agrees there needs to be a floor Frequency Response Setting threshold however the current 1% of peak of peak load/generation threshold is causing many Balancing Authorities to over bias, causing unnecessary ACE and frequency undulations. The drafting team is proposing a phased approach for reducing the Frequency Bias Setting value to less than 1% of peak load/generation for Balancing Authorities with actual Frequency Response is currently less than this value. This approach is detailed in Attachment B.

Organization	Yes or No	Question 12 Comment
Bonneville Power Administration	No	RAS events and Contingent BA events shouldn't be used in the calculation. The FRS Form 1 has a basic flaw that needs correction. For Balancing Authorities that have frequency response wheeled across them by other BAs (for example, with BPA, any contingency that occurs in the south will have frequency response from BCHydro wheeled across it) and the associated losses will show as less frequency response by the BA that is being wheeled across. BPA recommends that the generation and load be measured, primarily generation, in order to find the frequency response of the BA. Since few, if any, BAs directly measure their total load, the calculated load will have the same issue due to the responses wheeling across the BA (load is generally calculated as total generation minus total interchange). Therefore, more study needs to be done to determine how to account for the energy flowing across a BA.
Response: The drafting team has taken the suggestion to exclude RAS events for frequency response analysis and will study this further should there be a need to incorporate more events to perform frequency response analysis.		

Organization	Yes or No	Question 12 Comment
The method of analyzing a BA response is formed on a net metered basis to obtain the BA response. The response is not summed across intermediate BAs for loss consideration and ultimate delivery of energy. In the case of Bias the deviation from present metering is an indication of response and load change within the BA as noted in the response. Frequency response could be calculated by measuring each generator and load bus change but then there are distribution losses reflected in the numbers. The generally accepted method presently assumes that change in loss for the frequency response MW delivery is not significant when delivered by many sources.		
SPP Standards Development	No	We do not necessarily agree that it does. Please see our response to Question 1.For the 2010 survey NERC provided the Points A and Points B for the listed events in the provided spreadsheet. FRS Form 1 does not contain that information, only the delta frequency. Please include the Point A and Point B frequencies for the SEFRD events in FRS Form 1.
Response: Please refer to our response for Question 1. The drafting team has revised FRS Form 1 and Points A and B values are calculated in FRS Form 2 and shown in FRS Form 1. These values will differ for each BA based on readings at the BAs location rather than a specific location in the interconnection.		
IRC Standards Review Committee	No	It is one method, but not necessarily the only proper method. Not all existing methods need to be replaced. The SRC suggests scan data could be used so that different metrics can be evaluated.
Response: The drafting team agrees with the IRC Standards Review committee conclusion that the field trial evaluation will support the proper selection of the metric utilized. The SDT believes there is a need for a common methodology for evaluating Frequency Response.		
ERCOT	No	It is one method, but not necessarily the only proper method. Not all existing methods need to be replaced. The SRC suggests scan data could be used so that different metrics can be evaluated.
Response: The drafting team agrees with the IRC Standards Review committee conclusion that the field trial evaluation will support the proper selection of the metric utilized. The SDT believes there is a need for a common methodology for evaluating Frequency Response.		
ISO New Engand Inc.	No	It is one method, but not necessarily the only proper method.
Response: The drafting team agrees with the IRC Standards Review committee conclusion that the field trial evaluation will support the proper selection of the metric utilized. The SDT believes there is a need for a common methodology for evaluating Frequency Response.		
Kansas City Power & Light	No	This method is too simplistic and does not take into account normal statistical variations in metering accuracy and resolution for generation and tie-lines, does not take into account the natural variations of generation due to mechanical variations, and does not take into account the impact of load control actions on generation. Without taking these variations into account, the outcome is the wild calculation results that have been seen in the current submissions by BA's that should be an indication that the method needs considerable work to be considered useful.

Organization	Yes or No	Question 12 Comment
Response: The drafting team disagrees that the method needs to address SCADA support concerns cited. There should be a documented reason for each error which can be excluded. The field trial evaluation will identify errant calculations and any need for further revision.		
Progress Energy	No	Progress Energy believes you can, and should calculate a frequency response for BAs with the contingency also. We are also not certain that a strict median response should be used as it provides opportunity for BAs to perform moderately most of the year and make up for it with a few days slightly above their desired median target when they should take measures to hit their target every time within a standard deviation tolerance (excluding outliers)
Response: We thank you for your support. The SDT, in consultation with the NERC Frequency Response Initiative, has performed empirical studies that demonstrate the median is more resilient to data quality problems and statistical outliers. The SDT believes that this measurement methodology using the median value is the most appropriate method at this time.		
NorthWestern Energy	No	A Balancing Authority's frequency response is based upon a "median" value calculated from analyzing multiple events. Frequency response during some of these events is better than others, depending on the system conditions at the time and the amount system loading and unloaded generation online at the time of the event. Given these circumstances a BA's actual response could vary by event (better or worse than median), thus compliance measurement per event to a frequency response obligation based on the median response (over multiple events) could put BA's in non-compliant situations unjustly. Page 2 implies that there is currently too much frequency response based on the 1% of peak demand method of establishing frequency bias. Even though NWE does not use the 1% method, NWE feels that the 1% minimum has been a tried and true method of providing frequency response in the Western Interconnection.Without the 1% minimum (and BA's using a natural response less than the 1%), the total interconnection frequency response would decrease according to research. This would lead to decreased interconnection bias, causing other operational issues, such as lower L10 values and possible CPS2 compliance factors.
Response: The drafting team agrees that calculated frequency response varies from event to event. This is because there are multiple Balancing Authorities interconnected and each BA has a small frequency response contribution compared to the variation in its load and generation experienced at any given moment. This is why the drafting team is proposing to use the median value of events selected during the year as a measure of "average" response. The median is the preferred measure to eliminate population statistical outliers which have tendency to skew results. The SDT agrees the Interconnections possess sufficient frequency response. The drafting team is proposing testing using a bias setting value of less than 1% for BAs with frequency response that is less than the 1% value currently calculated in order to better match the natural response. The drafting team agrees there needs to be a floor threshold however the current 1% threshold is causing many BAs to over-bias, resulting in ACE and frequency undulations. Please identify the research indicating control problems would occur using a minimum bias setting that is less than 1%.		

Organization	Yes or No	Question 12 Comment
The SDT agrees bias setting changes may impact CPS compliance calculation which is why the drafting team is proposing field testing using small, incremental changes to the bias setting. Research by Nathan Cohn (Control of Generation and Power Flow on Interconnected Systems) indicates improved AGC and frequency performance can be realized by better matching bias setting to frequency response; which should improve CPS compliance.		
Energy Mark, Inc.	No	Comment 29: I agree that a method similar to the one suggested can be used to calculate the BA's FRM. However, there are a number of errors in the suggested FRS Form 1.Data Entry Tab: Comment 30: The calculation of SEFRD in column G is incorrect for events marked as Internal Contingency in Column I. This calculation must also include the change in internal generation due to the Internal Contingency. This adjustment must either be explained in the "Balancing Authority FRS Form 1 Background and Instructions" or the calculation must be modified using a column added to the NERC FRS Form 1 (between column J and K) to include the size of the Internal Contingency in MW. Comment 31: The calculation in cell L22 is incorrect because it includes the incorrect calculations from the lines that indicate Internal Contingency. If the calculation in column G is corrected this cell will also be corrected. Comment 32: The calculation in cell L23 is incorrect because it includes the incorrect calculations from the lines that indicate Internal Contingency. If the calculation in column G is corrected this cell will also be corrected. Comment 33: The calculation in cell L24 is incorrect. It provides the intercept of the linear regression for the Frequency Response using the Intercept function. It should provide the slope of the regression of the change in NAI from Column F to D regressed against the change in Frequency, Column B, using the LINEST function with a forced fit through the origin, using the function y = mx. The correct value for the sample data in the NERC FRS Form 1 is -24.7, not -16.2. Comment 34: The calculation in cell L27 is incorrect. It provides the intercept of the linear regression for the Frequency Response using the Intercept function. It should provide the slope of the regression of the change in NAI from Column F to D regressed against the change in Frequency, Column B, using the LINEST function with a forced fit through the origin, using the function y = mx. The correct value for the sample data in the NERC FRS Form 1 is -22.5, not -33.9. Comment 35: Cell M19 and M31 should read "...Frequency Response Obligation...", not "...Frequency Requirement Obligation..." Comment 36: The regression methods described in Comments 33 & 34 above provide the best method to calculate FRM. The linear regression method described is the only method of those suggested that properly weights the data with respect to its influence on the value of FRM. Using the median fails to weight the data at all. Using simple averaging weights the smaller events more than the larger events in the sample as compared to their influence on the best estimate for FRM.

Organization	Yes or No	Question 12 Comment
Response: Comments 29,31, 32, 33, 34 and 35 – FRS Form 1 has been revised and corrected Comments 30 – FRS Form 1 has been extensively revised and instructions for its use have be clarified. Comment 36 – The SDT is evaluating several calculation methodologies. The SDT will propose the most suitable method in its final draft of this standard.		
American Electric Power	No	The FRS Form 1 is actually calculating prior performance results from identified events to determine future measure. The calculation method to determine a BA's FRM still is not capturing all contributing factors that occur in real time and have an impact at time of event occurrence to determine frequency response performance to be measured. The calculation method and FRM needs to be more complete to include all of these contributing factors such as magnitude of actual generation on line at time of occurrence that is capable of governor & AGC response, actual generator loading, scheduled interchange imports to balance or meet load demand, etc. The calculation method and FRM also needs to be more dynamic to allow inclusion of these variable contributing factors to be able set proper measure and identify lack of performance to actually address the issue, if there truly is one. There needs to be some form of measure at the actual generator level. Measuring a BA's aggregate response will not address contributing generators having negative governor or AGC frequency response, and puts the entire burden on the BA when the performance issue to be resolved is more at generator level. There appears to be no reliability basis or replacement for addressing the AGC frequency response phase out approach for R5 implementation plan. Without a reliability results based study to support this approach, it appears on the surface that there is the potential to lose some of the AGC part of response. Variable energy resources that are non-responsive must also be addressed in the overall calculation and measure. Because the electric industry has evolved with unbundling of generation/transmission and implementation of energy markets, there needs to be an ancillary service component for frequency response to address the factor of independent players that impact the lack of or negative frequency response issue. When impacting entities have financial factors that conflict with reliability intent, the reliability performance process can be compromised and made more difficult to achieve.
Response: FRS Form 1 has been revised. The dynamic measure as suggested implies the BA should have a dynamic response incorporated into its frequency bias setting as a variable component. The SDT believes that the current 1% of peak of peak load/generation threshold is causing many Balancing Authorities to over bias, causing unnecessary ACE and frequency undulations. The drafting team is proposing a phased approach for reducing the Frequency Bias Setting value to less than 1% of peak load/generation for Balancing Authorities with actual Frequency Response that is currently less than this value. This approach is detailed in Attachment B. The drafting team welcomes the initiative of companies to offer a NAESB solution for ancillary services which is beyond the scope of this SAR.		

Organization	Yes or No	Question 12 Comment
Duke Energy	No	Other factors need to be considered and incorporated in the calculation. See comments to 1 and 2 above.
Response: Please see our response to Questions 1 and 2. FRS Form 1 has been revised and the drafting team will list specific reasons for revisions and event exclusion.		
Patterson Consulting, Inc.	Yes	Pending modifications based on results from the field test and subsequent operation under the new standard, FRS Form 1 is a good start for calculating a Balancing Authority's Frequency Response Measurement and Frequency Bias Setting.
Response: We thank you for your affirmative response and clarifying comment. FRS Form 1 has been revised.		
South Carolina Electric and Gas	Yes	The form must have clear instructions on its use and meanings of the terms.FRS Form 1 and Instructions should be included as an attachment to the BAL-003-1 standard.
Response: We thank you for your affirmative response and clarifying comment. FRS Form 1 has been revised.		
Santee Cooper	Yes	The form must have clear instructions on its use and meanings of the terms. The form should include the ability to take into account changes in metered non-conforming loads.
Response: We thank you for your affirmative response and clarifying comment. FRS Form 1 has been revised to allow for adjustments such as non-conforming load.		
LG&E and KU Energy	Yes	The form must have clear instructions on its use and meanings of the terms.
Response: We thank you for your affirmative response and clarifying comment. FRS Form 1 has been revised.		
FirstEnergy	Yes	Although the method seems acceptable in theory, the results of the field test will be needed to validate the methodology.
Response: We thank you for your affirmative response and clarifying comment.		

Organization	Yes or No	Question 12 Comment
SERC OC Standards Review Group	Yes	The form must have clear instructions on its use and meanings of the terms.
Response: We thank you for your affirmative response and clarifying comment. FRS Form 1 has been revised.		
ENBALA Power Networks	Yes	ENBALA also believes that including an additional metric, such as the metric suggested in the recent Lawrence Berkeley National Laboratory of a nadir-based frequency response, would be useful in assessing the current inertial response capabilities and level of risk for under-frequency load shedding.
Response: We thank you for your affirmative response and clarifying comment. The SDT will consider your suggestion during the field trial.		
NIPSCO	Yes	Seems straightforward compared to other methods
Response: We thank you for your affirmative response and clarifying comment.		
EKPC	Yes	The form should include clear instructions for use and clear definitions for terms.
Response: We thank you for your affirmative response and clarifying comment. FRS Form 1 has been revised.		
Manitoba Hydro	Yes	Although it can be difficult for some events to determine the NIA and load values for the A & B points(due to significant signal variations), this is still the best known method at this time.
Response: We thank you for your affirmative response and clarifying comment. FRS Form 1 has been revised.		
Seattle City Light	Yes	
We Energies	Yes	
Westar Energy	Yes	

Organization	Yes or No	Question 12 Comment
FMPP	Yes	
Arizona Public Service Company	Yes	
Midwest ISO Standards Collaborators	Yes	
Independent Electricity System Operator	Yes	
MRO's NERC Standards Review Subcommittee	Yes	
Alberta Electric System Operator		The standard uses median of multiple SEFRD for the calculation of FRM, which is a reasonable method. The AESO suggests NERC considers the alternative "zero-cross linear regression" method for the FRM calculation. The key difference of "zero-cross linear regression" is that it puts more weight on events with bigger frequency deviation. As the standard is to address the concerns related with large frequency error that could cause UFLS, the more weight put on larger events seems more reasonable.
Response: We thank you for your input and suggested method will be considered during the field trial.		
Northeast Power Coordinating Council		Refer to the response to Question 17.
Response: Please see our response to Question 17.		

13. ***The proposed standard requires the use of FRS Form 1 for calculating a Balancing Authority's Frequency Bias Setting. Do you agree with the SDT that this is the proper method to calculate its Frequency Bias Setting? If not, please explain in the comment area and if possible provide an alternate method to calculate Frequency Bias Setting.***

Summary Consideration: Many of the commenters agreed with requiring the use of FRS Form 1 for calculating a Balancing Authority's Frequency Bias Setting. Most commenters agreed with the concept but expressed concern that FRS Form 1 had errors, incorrect calculations, did not provide consideration for variable bias, and instructions were vague. Some commenters indicated that the methodology was too simplistic and use of the median value is not an adequate approach. Comments were also received suggesting the current 1% of peak methodology is a proven method that should be maintained and each Balancing Authority should be allowed to determine its Frequency Bias Setting. One commenter suggested the FRO value should not be considered when determining the Frequency Bias Setting. Another commenter suggested gradually lowering the Frequency Bias Setting floor threshold over several years to assess the associated reliability impacts. The SDT agrees and implemented this approach. Initially the FRM will be computed to 0.8% of the Balancing Authority's forecasted peak load or generation. A recommendation was provided to estimate the Frequency Bias Setting using a linear slope approach with a least square fit method. The SDT will assess this method as part of the field trial. Observations provided include field testing must validate the methodology and that the methodology should include two measures (AGC and interchange) for identifying lack of frequency response.

In response to industry comments the SDT has revised FRS Form 1 to allow adjustments for known variables that will impact the measure. One commenter noted that Requirement R2 states that the ERO will provide the Frequency Bias Setting for each Balancing Authority whereas FRS Form 1 specifies a calculation to obtain a value which the ERO is not required to review or use. The SDT has modified the requirement to address this process reporting and implementation concern.

Organization	Yes or No	Question 13 Comment
Bonneville Power Administration	No	BPA thinks that the Form can be used as a tool, but the results shouldn't be the required Frequency Bias setting. Each individual BA should be allowed to set their own. Also, this shows no consideration for variable bias. Variable bias changes greatly during a contingency and this should be considered.Please see comments to number 12.
Response: The SDT agrees that measurement of individual generator's performance would produce a more accurate measure of Primary Frequency Control and that the SDT had not considered losses within a BA's system due to frequency response of other BA's frequency response flowing through their system. This could indeed have some effect on the accuracy of the measure when using Interchange Actual for the measure. The SDT agrees that variable bias, based on real time conditions (up and down headroom) of on line generators and other frequency responsive devices, will produce the most accurate value for the bias setting if the BA implements a program that will accurately estimate Primary Frequency Control from each of its generators or other frequency responsive devices and account for load dampening. Form 1 could still be used as a confirmation of general performance and to consistently measure every BA to the same events for comparison to the Interconnection's performance as a whole. If the BA were willing to measure performance of each generator and other frequency responsive devices to the same list of events as an additional measure, this could be used in the field trial to determine the magnitude of the measurement error of Form 1.		

Organization	Yes or No	Question 13 Comment
The SDT would like to move the industry to accept the use of variable bias as the superior method for setting the Bias in the ACE equation as long as the BA meets its minimum FRO and that the variable bias result matches actual Primary Frequency Control performance within some tolerance. A BA should not be allowed to use a variable bias just to inflate their L10 values for CPS2 compliance.		
SPP Standards Development	No	We do not necessarily agree that it does. Please see our response to Question 1.Given the disclaimers on page 7 of the FRS Form 1 instructions under Data Values, do the BAs have the discretion to change data in Form 1 if it doesn't match the data they recorded on their system?
Response: FRS Form 1 has been revised to allow adjustments for known variables that will impact the measure. The field trial will validate the accuracy of the measure and identify problems using Interchange Actual. The BA can adjust the t (0) event time to align with their frequency data but they should not change their data. Adjustments should be made in the columns provided in the revised FRS Form 1.		
IRC Standards Review Committee	No	It appears to be one acceptable method, but not all the calculations done through the use of the form are clearly described. Further, it says that the Frequency Bias Setting will be based upon the FRM, but it doesn't say how that will be done.
Response: FRS Form 1 has been revised to be clearer. Initially the FRM will be compared to 0.8 % of the BA's forecasted peak load or generation. The Bias setting will be based on the larger value. BA's will continue to be able to use a variable bias.		
ERCOT	No	It appears to be one acceptable method, but not all the calculations done through the use of the form are clearly described. Further, it says that the Frequency Bias Setting will be based upon the FRM, but it doesn't say how that will be done.
Response: FRS Form 1 has been revised to be clearer. Initially the FRM will be compared to 0.8 % of the BA's forecasted peak load or generation. The Bias setting will be based on the larger value. BA's will continue to be able to use a variable bias.		
Kansas City Power & Light	No	This method is too simplistic and does not take into account normal statistical variations in metering accuracy and resolution for generation and tie-lines, does not take into account the natural variations of generation due to mechanical variations, and does not take into account the impact of load control actions on generation. Without taking these variations into account, the outcome is the wild calculation results that have been seen in the current submissions by BA's that should be an indication that the method needs considerable work to be considered useful.
Response: When the BA's bias setting closely matches natural Primary Frequency Control, L10 and CPS1 and CPS2 will more accurately measure the BA's ACE impact on the Interconnection's frequency. This may also cause greater difficulty maintaining CPS1 and CPS2 compliance. The sample size of identified events is intended to address BA performance variability concerns. FRS Form 1 has been revised to account for known variables that will impact the measure. The SDT believes that when actual BA Primary Frequency Control		

Organization	Yes or No	Question 13 Comment
improves, the measure will be more consistent and useful.		
Progress Energy	No	The FRO should not be part of the determination of the bias setting unless you are actually going to respond by the FRO value. BAs should be trying to get their FRC <= FRO, but not biasing by the FRO. The bias has no effect on the FRC. Progress Energy also think the % of projected peak requirement should be removed now.
Response: The SDT agrees that the % of projected peak requirement has been contributing to Secondary Frequency Control problems and has determined that a phased-in approach is the preferred method of eliminating this requirement. The FRO is not intended to be the BA's bias setting unless the BA's actual Primary Frequency Control is equal to the BA's FRO and meets the minimum of the 0.8% of the BA's forecasted Peak Load or Generation.		
NIPSCO	No	Not sure, It appears that the FR is about 1/2 of the freq bias in the East Int. I think that the bias could be brought down gradually over several years while monitoring system frequency for reliability.
Response: The SDT agrees and the standard has been modified to reflect your concern.		
NorthWestern Energy	No	Page 2 implies that there is currently too much frequency response based on the 1% of peak demand method of establishing frequency bias. Even though NWE does not use the 1% method, NWE feels that the 1% minimum has been a tried and true method of providing frequency response in the Western Interconnection.Without the 1% minimum (and BA's using a natural response less than the 1%), the total interconnection frequency response would decrease according to research. This would lead to decreased interconnection bias, causing other operational issues, such as lower L10 values and possible CPS2 compliance factors. A Balancing Authority's frequency response is based upon a "median" value calculated from analyzing multiple events. Frequency response during some of these events is better than others, depending on the system conditions at the time and the amount system loading and unloaded generation online at the time of the event. Given these circumstances a BA's actual response could vary by event (better or worse than median), thus compliance measurement per event to a frequency response obligation based on the median response (over multiple events) could put BA's in non-compliant situations unjustly.
Response: The drafting team agrees that calculated frequency response varies from event to event. This is because there are multiple Balancing Authorities interconnected and each BA has a small frequency response contribution compared to the variation in its load and generation experienced at any given moment. This is why the drafting team is proposing to use the median value of events selected during the year as a measure of "average" response. The median is the preferred measure to eliminate population statistical outliers which have tendency to skew results. The SDT agrees the Interconnections possess sufficient frequency response. The drafting team is proposing testing using a bias setting value of less than 1% for BAs with frequency response that is less than the 1% value currently calculated in order to better match the natural response. The drafting team agrees there needs to be a floor threshold however the current 1% threshold is		

Organization	Yes or No	Question 13 Comment
causing many BAs to over-bias, resulting in ACE and frequency undulations. Please identify the research indicating control problems would occur using a minimum bias setting that is less than 1%. The SDT agrees bias setting changes may impact CPS compliance calculation which is why the drafting team is proposing field testing using small, incremental changes to the bias setting. Research by Nathan Cohn (Control of Generation and Power Flow on Interconnected Systems) indicates improved AGC and frequency performance can be realized by better matching bias setting to frequency response; which should improve CPS compliance. The SDT agrees bias setting changes may impact CPS compliance calculation which is why the drafting team is proposing field testing using small, incremental changes to the bias setting. Research by Nathan Cohn (Control of Generation and Power Flow on Interconnected Systems) indicates improved AGC and frequency performance can be realized by better matching bias setting to frequency response; which should improve CPS compliance. The SDT fails to see the implication that there is too much frequency response based on the 1% of peak demand method of establishing frequency bias. The bias setting will not increase or decrease Primary Frequency Control. It will only impact the measure of ACE and the resulting Secondary Control of the BA. The 1% minimum requirement was appropriate in the past when BA's Primary Frequency Control was nearly equal to 1% of the forecasted peak load or peak generation. Form 1 and this revision to BAL-003 would still require that the Bias setting in the ACE equation be equal to or greater than the natural Primary Frequency Control of the BA with a minimum value of 0.8% of the BA's forecasted peak load or peak generation. When the BA's bias setting closely matches natural Primary Frequency Control, L10 and CPS1 and CPS2 will more accurately measure the BA's ACE impact on the Interconnection's frequency. This may also cause greater difficulty maintaining CPS1 and CPS2 compliance. The sample size of identified events is intended to address BA performance variability concerns. The field trial results should prove if this is a correct assumption.		
Energy Mark, Inc.	No	Comment 37: My initial comments associated with calculation of the Frequency Bias Setting are included in my comments 3, 4, 5, 6, 30, 31, 32, 33, 34 and 36. Comment 38: The determination of the Frequency Bias Setting using a median or mean value provides an incorrect weighting of the individual SEFRD measurements to correctly determine the Frequency Bias Setting. The Frequency Bias Setting as used in the ACE Equation represents a linear function of Frequency Response to frequency error. The best estimate of the Frequency Bias Setting from this SEFRD data is the slope of the line through the origin using a least-squares fit. Any other method of determining the Frequency Bias Setting will improperly weight the individual data points contribution to the error thus providing a poorer estimate of the true value of Frequency Response.
Response: Comment 37 - Please refer to our response to the comments noted. Comment 38 - Once events have been identified and data collected the SDT can and will use multiple methods of determining the best selection of a bias setting for BA's using a fixed bias. The SDT will include your recommended method as one that is considered.		
FMPP	No	It would be better to define significant and let the BA exclude any events that meet this definition, since each BA will be ramping differently. Since SEFRD is defined as the individual sample of event data from a Balancing Authority which represents the change in Net Actual Interchange (NIA), divided by the change in frequency, expressed in MW/0.1Hz, whenever a BA includes an event with a "significant" change in NIA due

Organization	Yes or No	Question 13 Comment
		to a large interchange schedule ramp, the FRM is totally skewed, and should not be included. If other events are available means that if other events are not available then an entity's compliance is going to be based on an event or events that has been skewed for the BA by significant interchange schedule ramp.
Response: FRS Form 1 has been revised to account for known variables that will impact the measure. The SDT believes that when actual BA Primary Frequency Control improves, the measure will be more consistent and useful. Using identified events and measuring every BA's performance during these events will provide comparison of all BA's performance to the Interconnection's performance as a whole.		
American Electric Power	No	There should be two measures to identify lack of frequency response: A calculation and measure for the AGC part of frequency response based on actual load and generation on line at time of occurrence that is variably adjusted and measured, while also accounting for interchange imports to balance. Today's frequency bias setting does not really address the governor response issue. There also needs to be some form of generator governor response calculation and measure that starts with a base foundation of droop setting/relative governor response and is adjusted accordingly. As WECC appears to have shown in its studies, there would be excessive governor response based on current droop setting if governors responded as they are expected. This could be an indicator that governor response measure should only be a percentage of this droop, which protects the generator. Different types of generators and their characteristics must also be factored in.Since there does not appear to be a performance issue with the Standards involving CPS, we do not believe the CPS Bounds L10 values should be reduced.
Response: FRS Form 1 has been revised to account for identified variables in measuring Primary Frequency Control. The SDT agrees that measuring generator governor response and Primary Frequency Control would be beneficial for determining proper delivery of frequency response. The SDT also agrees that generator governor and droop settings will impact Primary Frequency Control but this concern is outside the scope of this project and a separate SAR will be required to address governor settings. The SDT is not aware of any WECC studies indicating excessive governor response based on current droop settings if governors responded as they are expected. The industry nominal droop setting is 5% and this level of performance should limit transmission flows across specific elements unless the planning process does not account for this flow during contingencies. If Primary Frequency Control is not evenly distributed across the Interconnection or there is not participation in Primary Frequency Control by all generators with sufficient regulation margin, elements of the transmission system can become overloaded during a contingency. The SDT believes that when the Bias setting in the BA's ACE equation closely matches the Primary Frequency Control of the BA, then the ACE will accurately measure the BA's impact on Interconnection frequency through the CPS 1 and CPS 2 measures. If a BA has very low Primary Frequency Control and resulting lower Bias setting, the L10 value will change also.		
Duke Energy	No	Other factors need to be considered and incorporated in the calculation. See comments to 1 and 2 above.
Response: FRS Form 1 has been revised to account for known variables.		
Patterson Consulting, Inc.	Yes	Requirement 2 states that the ERO will provide the Frequency Bias Setting for each Balancing Authority. While FRS Form 1 makes a calculation, the requirement does not require the ERO to review or use the FRS Form 1 value. Otherwise, pending modifications based on results from the field test and subsequent operation

Organization	Yes or No	Question 13 Comment
		under the new standard, FRS Form 1 is a good start for calculating a Balancing Authority's Frequency Response Measurement and Frequency Bias Setting.
Response: The SDT has modified the requirement to address the reporting and implementation process of the bias setting.		
South Carolina Electric and Gas	Yes	The form must have clear instructions on its use and meanings of the terms. FRS Form 1 and Instructions should be included as an attachment to the BAL-003-1 standard.
Response: The SDT agrees and has revised Form 1 with instructions to provide clarity in using the form.		
Santee Cooper	Yes	The form must have clear instructions on its use and meanings of the terms.
Response: The SDT agrees and has revised Form 1 with instructions to provide clarity in using the form.		
MRO's NERC Standards Review Subcommittee	Yes	We agree that using Points A and B is correct and the calculations in the spreadsheet are correct.
Response: Thank you for your comment.		
LG&E and KU Energy	Yes	The form must have clear instructions on its use and meanings of the terms.
Response: The SDT agrees and has revised Form 1 with instructions to provide clarity in using the form.		
Midwest ISO Standards Collaborators	Yes	We agree that using Points A and B is correct and the calculations in the spreadsheet are correct.
Response: Thank you for your comment.		
FirstEnergy	Yes	Although the method seems acceptable in theory, the results of the field test will be needed to validate the methodology.
Response: The SDT agrees. The field test will utilize the method to test the measure.		
SERC OC Standards Review Group	Yes	The form must have clear instructions on its use and meanings of the terms.
Response: The SDT agrees and has revised Form 1 with instructions to provide clarity in using the form.		

Organization	Yes or No	Question 13 Comment
EKPC	Yes	The form should include clear instructions for use and clear definitions for terms.
Response: The SDT agrees and has revised Form 1 and included instructions to provide clarity in using the form.		
We Energies	Yes	
Seattle City Light	Yes	
Manitoba Hydro	Yes	
Independent Electricity System Operator	Yes	
Arizona Public Service Company	Yes	
ENBALA Power Networks	Yes	
Westar Energy	Yes	
Alberta Electric System Operator		The AESO finds it difficult to comment as it is not clear how the FRO is determined.
Response: The revised instructions clarify the method for determining the FRO.		
Northeast Power Coordinating Council		Refer to the response to Question 17.
Response: Please refer to our response for Question 17.		

14. ***The SDT has provided a document (FRS Form 1 Instructions) describing how to use FRS Form 1 for calculating FRM and Frequency Bias Setting. Do you agree with the SDT that this document provides a clear understanding of how to use the form? If not, please explain in the comment area.***

Summary Consideration: Several of the commenters did not agree that FRS Form 1 instructions provide a clear understanding of how to use the form. The majority of commenters indicated that the instructions were incomplete, unclear, required better definitions, lacked variable bias information, technically incomplete and mainly provided background information. In response to industry comments the SDT has revised FRS Form 1 instructions and removed the background information.

Organization	Yes or No	Question 14 Comment
MRO's NERC Standards Review Subcommittee	No	On page 5 and 6, graphics appear to be missing. This document really provides no instructions but rather explanations and background material for measuring frequency events. Instructions would be more along the lines of step 1: Enter date in box, etc.
Response: The SDT has modified the FRS Form 1 and included instructions to provide clarity in using the form.		
Midwest ISO Standards Collaborators	No	On page 5 and 6, graphics appear to be missing. This document really provides no instructions but rather explanations and background material for measuring frequency events. Instructions would be more along the lines of step 1: Enter date in box, etc.
Response: The SDT has modified the FRS Form 1 and included instructions to provide clarity in using the form.		
FirstEnergy	No	On page 5 and 6, graphics appear to be missing. This document really provides no instructions but rather explanations and background material for measuring frequency events. Instructions would be more along the lines of step 1: Enter date in box, etc.
Response: The SDT has modified the FRS Form 1 and included instructions to provide clarity in using the form.		
We Energies	No	On page 5 and 6, graphics appear to be missing. This document really provides no instructions but rather explanations and background material for measuring frequency events. Instructions would be more along the lines of step 1: Enter date in box, etc.
Response: The SDT has modified the FRS Form 1 and included instructions to provide clarity in using the form.		
LG&E and KU Energy	No	We believe the FRS form 1 instructions should be improved by better defining the terms used and improving the overall layout of the form. The document provided should be corrected so that all figures are viewable

Organization	Yes or No	Question 14 Comment
Response: The SDT has modified the FRS Form 1 and included instructions to provide clarity in using the form.		
SERC OC Standards Review Group	No	We believe the FRS form 1 instructions should be improved by better defining the terms used and improving the overall layout of the form. Fiqure 1 in Section B of the FRS Form 1 Instructions document should be corrected so that it is viewable.
Response: The SDT has modified the FRS Form 1 and included instructions to provide clarity in using the form.		
South Carolina Electric and Gas	No	We believe the FRS form 1 instructions should be improved by better defining the terms used and improving the overall layout of the form. The document provided should be corrected so that all figures are viewable.
Response: The SDT has modified the FRS Form 1 and included instructions to provide clarity in using the form.		
Bonneville Power Administration	No	There is no explanation for variable bias. If the suggesting from tab 2 is that a monthly average should be used then this grossly misrepresents the amount of variable bias that is used during a contingency. For example: BPAs monthly average ranges from-150 to -160, but during a contingency it can be in the -400 to -500 range. Figure 1 does not show up so it cannot be determined if BPA agrees with Points A, B and C. Averaging the pre and post data with 16 seconds and 34 seconds, respectively, will cause the calculations to be skewed with some generator response, some tertiary response, etc. We do agree, if Figure 1 appears, that this does spell out how to use the form, BPA just has issues with the data to be provided.
Response: Variable frequency bias settings are determined by Balancing Authorities using a calculation based on present operating conditions. The SDT is aware of the extraneous influences in Net Actual Interchange values, and intends to select a sampling interval and an aggregation technique to minimize these influences. We apologize for the exclusion of Figure 1. The SDT has removed this figure from the revised instructions and has modified the FRS Form 1 and including instructions within the form to provide clarity in using the spreadsheet.		
SPP Standards Development	No	This document provides valuable background information regarding frequency deviations but lacks the specific line-by-line Form 1 instructions as mentioned at the top of page 7. We need those details, what goes in each column, how do we determine which values to use, etc. This would tend to minimize any confusion that currently exists regarding completing the form.One specific item we'd like to see provided in the instructions, as well as changed in Form 1, is carrying the Frequency Bias Setting value (Cell L32) out to two decimals. The current limitation of one decimal has caused confusion in past surveys.
Response: The SDT has modified the FRS Form 1 and included instructions to provide clarity in using the form.		

Organization	Yes or No	Question 14 Comment
IRC Standards Review Committee	No	The document explains much of the FRS Form 1, but not all, as commented previously.
Response: The SDT has modified the FRS Form 1 and included instructions to provide clarity in using the form.		
ERCOT	No	The document explains much of the FRS Form 1, but not all, as commented previously.
Response: The SDT has modified the FRS Form 1 and included instructions to provide clarity in using the form.		
Progress Energy	No	The forms clarity can only truly be found by reverse engineering the formulas within each of the cells.
Response: The SDT has modified the FRS Form 1 and included instructions to provide clarity in using the form.		
ENBALA Power Networks	No	The FRS Form 1 Instructions that was downloaded from the supporting website seemed to be missing information on page 5. We found that the accompanying FRS Form 1 (excel document) was more useful than the actual instruction document in providing detail on the required calculation for the Bias Setting.
Response: The SDT has modified the FRS Form 1 and included instructions to provide clarity in using the form.		
Energy Mark, Inc.	No	Comment 39: The following comments apply to Balancing Authority FRS Form 1 Background and Instructions.Section A: Comment 40: The last sentence in the second paragraph should be modified to read, “Therefore, it is better to analyze response only when significant frequency deviations occur until better measurement methods can be developed to overcome these difficulties.”Section A, Subsection 1, Frequency Response: Comment 41: The words “continuous and inverse relationship” should be changed to “bidirectional, continuous and inverse relationship” in all three bullets. Frequency Response that is not provided bi-directionally will be rapidly depleted by oscillating frequency events. Comment 42: If a BA has “non-bidirectional step-function Frequency Response” to frequency, it must also have sufficient continuous frequency response to restore frequency, frequency response, and frequency responsive reserves (margins) following the use of the “non-bidirectional step-function Frequency Response.” Therefore, the Frequency Response of primary interest for this standard is a subset of the Frequency Response defined in the NERC Glossary. Comment 43: Simulations and actual experience on the interconnections have demonstrated that step function Frequency Responses can result in frequency instability and oscillations when they are not effectively coordinated with bidirectional, continuous and inverse Frequency Response. Therefore, it is imperative that the standard differentiate this bidirectional, continuous and inverse Base Frequency Response from other

Organization	Yes or No	Question 14 Comment
		Supplemental Frequency Responses that can be applied under restricted conditions to supplement it.Section A, Subsection 2, Response to Internal and External Generation/Load Imbalances: Comment 44: Most AGC Systems use the Frequency Bias Setting in conjunction with the frequency deviation to determine whether an imbalance in load and generation is internal or external to the BA. This can only be done effectively when the Frequency Bias Setting matches the internal Frequency Response of the BA. Unless the minimum Frequency Bias Setting requirements are modified to allow this matching to be implemented, the most AGC Systems will be unable to perform as indicated in this subsection.Section A, Subsection 4, Effects of a Disturbance on all Balancing Authorities...: Comment 45: The description should be modified as follows; "When a loss of generation occurs, Interconnection frequency declines because machine speed must decrease to supply the energy shortfall from rotating kinetic energy. Initially, rotating kinetic energy from all rotating machines with direct mechanical-to-electrical coupling addresses the entire shortfall by lowering machine speed, and hence frequency, of the Interconnection*.* Initially, an amount of kinetic energy equal to the power (generation) lost will be withdrawn from the stored energy in rotating machines with direct mechanical-to-electrical coupling throughout the Interconnection. As the mechanical speeds are reduced, Interconnection frequency decreases proportionally. Comment 46: The term Inadvertent Interchange is not correctly used at the end of the first paragraph. Tie flow error indicates power. Inadvertent Interchange indicates energy (power integrated over an hour). A better sentence would be, "The resulting tie flow error (NIA - NIS) will be integrated into Inadvertent Interchange." Comment 47: The first sentence in the fifth paragraph states, "If the Frequency Bias Setting is greater (as an absolute value) than the Balancing Authority's actual Frequency Response, then its AGC will ... , which further helps arrest the frequency decline, but increases Inadvertent Interchange. Frequency decline is arrested within the first 10 seconds of an imbalance by the Frequency Response of the interconnection. AGC action is not initiated until many seconds after the frequency decline is arrested. Therefore, a Frequency Bias Setting greater than the actual Frequency Response will not result in the AGC System having any effect on the arrested frequency or make any contribution to arrest the frequency decline. The only effect will be to provide aid during the initial stages of the frequency recovery which is immediately withdrawn during the later stages of the frequency recovery, while contributing to Inadvertent Interchange. In fact, the effect of a Frequency Bias Setting greater than the actual Frequency Response is very similar to the effect the a BA receives from a reserve sharing group with the exception that the reserve sharing group does not withdraw the aid until after the frequency recovery has been completed. The last sentence in this paragraph is also incorrect for the same reasons stated previously. If a BA's Frequency Bias Setting is less than the actual Frequency Response, the BA will still contribute to arresting the frequency, however, it may withdraw its Frequency Response before the contingent BA or Reserve Sharing Group is able to initiate recovery contributing to further frequency decline or a delayed frequency recovery.Section A, Subsection 5, Effects of a Disturbance on the Contingent Balancing Authority: Comment 48: In the first sentence, the phrase "as allowed by the Frequency Bias Settings" refers to the

Organization	Yes or No	Question 14 Comment
		replacement power provided to the Contingent BA from the interconnection. The initial amount of replacement power supplied to the Contingent BA is unaffected by the Frequency Bias Settings. The Frequency Bias Settings will only affect how quickly the replacement power is withdrawn after the frequency is arrested and stabilizes. The risk is that the replacement power will be withdrawn before the Contingent BA or RSG can replace it. Comment 49: The two boxes indicating that the Point A and Point B values are averages should also indicate that the averaging periods for these calculations vary with the scan rate used to collect the data. The correct averaging periods were presented in Definitions of Frequency Values for Frequency Response Calculation in NERC Reference Document - Understand and Calculating Frequency Response.
Response: Comments 39 through 48: The SDT has removed the FRS Form 1 Background Document from this standard and therefore your comments concerning language within this document are not incorporated in this version. Comment 49: The SDT created FRS Form 2 to address your comments. In addition, the SDT has extensively modified the instructions for the use of these forms to provide additional clarity.		
EKPC	No	The form should include clear instructions for use and clear definitions for terms. All figures within the document should be viewable. More examples for various situations (non-conforming loads) should be included.
Response: The SDT has removed the FRS Form 1 Background Document from this standard and therefore your comments concerning figures within this document are not incorporated in this version. The SDT has modified the FRS Form 1 and included detailed instructions within the form to provide clarity in using the form.		
American Electric Power	No	The FRO value and calculation formula assigned by the ERO is not totally clear. The survey form should indicate the complete formula used by the ERO. It appears to be missing.
Response: The information you are referencing is now included in Attachment A. The SDT has also modified the FRS Form 1 and included detailed instructions to provide clarity in using the form.		
Duke Energy	No	The form does not recognize the impacts noted in the comment to 1 above. The form does show a column that appears to allow for exclusion of contingent BA events, but it is not clear how that is accomplished, nor how doing so matches the definitions currently proposed. Duke Energy agrees with the SERC OC comments "We believe the FRS form 1 instructions should be improved by better defining the terms used and improving the overall layout of the form. The document provided should be corrected so that all figures are viewable." The form does not provide much in the way of instructions.

Organization	Yes or No	Question 14 Comment
Response: The SDT has removed the FRS Form 1 Background Document from this standard and therefore your comments concerning figures within this document are not incorporated in this version. The SDT has also modified the FRS Form 1 and included detailed instructions within the form to provide clarity in using the form.		
Santee Cooper	Yes	The instructions should include how to take into account changes in metered non-conforming loads.
Response: The SDT thanks you for your affirmative response and clarifying comment. The SDT has modified FRS Form 1 to allow for adjustments such as non-conforming load. The SDT has modified the FRS Form 1 and included instructions to provide clarity in using the form.		
NIPSCO	Yes	We didn't read it but the form looks good.
Response: The SDT thanks you for your affirmative response and clarifying comment. The SDT has modified the FRS Form 1 and included instructions to provide clarity in using the form.		
Patterson Consulting, Inc.	Yes	There are inaccuracies that should be corrected, but the document is useful and valuable. The desired "averaging" of scan-cycle data included in FRS Form 1 Background and Instructions should be made mandatory to achieve the standard's purpose of providing consistent measurement methods.
Response: The SDT thanks you for your affirmative response and clarifying comment. The SDT created FRS Form 2 to address the averaging issue identified in your comment. In addition, the SDT has extensively modified the instructions for the use of these forms to provide additional clarity. The SDT has also modified the FRS Form 1, correcting errors in the calculations.		
FMPP	Yes	
Seattle City Light	Yes	
Manitoba Hydro	Yes	
NorthWestern Energy	Yes	
Independent Electricity System Operator	Yes	

Organization	Yes or No	Question 14 Comment
Kansas City Power & Light	Yes	
Arizona Public Service Company	Yes	
Northeast Power Coordinating Council		Refer to the response to Question 17.
Response: Please refer to our response to Question 17.		

15. ***The SDT is soliciting comments on methods of obtaining Frequency Response to meet the FERC Order 693 directive. If possible please provide any thoughts you may have on this subject.***

Summary Consideration: Stakeholders provided the suggestions shown below as possible methods of obtaining Frequency Response to meet the FERC Order 693 directive:

1. Develop requirements applicable to the Generator Owner.
2. Address droop, dead band settings and governor operation.
3. Corroborate with manufacturers to address load demand response.
4. Use generator output as a primary input for calculating Frequency Response
5. Define ways Reserve Sharing Groups can assist Balancing Authorities in providing Frequency Response.
6. Write standard requirements based on performance needs.
7. Establish demand response as an ancillary service providing frequency response.
8. Do not apply the standard to entities that do not have generation resources.
9. Create a primary frequency market.
10. Keep the 1% method currently in use.
11. Ensure generators provide appropriate governor response and merchant generation contracts include a Frequency Response obligation.
12. Develop a specific continent wide Frequency Response definition.
13. Provide a customer compensated pre-emptive load shedding program.

In response to industry comments the SDT delivered to NERC staff the recommendation for collaboration between the ERO and manufacturers regarding load demand response. The SDT has specified in the latest draft standard other methods for a BA to obtain Frequency Response. The SDT will examine, during the field trial, the possibility of transferring Frequency Response between BAs.

Organization	Yes or No	Question 15 Comment
Santee Cooper		The SDT should consider focusing and directing requirements at root causes. Specifically, the SDT should develop requirements that apply to GOs and address droop requirements, deadband settings, governor operation, etc., as well as specific response expectations which are measured and compared to reported

Organization	Yes or No	Question 15 Comment
		settings. Such requirements would likely include exemption criteria to address older existing systems as well as current operating conditions. Newer systems should be developed, however, to meet specific requirements that will ultimately improve or maintain Frequency Response at acceptable levels. Subsequent efforts by the ERO should also consider collaboration with manufacturers to address demand responses associated with loads.
Response: This issue has been discussed and the SDT understands your concern. However, governor droop requirements, dead-band settings and governor operation are outside the scope of the project approved SAR. The SDT believes that the Generator Verification standards will help address these concerns. The SDT will pass on your suggestion concerning further collaborations between the ERO and manufacturers.		
Bonneville Power Administration		Primarily, frequency response comes from governor control at generators. In order to accurately measure this, the output of generation should be used as one of the primary inputs to the calculation of frequency response. Due to losses, as earlier explained, some BAs could be penalized due to losses associated with other BA frequency response flowing over the BAs' transmission system. This needs to be taken into account when calculating the frequency response of the BAs.
Response: The SDT does not have adequate information to address this suggestion. An impact study would be the best option for conducting an analysis.		
SPP Standards Development		The SDT has already offered a suggestion that Reserve Sharing Groups could assist Balancing Authorities in the provision of Frequency Response. We're not familiar with such arrangements within Reserve Sharing Groups and would need more information regarding the specifics of such sharing arrangements. That being the case, as written the draft standard does not provide for the provision of Frequency Response by any entity other than a Balancing Authority. Such arrangements would definitely have to be reflected in modifications to Form 1.
Response: Since these are new Requirements, existing RSG agreements most likely do not address Frequency Response. The SDT has revised the standard to include RSGs. The SDT has also specified in the latest draft standard version other methods for a BA to obtain Frequency Response. The SDT will examine, during the field trial, the possibility of transferring Frequency Response between BAs.		
IRC Standards Review Committee		Demand Response performing as an ancillary service in which the resources are paid to reduce load upon automatic or manual deployment can provide frequency response. Other devices are available, such as flywheels or storage arrangements, such as battery banks, that can provide fast and sustainable response, could also provide frequency response. The standard must be written around performance requirements and results rather than prescriptive requirements that may have the unintended consequence of stifling innovation and creativity in this area. Within the ERCOT Interconnection and the ERCOT market construct, an ancillary service titled Load acting as a Resource (LaaR) may provide up to 50% of the responsive reserve requirement and provides automatic underfrequency relay activated response to frequency drops. Other market constructs provide for similar

Organization	Yes or No	Question 15 Comment
		services. As indicated in our comments under Q2, there is a missing piece to maintaining system frequency and arresting frequency deviation, and that is the generators' governor response. We suggest the SDT conduct an industry discussion on this subject, and determine the entity(ies) responsible for governor actions/setting, the mechanism to provide such a response, and the place for stipulating the necessary standard requirements to enforce compliance for governor actions before further developing this BAL-003-1 standard.
Response: Manual deployment is not quick enough for frequency response. Automatic deployment of other devices could be useful to provide the desired frequency response. The SDT has also specified in the latest draft standard version other methods for a BA to obtain Frequency Response. Regarding governor response - this issue has been discussed and the SDT understands your concern However, generator droop requirements, dead-band settings and governor operation are outside the scope of the project approved SAR. The SDT believes that the Generator Verification standards will help address these concerns.		
ERCOT		Demand Response performing as an ancillary service in which the resources are paid to reduce load upon automatic or manual deployment can provide frequency response. Other devices are available, such as flywheels or storage arrangements, such as battery banks, that can provide fast and sustainable response, could also provide frequency response. The standard must be written around performance requirements and results rather than prescriptive requirements that may have the unintended consequence of stifling innovation and creativity in this area. Within the ERCOT Interconnection and the ERCOT market construct, an ancillary service titled Load acting as a Resource (LaaR) may provide up to 50% of the responsive reserve requirement and provides automatic underfrequency relay activated response to frequency drops. Other market constructs provide for similar services. As indicated in our comments under Q2, there is a missing piece to maintaining system frequency and arresting frequency deviation, and that is the generators' governor response. We suggest the SDT conduct an industry discussion on this subject, and determine the entity(ies) responsible for governor actions/setting, the mechanism to provide such a response, and the place for stipulating the necessary standard requirements to enforce compliance for governor actions before further developing this BAL-003-1 standard.
Response: Manual deployment is not quick enough for frequency response. Automatic deployment of other devices could be useful to provide the desired frequency response. The SDT has also specified in the latest draft standard version other methods for a BA to obtain Frequency Response. Regarding governor response - this issue has been discussed and the SDT understands your concern However, generator droop requirements, dead-band settings and governor operation are outside the scope of the project approved SAR. The SDT believes that the Generator Verification standards will help address these concerns.		

Organization	Yes or No	Question 15 Comment
Kansas City Power & Light		The determination of sufficient frequency response in the interconnection is complex and varies according to the ratio of generation online and the load in the interconnection. The calculation of actual frequency response is also extremely challenging considering metering accuracy & resolution, SCADA sample rates, statistical variations of load and generation. To accurately assess what is needed and the methods to implement such a complex subject will take considerable thoughtfulness, time, testing and engineering ingenuity.
Response: The SDT agrees with your comments and thanks you for your participation.		
Progress Energy		We feel this problem exists on the generator level and this standard should only be applied to those entities and their response. This will impact BAs of vertically integrated companies. Entities without generation resources should not be held accountable for frequency response. If their energy supplier wants to make them responsible for purchasing ancillary response service, that will be up to them on how they distribute it. Based on the fact that schedules respond too slowly to meet the response window of the frequency measure, schedules should never be used to measure response capabilities, thus making ancillary service unnecessary.
Response: The SDT agrees that schedules are too slow to be used for Frequency Response. The SDT has also specified in the latest draft standard version other methods for a BA to obtain Frequency Response. The SDT is responding to a FERC directive to "...define methods of obtaining Frequency Response..." Regarding governor response - this issue has been discussed and the SDT understands your concern However, generator droop requirements, dead-band settings and governor operation are outside the scope of the project approved SAR. The SDT believes that the Generator Verification standards will help address these concerns. Also, Requirements imposed on generators is outside the scope of the project approved SAR.		
ENBALA Power Networks		ENBALA supports the creation of a Primary Frequency Market. This could be achieved in two methods: Implementation of a new Market for Primary Frequency Response Or Including in the definition of spinning reserves the requirement for resources to be capable of providing Primary Frequency Response through autonomous and local control by governor action and inertial response. And We particularly encourage the participation from all resources capable of providing this service in a coordinated approach, including alternative technologies such as controllable loads, energy storage, electrically-coupled wind farm controls, and demand response. Furthermore, we stress that this service needs to be a coordinated, autonomous, and local control and should NOT be integrated in the AGC system.

Organization	Yes or No	Question 15 Comment
Response: The NERC Reliability Standards do not necessarily dictate "how" Requirements are satisfied. A market can be created by a region, sub-region, ISO, RTO or other entities as appropriate to facilitate compliance however the NERC Reliability Standards do not establish markets.		
NIPSCO		We reviewed the related NERC Training Document from 2003 and your proposed method seems like the best approach.
Response: The SDT thanks you for your support.		
NorthWestern Energy		A Balancing Authority's frequency response is based upon a "median" value calculated from analyzing multiple events. Frequency response during some of these events is better than others, depending on the system conditions at the time and the amount system loading and unloaded generation online at the time of the event. Given these circumstances a BA's actual response could vary by event (better or worse than median), thus compliance measurement per event to a frequency response obligation based on the median response (over multiple events) could put BA's in non-compliant situations unjustly. Page 2 implies that there is currently too much frequency response based on the 1% of peak demand method of establishing frequency bias. Even though NWE does not use the 1% method, NWE feels that the 1% minimum has been a tried and true method of providing frequency response in the Western Interconnection. Without the 1% minimum (and BA's using a natural response less than the 1%), the total interconnection frequency response would decrease according to research. This would lead to decreased interconnection bias, causing other operational issues, such as lower L10 values and possible CPS2 compliance factors.
Response: The drafting team agrees that there is great variability in calculated frequency response event to event. This is because in a multi-BA Interconnection, a given BA's frequency response contribution is small compared to the variations in load and generation within the BA at any given moment. This is why the drafting team is proposing to use the median value of many events during the year as the measure of "average" response. The median is the preferred measure of by statisticians when dealing with data populations containing outliers. The SDT agrees the Interconnections possess sufficient frequency response. The drafting team is proposing a test allowing all BAs with frequency response less than the 1% of peak to use a Frequency Bias Setting set less than 1% of peak to better match the Frequency Bias setting to the natural response. The drafting team agrees a floor threshold needs to be maintained however the current 1% of peak requirement is causing many BAs to over-bias, causing undulations in ACE and frequency. The SDT would appreciate it if you could identify the research indicating control problems would be realized if the minimum bias setting was set less than 1%. The SDT also agrees CPS compliance scoring may be affected which is why the drafting team proposes testing using incremental changes to the Frequency Bias Setting. Research by Nathan Cohn (Control of Generation and Power Flow on Interconnected Systems) implies that better matching of the Frequency Bias Setting to the system Frequency Response Characteristic will improve AGC and frequency performance, and also improve CPS compliance scoring. The SDT does not agree that there is excessive frequency response because of the 1% of peak demand method for establishing the Frequency Bias Setting. The		

Organization	Yes or No	Question 15 Comment
bias setting does not increase or decrease Primary Frequency Control. The bias setting value will only impact the measure of ACE and resulting Secondary Control. The 1% of peak minimum threshold was appropriate in the past when BA Primary Frequency Control was nearly equal to 1% of the forecasted peak load or peak generation. Keep in mind FRS Form 1 and the BAL-003 draft standard still require the ACE Frequency Bias Setting be set equal to or greater than the Frequency Response Characteristic with an initial minimum value of 0.8% of the BA forecasted peak load or peak generation. When the BA Frequency Bias Setting better matches the Frequency Response Characteristic, L10 and CPS1 and CPS2 will more accurately measure the BA's ACE impact on Interconnection frequency. This may result in lower CPS1 and CPS2 compliance scoring than currently realized. The sample size of selected events used for analysis is intended to minimize the concern about variability of performance observed on an event-to-event basis so that the BA can realize a consistent reference measure when performing analysis.		
Energy Mark, Inc.		Comment 50: In those regions of North America where energy is supplied through markets, Frequency Response should be defined as an additional Ancillary Service and acquired through these Ancillary Service Markets. Attempts to acquire Frequency Response through methods external to the Ancillary Service markets will contribute to market inefficiencies since these external methods must affect the capacity available to the Ancillary Service markets. Use of out-of-market methods would oppose the very reasons that electric energy markets were created in the first place. Comment 51: BAs not participating in formal RTOs or ISOs could obtain Frequency Response by insuring that their owned generation is providing appropriate Governor Response to the BA and that contracts will merchant generation are modified to include the provision of Frequency Response in the merchant contracts. It may be appropriate to request guidance from regulatory agencies encouraging the renogiation efforts required to modify existing merchant generator contracts. Comment 52: Whether Frequency Response is obtained through Ancillary Service Markets, merchant generator contracts or owned generation, specific continent wide definitions for Frequency Response should be developed to provide guidance and consistency in these diverse circumstances. NERC should be taking the lead on developing the necessary continent wide definitions or policies for Frequency Response.
Response: Comments 50 & 51: The NERC Reliability Standards do not necessarily dictate "how" Requirements are satisfied. A market can be created by a region, sub-region, ISO, RTO or other entities as appropriate to facilitate compliance however the NERC Reliability Standards do not establish markets. Comment 52: The SDT will forward this comment to NERC staff.		
Beacon Power Corporation		Beacon Power is a manufacturer and merchant developer of an innovative advanced energy storage technology that uses flywheels. Beacon Power's technology operates by using flywheels to rapidly recycle energy from the grid in order to follow moment-by-moment changes in frequency nearly instantaneously. The following characteristics of Beacon's technology support the use of this technology for frequency response on the electric grid. âˆ' Responds to local frequency change in less than 1 second; full response in less than 4 seconds âˆ' State of the art electronic control - accurate response. No dead-band required, but could be incorporated if beneficial - Inherently modular - Can be distributed around the grid. With distributed local

Organization	Yes or No	Question 15 Comment
		response to frequency, less likely to be limited by congestion, and ensures islanded portions of the grid maintain frequency response. The ability of Beacon Power's flywheels to quickly and precisely respond to frequency events on the grid makes this technology an ideal source of frequency response. The fast response provided can aid in arresting rapid frequency decline on the system, which can assist in preventing the frequency nadir from encroaching on the first step of Under Frequency Load Shedding. Because of its modular design, flywheels can be built and positioned throughout the grid to provide a diversified frequency response, ensuring adequate response during events that cause the grid to separate into islands. Any standards developed by NERC must allow energy storage and should be inclusive of all technologies able to provide frequency response. Storage resources that provide frequency response should be allowed to recover their costs as a wholesale transmission facility subject to FERC's jurisdiction. Storage facilities do not generate electricity and operate only to enhance the reliability of transmission service. Given that there is no open-market for frequency response, there are no concerns of cross-subsidization or competitive concerns. This will address the FERC Order 693 directive to develop a method of obtaining frequency response, and will improve the overall reliability of the interconnections. Beacon agrees with the approach of mandating Balancing Authority response. However, the SDT should go further to define performance requirements for different tiers of frequency response, for example full response in 5 seconds maintained until 15 seconds, and full response in 15 seconds maintained until 90 seconds (numbers are for example only, the SDT would determine the appropriate values), so that Balancing Authorities can be confident when acquiring new sources that demonstrate those performance characteristics. The use of Reserve Sharing Groups (as detailed in Attachment A) to provide a means of sharing Frequency Response seems unnecessary. Since Frequency Response is contributed to the entire interconnection, ignoring any propagation delays, any Balancing Authorities within an interconnection can share Frequency Response if a consistent method of measuring and allocating it can be determined. However, since all online sources of Frequency Response will contribute based on the change in frequency, this sharing of Frequency Response will not improve interconnection performance. It will only allow Balancing Authorities with too few sources to meet NERC requirements. Hence, sharing arrangements would only improve frequency performance if it results in more frequency responsive sources being online during an event. Additionally, due to the geographical differences of the Balancing Authorities within the Reserve Sharing Groups, their use is not conducive to a diversified interconnection frequency response.
Response: Frequency Response required by the Standard fully satisfies the reliability needs of each Interconnection. Since these are new Requirements, existing RSG agreements most likely do not address Frequency Response. The SDT is just offering this as a suggestion that needs to be vetted. The SDT has also specified in the latest draft standard version other methods for a BA to obtain Frequency Response.		
Westar Energy		RSG and Spinning Reserve today is SECONDARY response. How does FERC see the RSG (or RTO markets) providing PRIMARY frequency response? Allowing the RSG option does not "address the 693

Organization	Yes or No	Question 15 Comment
		directive", only dumps it on the RSG with no direction. Using frequency responsive loads seems impractical based on the small frequency deviation levels required. What customer would be ok with dropping load when frequency drops to 59.964 or 59.92, etc.
Response: Since these are new Requirements, existing RSG agreements most likely do not address Frequency Response. The SDT is just offering this as a suggestion that needs to be vetted. The SDT has also specified in the latest draft standard version other methods for a BA to obtain Frequency Response. Customers are not required to provide frequency responsive load for reliability however this is an options entities may wish to explore.		
ISO New England Inc.		As indicated previously in our comments, there is missing piece to maintaining system frequency and arresting frequency deviation, and that is the generators' governor response. This standard appears to incorrectly assume that the BAs have the resources/ability to provide (primary) Frequency Response, and this is simply not the case. The BAs do not necessarily own facilities which can provide this service.
Response: The SDT is responding to a FERC directive to "...define methods of obtaining Frequency Response..." The SDT has also specified in the latest draft standard version other methods for a BA to obtain Frequency Response. Regarding governor response - this issue has been discussed and the SDT understands your concern. However, governor droop requirements, dead-band settings and governor operation are outside the scope of the project approved SAR. The SDT believes that the Generator Verification standards will help address these concerns.		
Independent Electricity System Operator		As indicated in our comments under Q2, there is missing piece to maintaining system frequency and arresting frequency deviation, and that is the generators' governor response. We suggest the SDT conduct an industry discussion on this piece, and determine the entity responsible for governor actions/setting, the mechanism to provide such a response, and the place for stipulating the necessary standard requirements to enforce compliance for governor actions before further developing this BAL-003-1 standard.
Response: The NERC Reliability Standards do not dictate how Requirements are satisfied. The SDT believes each Interconnection possesses sufficient frequency response. Regarding governor response - this issue has been discussed and the SDT understands your concern. However, governor droop requirements, dead-band settings and governor operation are outside the scope of the project approved SAR. The SDT believes that the Generator Verification standards will help address these concerns.		
Duke Energy		The efforts to develop the MOD-025/026 standards and the associated work to determine actual and predicted generator response will do much to identify the response available and provide ways to plan for and validate the response needed and supplied. ERCOT has demonstrated effective use of Load Acting as a Resource (LAAR - essentially customer compensated pre-emptive load shedding). Exploration of similar applications of this in other interconnections is warranted.

Organization	Yes or No	Question 15 Comment
Response: The NERC Reliability Standards do not necessarily dictate "how" Requirements are satisfied. A market can be created by a region, sub-region, ISO, RTO or other entities as appropriate to facilitate compliance however the NERC Reliability Standards do not establish markets.		
Patterson Consulting, Inc.		The SDT has taken the correct approach in mandating Balancing Authority response. Balancing Authorities should be able to acquire that response from various sources to create a suitable portfolio to meet the required performance. The industry may benefit if the SDT defined required performance characteristics for Frequency Response from a technical perspective, such as initial response in less than 2-8 seconds, maximum response in less than 2-40 seconds, continuous (or not) response, etc. (These values are examples and should be determined by the SDT.) Once the market and industry understand expectations, existing or new technologies with those characteristics become possible sources. Then, it is just a matter of adjusting tariffs (compensation) to incent implementation. If Frequency Response is allowed to be shared between Balancing Authorities, the SDT must create requirements to address such issues as deliverability, measurement, and suitable electrical diversity throughout the interconnection.
Response: The SDT agrees with your comment. However, keep in mind that the SDT is responding to a FERC directive to "...define methods of obtaining Frequency Response..." The SDT has also specified in the latest draft standard version other methods for a BA to obtain Frequency Response. The SDT is evaluating several averaging time periods during the field trial. The SDT will select the averaging time period that provides the most accurate results.		
Alberta Electric System Operator		Frequency Response has different aspects and time frames (inertia, governor and AGC response), the method of obtaining Frequency Response should respect these different aspects and time frames.
Response: The SDT is responding to a FERC directive to "...define methods of obtaining Frequency Response..." The SDT has also specified in the latest draft standard version other methods for a BA to obtain Frequency Response.		
FirstEnergy		See our responses to Question 4.
Response: Please refer to our response to Question 4.		
Northeast Power Coordinating Council		Refer to the response to Question 17.
Response: Please refer to our response to Question 17.		

16. ***If you are aware of any conflicts between the proposed standard and any regulatory function, rule order, tariff, rate schedule, legislative requirement, or agreement please identify the conflict here.***

Summary Consideration: Most of the commenters responding to this question provided a response but did not identify any conflicts. A couple of the commenters felt that there may be a conflict with both the FERC Order 693 and the FERC March 18, 2010 order. Another commenter felt that the requirements could impact CPS performance and that using events from the prior evaluation period could create the possibility of double jeopardy.

The SDT explained that the comment concerning the "…scheduled periodicity of Frequency Response surveys…" being the only issue needing to be addressed at this time was not correct. The SDT stated that in the December 16, 2010 FERC Order Accepting NERC's Compliance Filing the Commission states in par 12 "…NERC's proposed action plan demonstrates a commitment to develop requirements for minimum levels of frequency response needed for Reliable Operation consistent with the Commission's directives in Order No. 693." The SDT believes that this clearly states that the directives from FERC Order 693 are to be addressed.

Concerning the comment that the requirements could impact CPS performance the SDT explained that it believes that the large gap commonly found between natural frequency response and the frequency bias settings deployed based on 1% of peak load was resulting in excessive and unnecessary regulation and was related to high frequency following DCS events and in other circumstances as well. The SDT agreed that the reduction of the 1% of peak load floor for the frequency bias setting can affect the total interconnection frequency bias setting, L10 values, and possibly CPS 2 compliance as well. The SDT further explained that it put Requirement R5 back in the proposed standard with a process for reducing the minimum to provide for monitoring the system to ensure reliable operation.

With regards to the comment concerning the possibility for double jeopardy the SDT responded that the SDT expected each year to normally have enough frequency events to avoid double jeopardy, but there was a need to have a backup plan in case a year does not yield sufficient frequency events.

Organization	Yes or No	Question 16 Comment
FirstEnergy		We are not aware of any conflicts at this time.
Response: The SDT thanks you for your participation.		
IRC Standards Review Committee		This proposed Field Trial and standard MAY conflict with Order 693 and the March 18, 2010 Order that state:Specifically, the Commission stated: As the Commission noted in the NOPR and in our response to FirstEnergy, Requirement R2 of this Reliability Standard states that "[e]ach Balancing Authority shall establish and maintain a Frequency Bias Setting that is as close as practical to, or greater than, the Balancing Authority's Frequency Response." The Commission believes that the achievement of this Requirement is fundamental to the tie line bias control schemes that have been in use to assist in balancing generation and load in the Interconnections for many years.

Organization	Yes or No	Question 16 Comment
		Further, in Order No. 693 the Commission concluded: We understand that the present Reliability Standard sets the required frequency response of the balancing authorities to be approximately one percent or greater by requiring that the frequency bias shall not be less than one percent and that the frequency bias be as close as practical to, or greater than, the actual frequency response. March 18 Order concludesAccordingly, to assure that NERC proceeds expeditiously, the Commission is setting a compliance deadline of six months from the date of issuance of this order for the development of modifications to Reliability Standard BAL-003-0 that comply with the Commission's directives as set forth in Order No. 693 to define the appropriate periodicity of frequency response surveys necessary to ensure that Requirement R2 and other requirements of the Reliability Standard are being met and the necessary amount of frequency response needed for reliable operation. May 13, 2010 Order for a Technical Conference statedThus, we direct that NERC submit, within 30 days after the technical conference, a proposed schedule that includes firm deadlines for completing studies, analyses needed to develop a frequency response requirement, and for submission of a modified Reliability Standard that is responsive to the Commission directives in Order No. 693 pertaining to Reliability Standard BAL-003-0. In short the Orders only ask for the BAL-003 to be revised to provide a schedule for the Frequency Response surveys. We may question whether the subjective 25 events per year is the same as a scheduled periodicity, but the point here is that that is the only mandate that is needed immediately. The only other requirement is that NERC file a schedule for completing its studies. Note that is not something that is for a standard it is something for a NERC filing.
Response: The SDT disagrees with your comment concerning the "...scheduled periodicity of Frequency Response surveys..." being the only issue needing to be addressed at this time. In the December 16, 2010 FERC Order Accepting NERC's Compliance Filing the Commission states in par 12 "...NERC's proposed action plan demonstrates a commitment to develop requirements for minimum levels of frequency response needed for Reliable Operation consistent with the Commission's directives in Order No. 693." This clearly states that the directives from FERC Order 693 are to be addressed.		
ERCOT		This proposed Field Trial and standard MAY conflict with Order 693 and the March 18, 2010 Order that state:Specifically, the Commission stated: As the Commission noted in the NOPR and in our response to FirstEnergy, Requirement R2 of this Reliability Standard states that "[e]ach Balancing Authority shall establish and maintain a Frequency Bias Setting that is as close as practical to, or greater than, the Balancing Authority's Frequency Response." The Commission believes that the achievement of this Requirement is fundamental to the tie line bias control schemes that have been in use to assist in balancing generation and load in the Interconnections for many years. Further, in Order No. 693 the Commission concluded: We understand that the present Reliability Standard sets the required frequency response of the balancing authorities to be approximately one percent or greater by requiring that the frequency bias shall not be less than one percent and that the frequency bias be as close as practical to, or greater than, the actual frequency response. March 18 Order concludesAccordingly, to assure that NERC proceeds expeditiously, the Commission is setting a compliance deadline of six months from the date of issuance of this order for the development of modifications to Reliability Standard BAL-003-0 that comply with the Commission's directives

Organization	Yes or No	Question 16 Comment
		as set forth in Order No. 693 to define the appropriate periodicity of frequency response surveys necessary to ensure that Requirement R2 and other requirements of the Reliability Standard are being met and the necessary amount of frequency response needed for reliable operation. May 13, 2010 Order for a Technical Conference statedThus, we direct that NERC submit, within 30 days after the technical conference, a proposed schedule that includes firm deadlines for completing studies, analyses needed to develop a frequency response requirement, and for submission of a modified Reliability Standard that is responsive to the Commission directives in Order No. 693 pertaining to Reliability Standard BAL-003-0. In short the Orders only ask for the BAL-003 to be revised to provide a schedule for the Frequency Response surveys. We may question whether the subjective 25 events per year is the same as a scheduled periodicity, but the point here is that that is the only mandate that is needed immediately. The only other requirement is that NERC file a schedule for completing its studies. Note that is not something that is for a standard it is something for a NERC filing.
Response: The SDT disagrees with your comment concerning the "...scheduled periodicity of Frequency Response surveys..." being the only issue needing to be addressed at this time. In the December 16, 2010 FERC Order Accepting NERC's Compliance Filing the Commission states in par 12 "...NERC's proposed action plan demonstrates a commitment to develop requirements for minimum levels of frequency response needed for Reliable Operation consistent with the Commission's directives in Order No. 693." This clearly states that the directives from FERC Order 693 are to be addressed.		
Arizona Public Service Company		AZPS would like clarity if Interpretations of BAL-003-0 will be part of BAL-003-1.
Response: This standard will replace all existing BA-003's and incorporates any approved interpretation.		
Energy Mark, Inc.		Comment 53: In Comment 25 I indicated that the suggested allocation method fails to meet the requirement that "A reliability standard shall neither mandate nor prohibit any specific market structure." My comments here support that contention. The allocation method is not influenced by demand for frequency response. As a consequence, only one side of a fair market is represented. Markets are effective because: 1. Markets are voluntary allowing the demand side of the market to choose to not create the need to acquire a product or service. 2. Markets select the lowest cost product or service from competing offers to supply the product or service demanded.When the allocation method is blind to the demand for the product or service it eliminates the most efficient market designs from consideration, and therefore, mandates a market design that only looks at the supply side of the market. Comment 54: Selecting an allocation method for Frequency Response that considers both the supply and demand sides of the market for Frequency Response would enable the implementation of a much more efficient market design. Such an allocation method would allow demand side reductions in the need for Frequency Response to compete with supply side increases in the need for Frequency Response allowing for

Organization	Yes or No	Question 16 Comment
		the creation of the most efficient markets in this Ancillary Service.
Response: The SDT acknowledges your concerns but your market-related suggestions are outside the scope of the industry approved SAR.		
FMPP		NERC Relablity Standards Conflict - by using events from last year to determine an entity's compliance with a Requirement for this year puts the entity in double jeopardy for last year's events, which were already used for compliance for last year.
Response: The SDT agrees that a standard should not place an entity in double jeopardy. The SDT expects that each year will normally have enough frequency events to avoid double jeopardy, but it needs to have a backup plan in case a year does not yield sufficient frequency events.		
American Electric Power		This Standard has the potential to affect Standards involving CPS performance with respect to the calculated CPS Bounds L10 if relative.
Response: The SDT believes that the large gap commonly found between natural frequency response and the frequency bias settings deployed based on 1% of peak load is resulting in excessive and unnecessary regulation and is related to high frequency following DCS events and in other circumstances as well. You are correct in asserting that the reduction of the 1% of peak load floor for the frequency bias setting can affect the total interconnection frequency bias setting, L10 values, and possibly CPS 2 compliance as well. The SDT has put Requirement R5 back in the proposed standard. The SDT has modified the plan for reduction of the minimum Frequency Bias Setting. The plan is no longer tied to the Field Trial. The SDT has removed the table reflecting the reduction of the minimum bias setting. The SDT is proposing a method of reducing the minimum Frequency Bias Setting in which the ERO will monitor the results of the reductions and adjusting them accordingly in an effort to bring the Frequency Bias Setting closer to natural Frequency Response. Please refer to Attachment B for details of this reduction plan.		
Northeast Power Coordinating Council		Refer to the response to Question 17.
Response: Please refer to our response to Question 17.		
Patterson Consulting, Inc.		None.
Kansas City Power & Light		No other comments.

17. ***Please provide any other comments (that you have not already provided in response to the questions above) that you have on the draft standard BAL-003-1.***

Summary Consideration: Several commenters indicated that the supplemental compliance information and attachment sections created additional standard requirements. In response to this concern these documents have been revised. If a requirement states that the entity must perform in accordnace with Attachment X, then Attachment X is an extension of that requirement and the performance identified in the attachment is mandatory and enforceable.

Several commenters expressed concern that the Balancing Authority may not have the necessary means to effectively manage Frequency Response and recommended that the SDT consider establishing a standard for generators to support the Balancing Authorities achieve the necessary level of Frequency Response. The SDT explained that this standard will provide the metrics for Frequency Response while the market will define itself.

Commenters also stated that insufficient detail has been provided for evaluating the appropriateness of the methodology used for determining FRO. They indicated that the standard needed more details on how the FRO is calculated and allocated among the Balancing Authorities. The SDT made significant modifications to Attachment A – Supporting Document which details the methodology used to determine the calculations.

Commenters indicated that the plan to annually reduce the floor percentage for the Frequency Bias Settings may adversely impact reliability. In response to this concern the Implementation Plan no longer outlines the Frequency Bias Setting reduction plan initially proposed. Attachment B sets forth the procedure for reducing the Frequency Bias Setting floor threshold.

Another commenter stated that emphasis should be placed on the Frequency Excursion Curve Point C value and not other values because the Point C value is critical for reliability. A request was also received to correlate the frequency response for the Point B value timeframe window with the timeframe window for the Point C value. The SDT committed to reviewing this relationship during the field trial.

One commenter asked how to attain or schedule Frequency Response from another Balancing Authority if it is a market resource. The SDT responded that the standard simply provides reliability metrics. Industry determines which markets and independent solutions could be developed.

A comment was received requesting clarification of the NERC glossary term “native load” mentioned in the Implementation Plan. Instead of providing clarification, this term has been removed from the Implementation Plan.

Twenty-five additional industry comments have been received regarding the draft BAL-003-1 standard as noted in the following table.

Organization	Question 17 Comment
Northeast Power Coordinating Council	It is not clear from either Form 1 or its instructions whether the supplied frequency deviation for an event should be used without modification, or if it should be overwritten with a value computed from the Balancing Authority’s data source (or if

Organization	Question 17 Comment
	there is an option, to use the lesser value, for example). Clearly express which frequency deviation value to use. The load sensitivity calculation is an important Balancing Authority Area value to compute accurately for modeling purposes. As proposed, it would use the same computational technique as that used for frequency bias sampling calculations. To yield a useful result, load values would need to have "convergence characteristics" similar to that found in the actual net interchange values used for frequency bias sampling. While experience has shown that the average or median values of the frequency bias samples computed for most Balancing Authorities will converge with about 20 samples, a similar outcome for load sensitivity calculations might not occur. Frequency bias samples rely on the measured actual net interchange values that are sampled at the AGC scan rate, and the actual net interchange tends to be a rather stable value because AGC and operator actions usually keep the actual net interchange close to a scheduled value. The total net system load may have greater volatility and may be trending in a particular direction much more often than actual net interchange. Also, the load calculation typically relies on adding the sum of the generation within the Balancing Authority to the actual net interchange. The generation values may have a slower scan rate, longer data latency periods, and smaller generators might not be telemetered, with hourly scheduled values or manually entered values being used instead. These differences can contribute to a very different convergence characteristic than that found for actual net interchange. Simply put, the load sensitivity calculation needs validation. The Form 1 instructions mention a generation only Balancing Authority form to be filled in. It is not shown on the spreadsheet provided, and it is not clear what data should be entered, though it seems like it would still be actual net interchange.Form 1 contains an entry form for a single Balancing Authority Interconnection, however, it is not referenced in the Form 1 instructions.Section A of the Form 1 instructions contains excellent background material that explains why this effort is important. However, section B needs a careful review so that the instructions are thorough and unambiguous.The information on variable bias calculations seems sparse, and the requirements for variable bias should be reviewed thoroughly with those Balancing Authorities that are familiar with the nuances and challenges of determining an appropriate variable bias.If BIAS is set equal to response, about 50% of the time, AGC will cancel out the primary response; the BIAS, therefore, should be slightly higher than the natural response but clearly 1% is too large. The game plan to continually reduce the floor percentage for frequency bias settings needs to be reconsidered. With .4% peak load being a typical actual frequency response lately for Balancing Authorities, the 1% of peak load to .8% of peak load transition seems prudent. Perhaps a further reduction to .6% may be useful as well, but lesser floors may in effect result in AGC too often canceling out the primary frequency response being provided.While the 16 to 52 second sampling window for point B computations seem to be a reasonable initial guess for the metric, preliminary studies by the Frequency Responsive Reserve Standard Drafting Team (FRRSDT) indicate that AGC contributions from fast acting hydro generators will be included in the samples. As those same studies were not conclusive, perhaps the initial years of this standard could require the provision of scan rate data from 30 seconds before to 60 seconds after the start of the frequency decline for each event. While this significantly increases the volume of data to be provided, it would allow the FRRSDT to determine the best sampling intervals to be used. Perhaps a point B sampling interval of 15 to 30 seconds would filter out most of the fast acting AGC, but more data/analysis is needed to determine the best sampling interval to be sure that the primary response data is not being corrupted by this fast acting AGC response.To support Balancing Authorities in achieving the targeted level of frequency response, a standard for generators is needed as well, as they are historically the largest source of discretionary frequency response. The standard could give a Balancing Authority the right to waive these requirements should they pursue other sources of frequency

Organization	Question 17 Comment
	response, such as ERCOT's "load acting as a resource (LAAR)" efforts. Point C values are the more important reliability metric. Since point C metrics are challenged with data quality issues on a Balancing Authority and generator level, an effort should be made to correlate the required frequency response in the point B time window with that needed in the point C time window (perhaps using rules of thumb, such as 100% of load's frequency response and 30% of generator's frequency response occurs in time for point C). While Attachment A mentions that N-2 category C events will be used to determine the frequency response obligation on an interconnection level, there is insufficient detail provided at this time to evaluate the appropriateness of the obligations selected. Efforts in this area for the frequency model developed by the Reliability-Based Control Standard Drafting Team (and now the BARCSDT) for HQTE may shed some insight into this process.
Response: The SDT agrees that clearer instructions are needed in Form 1. This has been addressed in the revised form. The SDT also agrees that there may be limited benefit from measuring the load response of a BA due to data fidelity and resolution. An attempt to measure a BA's load response was included for the field trial to determine its value and was not used in the BA's frequency response measure. It is believed that some BA's with generation data that is on a similar scan rate as their Interchange data may find that it accurately measures their load dampening. The field trial will determine if it is useful or not. The SDT agrees that the 16 to 52 second sampling window may include some fast acting AGC. The field trial will determine if this sampling period should be reduced. Form 1 has been revised to include a minimum data set that starts 30 seconds before the event and ends not earlier than 60 seconds after the event to help identify the overall best averaging periods. The SDT also agrees that the use of LaaRs in ERCOT is a great backup to Primary Frequency Control but would also like to point out that this response only responds in one direction and does not provide bidirectional frequency stability for the moment to moment changes in frequency. Once utilized, it takes hours to restore the service for the next contingency. During this time, the BA and Interconnection depends on Primary Frequency Control from other sources that are continuous and bidirectional as long as headroom is available. The SDT agrees that Point C Primary Frequency Control is critical for preventing UFLS and will use the field trial results to determine if the Point B measure of performance can be correlated to Point C performance. Thank you for your comments. Regarding governor response - this issue concerning generators has been discussed by the SDT. The SDT understands your concern. However, governor droop requirements, dead-band settings, and governor operation is outside of the industry approved SAR. The SDT believes that the Generator Verification standards will help address these concerns. The N-2 criteria is being evaluated during the field trial.	
ISO New Engand Inc.	It is not clear from either Form 1 or its instructions whether the supplied frequency deviation for an event should be used without modification, or if it should be overwritten with a value computed from the Balancing Authority's data source (or if there is an option, to use the lesser value, for example). Clearly express which frequency deviation value to use. 2. The load sensitivity calculation is an important Balancing Authority Area value to compute accurately for modeling purposes. As proposed, it would use the same computational technique as that used for frequency bias sampling calculations. To yield a useful result, load values would need to have "convergence characteristics" similar to that found in the actual net interchange values used for frequency bias sampling. While experience has shown that the average or median values of the frequency bias samples computed for most Balancing Authorities will converge with about 20 samples, a similar outcome for load sensitivity calculations might not occur. Frequency bias samples rely on the measured actual net

Organization	Question 17 Comment
	interchange values that are sampled at the AGC scan rate, and the actual net interchange tends to be a rather stable value because AGC and operator actions usually keep the actual net interchange close to a scheduled value. The total net system load may have greater volatility and may be trending in a particular direction much more often than actual net interchange. Also, the load calculation typically relies on adding the sum of the generation within the Balancing Authority to the actual net interchange. The generation values may have a slower scan rate, longer data latency periods, and smaller generators might not be telemetered, with hourly scheduled values or manually entered values being used instead. These differences can contribute to a very different convergence characteristic than that found for actual net interchange. Simply put, the load sensitivity calculation needs validation.The Form 1 instructions mention a generation only Balancing Authority form to be filled in. It is not shown on the spreadsheet provided, and it is not clear what data should be entered, though it seems like it would still be actual net interchange.Form 1 contains an entry form for a single Balancing Authority Interconnection, however, it is not referenced in the Form 1 instructions.Section A of the Form 1 instructions contains excellent background material that explains why this effort is important. However, section B needs a careful review so that the instructions are thorough and unambiguous.The information on variable bias calculations seems sparse, and the requirements for variable bias should be reviewed thoroughly with those Balancing Authorities that are familiar with the nuances and challenges of determining an appropriate variable bias.If BIAS is set equal to response, about 50% of the time, AGC will cancel out the primary response; the BIAS, therefore, should be slightly higher than the natural response but clearly 1% is too large. The game plan to continually reduce the floor percentage for frequency bias settings needs to be reconsidered. With .4% peak load being a typical actual frequency response lately for Balancing Authorities, the 1% of peak load to .8% of peak load transition seems prudent. Perhaps a further reduction to .6% may be useful as well, but lesser floors may in effect result in AGC too often canceling out the primary frequency response being provided. While the 16 to 52 second sampling window for point B computations seem to be a reasonable initial guess for the metric, preliminary studies by the Frequency Responsive Reserve Standard Drafting Team (FRRSDT) indicate that AGC contributions from fast acting hydro generators will be included in the samples. As those same studies were not conclusive, perhaps the initial years of this standard could require the provision of scan rate data from 30 seconds before to 60 seconds after the start of the frequency decline for each event. While this significantly increases the volume of data to be provided, it would allow the FRRSDT to determine the best sampling intervals to be used. Perhaps a point B sampling interval of 15 to 30 seconds would filter out most of the fast acting AGC, but more data/analysis is needed to determine the best sampling interval to be sure that the primary response data is not being corrupted by this fast acting AGC response. To support Balancing Authorities in achieving the targeted level of frequency response, a standard for generators is needed as well, as they are historically the largest source of discretionary frequency response. The standard could give a Balancing Authority the right to waive these requirements should they pursue other sources of frequency response, such as ERCOT's "load acting as a resource (LAAR)" efforts. Point C values are the more important reliability metric. Since point C metrics are challenged with data quality issues on a Balancing Authority and generator level, an effort should be made to correlate the required frequency response in the point B time window with that needed in the point C time window (perhaps using rules of thumb, such as 100% of load's frequency response and 30% of generator's frequency response occurs in time for point C).While Attachment A mentions that n-2 category C events will be used to determine the frequency response obligation on an interconnection level, there is insufficient detail provided at this time to evaluate the appropriateness of the obligations selected. Efforts in this area for the

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	frequency model developed by the Reliability-Based Control Standard Drafting Team (and now the BARCSDT) for HQTE may shed some insight into this process.
Response: The SDT agrees that clearer instructions are needed in Form 1. This has been addressed in the revised form. The SDT also agrees that there may be limited benefit from measuring the load response of a BA due to data fidelity and resolution. An attempt to measure a BA's load response was included for the field trial to determine its value and was not used in the BA's frequency response measure. It is believed that some BA's with generation data that is on a similar scan rate as their Interchange data may find that it accurately measures their load dampening. The field trial will determine if it is useful or not. The SDT agrees that the 16 to 52 second sampling window may include some fast acting AGC. The field trial will determine if this sampling period should be reduced. Form 1 has been revised to include a minimum data set that starts 30 seconds before the event and ends not earlier than 60 seconds after the event to help identify the overall best averaging periods. The SDT also agrees that the use of LaaRs in ERCOT is a great backup to Primary Frequency Control but would also like to point out that this response only responds in one direction and does not provide bidirectional frequency stability for the moment to moment changes in frequency. Once utilized, it takes hours to restore the service for the next contingency. During this time, the BA and Interconnection depends on Primary Frequency Control from other sources that are continuous and bidirectional as long as headroom is available. The SDT agrees that Point C Primary Frequency Control is critical for preventing UFLS and will use the field trial results to determine if the Point B measure of performance can be correlated to Point C performance. Thank you for your comments. This issue concerning generators has been discussed by the SDT. The SDT understands your concern. However, governor droop requirements, dead-band settings, and governor operation is outside of the industry approved SAR. The SDT believes that the Generator Verification standards will help address these concerns. The N-2 criteria is being evaluated during the field trial.	
Santee Cooper	Again, we believe that the SDT should consided or prior years' data. We are concerned with how the total frequency response obligation of an interconnection will be determined since this will ultimately determine each BA's FRO. We believe more detail should be presented on this issue.We appreciate the time and the work performed by the standard drafting team on this standard that we feel is a necessary component for reliable operation of the Interconnections.
Response: The SDT does not understand the intent of the first sentence in your comment.. The next posting will be more explicit in the method for determining the FRO.	
MRO's NERC Standards Review Subcommittee	We feel the Reserve Sharing Group should be removed from the applicability section as it's not included in any requirement.
Response: The SDT has modified the proposed standard to better reflect the RSG responsibility in providing Frequency Response.	
Xcel Energy	We feel Reserve Sharing Group should be removed from the applicability section since it is not included in any of the requirements. Additionally, the documents are not clear as to how there is a field trial included in the proposal.

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Response: The SDT has modified the proposed standard to better reflect the RSG responsibility in providing Frequency Response.	
LG&E and KU Energy	We are concerned that, in attachment A, the generation/load split in determining FRO may not be the most equitable method for allocation. In general, we feel that Attachment A needs additional clarity, i.e., is the split based on forecasted or prior years' data.We are concerned with how the total frequency response obligation of an interconnection will be determined since this will ultimately determine each BA's FRO. We believe more detail should be presented on this issue.Please make sure enhanced frequency response from load is examined as an economical source of frequency response per FERC requirements in Order 693 paragraphs 336 and 375. The SDT has not addressed how the requirements of the proposed standard can be implemented without a market mechanism.All frequency response available in an RTO/ISO ancillary services market should be offered in a non-discriminatory way (possibly on an OASIS). The standard needs more detail (not an attachment) on how the Interconnect FRO is allocated to BAs. We further suggest the SDT consider providing detail in Attachment A that the Reliability Coordinator will need to be involved in allocation of the FRO to specific regions or plants within the Reliability Coordinator Area. There is a good chance that the proper geographic location of frequency responsive reserves will increase Transfer Path capability when the Transfer Path capability is limited by a loss of generation. This may be the case in the west where loss of two Palo Verde units establishes the California-Oregon Intertie SOL because frequency responsive reserves are carried in the Pacific Northwest, not near Palo Verde. The BAL-003-1 standard does not consider this issue. Please review the (pk gen+pk load)/2 method described in Attachment A, page 3.We appreciate the time and the work performed by the standard drafting team on this standard that we feel is a necessary component for reliable operation of the Interconnections.
Response: The FRO is based on the forecasted values. The SDT had extensive discussions concerning the generation/load split for determining the BA FRO and believes that the proposed methodology is both reasonably equitable and non-discriminatory. The SDT recognizes the need to convert Attachment A into two documents. The first document will remain part of the standard as Attachment A and provide greater detail for the calculation methodologies. The second document will explain the rationale for the requirements as supplemental standard information. This standard provides metrics in which markets and independent solutions can be developed. This standard provides a minimum requirement of a BA but does not prevent an RC from imposing further restrictions. All of the methodologies proposed in this standard are being tested during the field trial.	
SERC OC Standards Review Group	The Standard Authorization Request Form references that BAL-003-0 originated as part of Project 2007-18, Reliability-based Control. Actually, it originated in Project 2007-05, Balancing Authority Control. We are concerned that, in attachment A, the generation/load split in determining FRO may not be the most equitable method

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	for allocation. In general, we feel that Attachment A needs additional clarity, i.e., is the split based on forecasted or prior years' data. We are concerned with how the total frequency response obligation of an interconnection will be determined since this will ultimately determine each BA's FRO. We believe more detail should be presented on this issue. We appreciate the time and the work performed by the standard drafting team on this standard which we feel is a necessary component for reliable operation of the Interconnections."The comments expressed herein represent a consensus of the views of the above named members of the SERC OC Standards Review group only and should not be construed as the position of SERC Reliability Corporation, its board or its officers."
Response: Revisions to BAL-003 were originally part of Project 2007-05, but Project 2007-05 was then merged on July 28, 2010 into Project 2007-18. The SDT recognizes the need to convert Attachment A into two documents. The first document will remain part of the standard as Attachment A and provide greater detail for the calculation methodologies. The second document will explain the rationale for the requirements as supplemental standard information. The FRO is based on the forecasted values. The methodologies proposed in this standard have been tested during the field trial.	
South Carolina Electric and Gas	The Standard Authorization Request Form references that BAL-003-0 originated as part of Project 2007-18, Reliability-based Control. Actually, it originated in Project 2007-05, Balancing Authority Control. We are concerned that, in attachment A, the generation/load split in determining FRO may not be the most equitable method for allocation. In general, we feel that Attachment A needs additional clarity, i.e., is the split based on forecasted or prior years' data. We are concerned with how the total frequency response obligation of an interconnection will be determined since this will ultimately determine each BA's FRO. We believe more detail should be presented on this issue.We appreciate the time and the work performed by the standard drafting team on this standard that we feel is a necessary component for reliable operation of the Interconnections.
Response: Revisions to BAL-003 were originally part of Project 2007-05, but Project 2007-05 was then merged on July 28, 2010 into Project 2007-18. The SDT recognizes the need to convert Attachment A into two documents. The first document will remain part of the standard as Attachment A and provide greater detail for the calculation methodologies. The second document will explain the rationale for the requirements as supplemental standard information. The FRO is based on the forecasted values. The methodologies proposed in this standard have been tested during the field trial.	
FirstEnergy	If not already planned, we suggest that the drafting team conduct a webinar on this project to clarify the deliverables and answer questions that industry may have.
Response: The SDT conducted a Webinar on July 18, 2011 and is planning on holding another webinar in November 2011 to explain the changes made between	

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versions.	
Bonneville Power Administration	o D1.4 R1 Supplemental Information (first paragraph) - Adds an additional requirement outside of the requirements section. o D1.4 R2 Supplemental Information (first paragraph) - Adds an additional requirement outside of the requirement section. o D1.4 R Supplemental Information (Second paragraph) - Adds an additional requirement outside of the requirements section. This number has nothing to do with frequency response during events. Also, has more to do with R1 than R2.
Response: The Additional Compliance Section has been completely revised and the issues you identified have been removed.	
SPP Standards Development	The reporting requirement in Attachment A under R1 '...each BA has one month to assemble its data and calculate the FRM.' is not consistent with the reporting requirements in D. Compliance, 1.4 of the draft Standard. R4 - We suggest replacing the word 'increase' with 'modify' or 'adjust'. We also suggest deleting Balancing Authority Area and replacing it with combined areas at the end of the sentence. Why is R4 in BAL-003-0 being retired?
Response: The SDT has corrected the error in the wording. The SDT prefers to use the word "increase" to provide clarity that the Frequency Bias Setting should go up when providing this service. Use of the terms you are suggesting could be interpreted to allow for adjustments up or down. BAL-003-01.b Requirement R4 is not longer necessary. This Requirement addresses how to calculate Frequency Bias Settings. This is no longer needed since the Frequency Bias Settings are calculated in FRS Form 1 using Frequency Response associated with the "official" list of events and a couple of "floor or ceiling" limits (% of peak load/gen and FRO). The entire calculation is built into the FRS Form 1 workbook.	
IRC Standards Review Committee	The sections of "Additional Compliance Information" in the draft standard seem to create requirements as written. For example, revision of 1.4 for R1 Supplemental Information is suggested to be as follows: Each Balancing Authority or the Interconnection designated entity shall reports its previous year's Frequency Response Measure (FRM) to the ERO on Form 1 by January 10 each year. If the ERO posts the official list of events after December 10, Balancing Authorities or the Interconnection designated entity will be given 45 days from the date the ERO posts the official list of events to submit their FRS Form 1. If aA Balancing Authority may elects to fulfill its Frequency Response Obligation by participating as a member of a Reserve Sharing Group (RSG). If a Balancing Authority elects to report as an RSG, the total of the participating Balancing Authorities' FRO will be compared to the total of the participating Balancing Authorities' FRM. Further, revision of 1.4 for R2 Supplemental Information is suggested to be as follows: Each Balancing Authority or the Interconnection designated entity shall reports its current year requested Frequency Bias

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	Setting and Frequency Bias type (fixed or variable) to the ERO on FRS-Form 1 by January 10 each year. If the ERO posts the official list of events after December 10, Balancing Authorities will be given 45 days from the date the ERONERC posts the official list of events to submit their FRS Form 11. Once the FRM and Frequency Bias Settings have been validated by the ERO, the ERO will disseminate the Frequency Bias Settings Report for all Balancing Authorities in each Interconnection along with the implementation date.Balancing Authorities with variable Frequency Bias Settings shall calculate monthly average Frequency Bias Settings. The previous year's monthly averages will be reported annually on FRS Form 1. Again, please clarify what qualifies as "variable" Frequency Bias Setting. Also please clarify how the "monthly average Frequency Bias Settings" are to be calculated. Is it a daily or weekly or hourly weighted average, or something else? In Attachment A: What is the "frequency deviation event threshold specified for the Interconnection"? Where is it specified? Please clarify.In Attachment A, 2.b.: Is this intended to be describing Point B? Please clarify.In Attachment A: While the ERO is deciding which events to use, does this mean that, throughout the year, the BA must collect and save all the relevant data for all events so as to have the data ready and available for when the ERO issues the list of events to be reported? In Attachment A, 4.: "Any indication or evidence of a secondary event occurrence after Point C should be reviewed for inclusion based on having sufficient information to perform a full analysis of the event". What meant by "should be reviewed"? Who is to be doing the review? What are the criteria for the review? In the Implementation Plan: "native load" is not defined in the ERCOT Interconnection. Please clarify.
Response: The Additional Compliance Section has been completely revised and the issues you identified have been removed. The Requirement and Measure have been modified to include references to RSGs. Variable frequency bias settings are determined by Balancing Authorities using a calculation based on present operating conditions. The SDT recognizes the need to convert Attachment A into two documents in order to provide further clarity. The first document will remain part of the standard as Attachment A and provide greater detail for the calculation methodologies. The second document will explain the rationale for the requirements as supplemental standard information. The current Reliability Standard BAL-005 cites the data required to be archived. As envisioned, the ERO will post the events to be analyzed on a quarterly basis to allow a BA to review its performance throughout the year. The Implementation Plan no longer references "Native Load". However, this term is defined in the NERC Glossary of Terms.	
ERCOT	The sections of "Additional Compliance Information" in the draft standard seem to create requirements as written. For example, revision of 1.4 for R1 Supplemental Information is suggested to be as follows: Each Balancing Authority or the Interconnection designated entity shall reports its previous year's Frequency Response Measure (FRM) to the ERO on Form

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	1 by January 10 each year. If the ERO posts the official list of events after December 10, Balancing Authorities or the Interconnection designated entity will be given 45 days from the date the ERO posts the official list of events to submit their FRS Form 1. If aA Balancing Authority may elects to fulfill its Frequency Response Obligation by participating as a member of a Reserve Sharing Group (RSG). If a Balancing Authority elects to report as an RSG, the total of the participating Balancing Authorities' FRO will be compared to the total of the participating Balancing Authorities' FRM.Further, revision of 1.4 for R2 Supplemental Information is suggested to be as follows:Each Balancing Authority or the Interconnection designated entity shall reports its current year requested Frequency Bias Setting and Frequency Bias type (fixed or variable) to the ERO on FRS-Form 1 by January 10 each year. If the ERO posts the official list of events after December 10, Balancing Authorities will be given 45 days from the date the ERONERC posts the official list of events to submit their FRS Form 11. Once the FRM and Frequency Bias Settings have been validated by the ERO, the ERO will disseminate the Frequency Bias Settings Report for all Balancing Authorities in each Interconnection along with the implementation date. Balancing Authorities with variable Frequency Bias Settings shall calculate monthly average Frequency Bias Settings. The previous year's monthly averages will be reported annually on FRS Form 1. Again, please clarify what qualifies as "variable" Frequency Bias Setting. Also please clarify how the "monthly average Frequency Bias Settings" are to be calculated. Is it a daily or weekly or hourly weighted average, or something else?In Attachment A: What is the "frequency deviation event threshold specified for the Interconnection"? Where is it specified? Please clarify.In Attachment A, 2.b.: Is this intended to be describing Point B? Please clarify.In Attachment A: While the ERO is deciding which events to use, does this mean that, throughout the year, the BA must collect and save all the relevant data for all events so as to have the data ready and available for when the ERO issues the list of events to be reported?In Attachment A, 4.: "Any indication or evidence of a secondary event occurrence after Point C should be reviewed for inclusion based on having sufficient information to perform a full analysis of the event". What meant by "should be reviewed"? Who is to be doing the review? What are the criteria for the review?In the Implementation Plan: "native load" is not defined in the ERCOT Interconnection. Please clarify.
Response: The Additional Compliance Section has been completely revised and the issues you identified have been removed. The Requirement and Measure have been modified to include references to RSGs. Variable frequency bias settings are determined by Balancing Authorities using a calculation based on present operating conditions. The SDT recognizes the need to convert Attachment A into two documents in order to provide further clarity. The first document will remain part of the standard as Attachment A and provide greater detail for the calculation methodologies. The second document will explain the rationale for the requirements as supplemental standard information. The current Reliability Standard BAL-005 cites the data required to be archived. As envisioned, the ERO will post the events to be analyzed on a quarterly basis to allow a BA to review its performance throughout the year. The Implementation Plan no longer references "Native Load". However, this term is defined in the NERC Glossary of Terms.	
Progress Energy	We believe this standard insufficiently addresses the true nature of the problem; however it does accuratly address the fact

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	that the current BA minimum frequency bias setting is too large. This standard should also exclude LSE's without generation capacity since this problem both exists and can be solved at the generator level.
Response: The SDT agrees that the generator level can solve the issues. This standard is addressing directives from FERC Order 693. Any reference to a generator requirement would be outside of the industry approved SAR. The LSE is not cited as an applicable entity.	
NIPSCO	We reviewed the number of BAs in the Eastern Interconnection and there are many. We're hoping that compliance to R1 would be covered by the RSGs similar to DCS.
Response: The SDT added the RSG as a applicable entity to allow a BA an alternative method for complying with this standard.	
Energy Mark, Inc.	Comment 55: In Comment 25 I indicated that the suggested allocation method creates perverse incentives for BAs attempting to make decisions concerning Frequency Response. My comments here support that contention. Since the suggested allocation method is blind to changes in the demand for Frequency Response and it allocates the requirement to supply Frequency Response on a fixed Peak Load / Peak Generation Ratio share, it supports economic decisions at the BA level that are far from economic at the interconnection level. This perverse influence on economics and reliability are illustrated with two examples. Example 1: A BA with a Peak Load / Peak Generation Ratio share of 5% of the interconnection must decide whether or not to implement a program to expend $1 M to reduce the demand for Frequency Response worth approximately a comparable $5 M. From an interconnection level this is an obvious decision. The BA should implement the program. However, when the allocation method is considered, if the BA implements the program, it will expend $1 M, but will only see a reduction in its Frequency Response requirement of $.25 M. The remainder of the reduction in demand for Frequency Response will be shared by the other BAs on the interconnection. Therefore, it is in the BAs interest to not implement the program even though it provides excellent overall economics and results in improved reliability. Example 2: A BA with a Peak Load / Peak Generation Ratio share of 5% of the interconnection must decide whether or not to implement a program to save $1 M in annual maintenance expenses at its generation plants that will increase the need for Frequency Response on the interconnection at an annual cost of $5 M. From an interconnection level this is an obvious decision. The BA should not implement the program. However, when the allocation method is considered, if the BA implements the program, it will save $1 M anually, but will only see a increase in its annual expense for Frequency Response requirement of $.25 M. The remainder of the increase in demand for Frequency Response will be shared by the other BAs on the interconnection. Therefore, it is in the BAs interest to implement the program even though it fails to provide good economics and results in a decline in reliability. These examples demonstrate why a fixed allocation method as suggested in Attachment A would result in perverse results

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	with respect to reliability and economics. Comment 56: A series of four technical papers were written and offered to the Frequency Response Standard Drafting Team that describe a measurement method for Frequency Response that does not have the detrimental limitations that exist with the Peak Load / Peak Generation Ratio share method suggested in Attachment A. These four paper are:1. Illian, H. F., Frequency Response Risk Measure, Prepared for the Frequency Response Standard Drafting Team, Energy Mark, July 1, 2010 revised September 7, 2010.2. Illian, H. F., Understanding ACE and CPS1, Prepared for the Frequency Response Standard Drafting Team, Energy Mark, September 8, 2010.3. Illian, H. F., Frequency Response Reliability Measure for the Balancing Authority, Prepared for the Frequency Response Standard Drafting Team, Energy Mark, October 11, 2010.4. Illian, H. F., Description of Regressions for Frequency Response Analysis, Prepared for the Frequency Response Standard Drafting Team, Energy Mark, September 21, 2010.PDFs of these papers have been forwarded to supplement these comments and should be addended as part of my comments.
Response: Comment 54 – The SDT understands your concerns and has taken them under consideration during the development of this standard. The SDT will provide technical justification for the methods it proposes within the standard. Comment 55 – The SDT thanks you for your work in creating the aforementioned papers. The SDT has reviewed these papers and considered them during the development of this standard. Furthermore, the SDT will forward them on to the appropriate NERC personnel.	
Hydro-Quebec TransEnergie	The proposed NERC standard (BAL-003) does not take into account the “point C” issue. The proposed requirements are only related to “point B”.The proposed NERC standard (BAL-003) validates that the Balancing Authority carries enough Synchronized Reserve and that this reserve is really Frequency Responsive, on average in the most common situations (based on the median). It is an “after-the-fact” evaluation of the performance of the Balancing Authority. However, there is no guaranty that the Balancing Authority will maintain the required Synchronized Reserve either when the load is very low or during peak load periods Real-time Monitoring of the frequency responsive reserve would be a good way to avoid this issue.
Response: The SDT is proposing a more conservative Point B result in order to protect for Point C UFLS. We encourage real-time monitoring of Frequency Response as a good practice but mandating it is beyond industry approved SAR. Also, the SDT believes that this is being addressed in the development of the Balancing Authority Reliability-based Control standards in Project 2010-14.	
Westar Energy	Based on a Category C (N-2) event, what is the approximate Interconnection Frequency Response Obligation for each Interconnection? What is the First Step UFLS for each Interconnection? Since there is no NERC Standard requirement for what first step UFLS is, what if it changes during the year?
Response: The SDT recognized the need to convert Attachment A into two documents. The first document will remain part of the standard as Attachment A and provide greater detail for the calculation methodologies, including FRO. The second document will explain the rationale for the requirements as supplemental standard information. Table 2 in revised Attachment A shows the FRO for each interconnection and the methodology used to determine this value. The UFLS set point used in the calculation is shown in Table 2 for each Interconnection. These values are intended to protect against frequency reaching the highest UFLS	

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setting for credible contingencies. The utilities have the ability to change the UFLS settings during the year. The entities FRO and Frequency Bias Setting would remain the same until it was reviewed by the ERO. Your comment does emphasize the need for the ERO to coordinate these changes across standards but this is outside the scope of this project..	
EKPC	EKPC would like to express the importance of considering large non-conforming loads and their effects on smaller BAs.We appreciate the drafting team's effort and dedication to this standard.
Response: The SDT has modified FRS form 1 to allow for adjustments, including non-conforming load.	
We Energies	The FRO and the standard in general focus on Frequency Response for an intact grid. Inadequate consideration is given to unexpected events such as separation, islanding and partial or total BES failure. In these cases, the location of the FR resources is important. For example, if a BA has a contract with an entity that controls load level to satisfy the required FRO, that load may not be within the island created following a disruption to the BES. A complete BES failure may leave a black start island with only load frequency response. Load frequency response is the ultimate dispersed source for this commodity, but may be inadequate as the sole provider under abnormal grid conditions. For better grid security, other dispersed sources of frequency response are desirable. Comment on the NERC Resources Subcommittee Position Paper on Frequency Response (Discussion Draft):EOP-005-2 does not contain requirements for the Balancing Authority in a restoration event involving the use of black start resources. Only Transmission Operators, Generator Operators, Transmission Owners identified in the Transmission Operators restoration plan, and Distribution Providers identified in the Transmission Operators restoration plan have roles in that standard. How will the BA "bring more Frequency Responsive resources to bear" during black start if they have no defined role?
Response: This standard is not meant to be an emergency operations standard. However, this standard could assist an entity in identifying and solving the problem you have mentioned. The NERC RS Position Paper on Frequency Response is not a product of this standard. It is an information paper requested by the NERC OC. The RS posted the document and received industry comments that were incorporated.	
American Electric Power	If a balancing authority loses generation, what happen to the neighboring balancing authority's AGC? If an overall Reserve Sharing Group's performance can possibly be used to meet performance measures, why is the RSG not included in the Standard applicability for such functional entity?
Response: If the Frequency Bias Setting is close to natural Frequency Response, as this standard is proposing, the AGC impacts would be minimal or none. The RSG is listed in the Applicability Section of this standard. The SDT has further modified Requirement R1 to identify the RSG within the requirement.	

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Duke Energy	Below are just some of the points that Duke Energy believes need to be discussed further. Relationship to other standards under development: Given the significant implications of this standard to the other balancing-related standards, Duke Energy feels strongly that the Standards Committee should keep the work under Project 2010-14, Balancing Authority Reliability-based Control, high on the list of standards to be developed. CPS1 and the proposed BAAL are measures that make sense in the long term, as they provide "support to maintain Interconnection Frequency within predefined bounds" and aid in "supporting frequency until the frequency is restored to schedule" as desired in the purpose statement of this standard. Reserve Sharing Group: Duke Energy understands and supports the concept that Frequency Response could be aggregated over a Reserve Sharing Group, however the details need to be addressed in the measures, and in the requirements, which in the current draft only apply to the Balancing Authority. Field test: Duke Energy found the implementation plan and field test confusing. The information didn't indicate when the field test would start and end. The implementation plan proposes starting the gradual adjustment of BAL-003-0 R5 in May 2011 - what if the standard hasn't been approved by FERC by then? Shouldn't those dates be tied somehow to the effective date of BAL-003-1 which is in turn tied to regulatory approval where required? Or is that gradual decrease actually part of the field test? Frequency responsive resources: What are the attributes needed for a resource, or combination of resources, to be considered capable of providing "Frequency Response"? The answer is a critical element to the development of market products in a uniform manner across the Interconnection. Among other attributes, Frequency Response aids in arresting sudden frequency decline, however frequency responsive resources must respond to positive and negative deviations in Interconnection frequency. Having loads that drop off the system at certain levels of frequency are valuable tools in arresting frequency decline, however such resources do nothing within the range of frequency in which the Interconnection operates perhaps 99% of the time. This would point to perhaps two types of services to address frequency below 60 Hz - provision of frequency response in normal and emergency operation, and provision of a service specific for arresting a significant drop in frequency at a specific bound to reduce the possibility of UFLS needing to be utilized. Duke Energy believes these are two different products and should not be considered interchangeable. Methods of obtaining Frequency Response: If frequency response is a market resource, how can it be attained or scheduled from another Balancing Authority? Duke Energy believes this question needs to be asked of the Interchange Subcommittee. As the concept of a Reserve Sharing Group providing a "group frequency response" would not in our opinion constitute "interchange", Duke Energy believes the measure for calculated response should look at the RSG as if it was a single BA, rather than attempt to measure the RSG participants individually. On the other hand, outside of an RSG, if resources in one BA Area were contracted to supplement the response of resources in another BA Area, would such response be provision of a service between a source and sink BA, or would it be interchange with the Interconnection in some manner? FRM calculation:

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	Under the proposed definition, the FRM calculation would only consider provision of response from resources external to the BA Area if the “interchange” came in the form of a Pseudo-tie adjustment to Actual Interchange - Dynamic Schedules would not be accounted for. As the use of Pseudo-ties changes load calculations and other data, even the use of them may not make sense compared perhaps to just having a mechanism to move the obligation to the area providing the response, and then determining if the provision of just Frequency Response must absolutely carry into increased secondary control requirements. Separating primary response from secondary control: Is it possible for resources in one BA to provide a measure of Frequency Response for another BA, but not result in a change to each BA’s Frequency Bias Setting used in the secondary control requirements?
Response: The development of the Balancing Authority Reliability-based Control standards in Project 2010-14 are outside the scope of this SDT, however the need to coordinate development was raised with the Standards Committee and the standards in Project 2010-14 that address “reserves” have been advanced as high priority. The SDT has modified Requirement R1 and the associated measure to identify the RSG. In reference to your field trial comment the SDT has modified the Implementation Plan to no longer reference the field test or the reduction of the minimum Frequency Bias Setting. The SDT has developed a process by which the ERO will reduce the minimum Frequency Bias Setting. The procedure used to reduce the Frequency Bias Setting is detailed in Attachment B and is now tied to regulatory approval of this standard. This standard will provide the metrics for Frequency Response while the market will define itself. The SDT encourages you to work with NAESB to define a market. The SDT encourages you to open a discussion with the Interchange Subcommittee concerning Frequency Response as a market resource. The SDT has included language that defines how the RSG is to perform and comply with this standard. The SDT agrees that a Reserve Sharing Group providing a “group frequency response” would not be interchange between the entities within that group. The SDT also agrees that the RSG would be evaluated as if it were a single BA. The SDT has incorporated an improved FRS Form 1 with instructions for its use. The SDT thanks you for your comment concerning Pseudo-tie but, based on the information provided, the SDT is unsure of your question and cannot provide a further response. With regards to your last comment, the SDT believes that it is possible as long as they are using a dynamic schedule.	
Patterson Consulting, Inc.	Requirement 4 is worded incorrectly, although it is taken from the existing standard. Requirement 4 states "Each Balancing Authority that is performing Overlap Regulation Service shall [increase] its Frequency Bias Setting in its ACE calculation by combining the Frequency Bias Settings for the entire Baalancing Authority Area being controlled." (Bracketing added for emphasis.) Considering Frequency Bias Settings are negative numbers, this requirement should have Balancing Authorities "decrease" rather than "increase" their Frequency Bias Settings. For example, the requirement could state "Each Balancing Authority that is performing Overlap Regulation Service shall decrease..." or if "decrease" is undesirable then "Each Balancing Authority that is performing Overlap Regulation Service shall modify..."

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Response: The SDT understands your concern with the use of the term "increase" and has replaced this word with "modify". The SDT revised Requirement R4 for additional clarity and it now reads: Each Balancing Authority that is performing Overlap Regulation Service shall modify its Frequency Bias Setting in its ACE calculation to be equivalent to the sum of the Frequency Bias Settings of the participating Balancing Authorities as validated by the ERO or calculate the Frequency Bias Setting based on the entire area being combined and thereby represent the Frequency Response for the combined area being controlled.	
Associated Electric Cooperative, Inc.	BAL-003-1 draft standard: Apparent Intent and expectations: 1) I agree with this emerging standard's recognizing that the arbitrary 1% of peak-load should be refined by being lowered to better reflect each BA's expected frequency response. 2) This emerging standard apparently attempts to address the divesture of generation from loads by utilizing the "(Load + Generation)/2" formula, which seems fair. 3) I'm still struggling with the concept of being able to share in the success of an RSG, but not its failures if your BA was individually successful. Something seems wrong with that approach. However if necessary, AECI will definitely use it to its advantage. 4) I really would have liked to see the Measures that are currently in draft. Comment on Definitions: 1) SEFRD - I had to read this definition several times because "The individual sample of event data" is actually an internally calculated value derived from a set of event sample data, and not really a "sample" value at all. So, I believe the SEFRD definition needs further work. 2) FRM is defined by undefined terms "FRS" and "FRS Form 1". 3) FRO – fine 4) FRS - "Frequency Response Survey" Requirements and Requirements Supplement Information1) R1 and R1 Supplemental Information, pp 2, 4 a) I believe these two sections should be combined into one requirement, specifying the basic BA requirement "or, if the BA was within an RSG and elects to report from within that RSG's performance," that RSG's performance requirement. b) The time-frame for reporting should be another requirement, and with a companion Measurement. (Concerning the timing, the original response timeframe is 31 days, but the if NERC slips past the "normal" December 10 deadline, the

Organization	Question 17 Comment
	response time requirement is increased by 50%, to 45 days? Did somebody make a mistake, or was this intentional?) c) The problem with this requirement is that it relies on each BA to "read" its own frequency-performance, and does not provide a clear system of comparison between BAs for the same frequency event. In other words, the drafting team is trying to impose a nice bright-line objective standard, that is really resting on what is currently a very subjective calculation of SEFRD. . (See item 3, Rx- below) 2) R2 and R2 Supplemental Information pp 2..4 a) See comment 1.b above, concerning reporting time-frame being another requirement b) I believe every BA should report its monthly average frequency-bias setting, whether fixed-bias or variable-bias. In the case of reporting fixed-bias, the first two months will likely be different from the remaining ten months within the same calendar year. 3) Rx - I believe there is a hidden requirement, that the ERO monitor each interconnection's frequency for candidate events, then annually select and provide the top events for FRS Form 1 reporting. That same requirement should dictate that the ERO provide the corresponding A, B, and C times for each FRS Form 1 reportable event, when the survey goes out. I believe this requirement should be spelled-out, in order to improve reporting consistency and make the FRS reporting process a bit more objective.

Response: "Apparent Intent"

Comments 1) & 2) – The SDT thanks you for your comment.

Comment 3) The SDT added the RSG as a applicable entity to allow a BA an alternative method for complying with this standard. The SDT has included language that defines how the RSG is to perform and comply with this standard.

Comment 4) The SDT purposely left the measures out of the first draft. This was to ensure the focus would be on the requirements themselves. The SDT also recognized that the requirements would probably need revision after receiving industry feedback.

Definitions:

Comment 1) The SDT agrees with your concern regarding the definition of SEFRD. The SDT has removed the definition from the standard.

Comment 2) The term FRS Form 1 is only identifying a form to be used when providing information to the ERO.

Comment 3) The SDT thanks you for your agreement with the definition.

Comment 4) Again, the term FRS is simply pointing to a particular for to be used when providing the information to the ERO.

Requirements:

Comment 1 a) The SDT has revised Requirement R1 to reference an RSG. The Requirement now reads "Each Balancing Authority (BA) or Reserve Sharing Group (RSG) shall achieve an annual Frequency Response Measure (FRM) (as detailed in Attachment A and calculated on FRS Form 1) that is equal to or more negative than its Frequency Response Obligation (FRO) to ensure that sufficient Frequency Response is provided by each BA or RSG to maintain an adequate level of

Organization	Question 17 Comment	
Frequency Response in the Interconnection." Comment 1 b) The Additional Compliance Section has been completely revised and the issues you identified have been removed. Comment 1 c) The revised standard changes the methodology from subjective to directed. Comment 2 a) The Additional Compliance Section has been completely revised and the issues you identified have been removed. The SDT has corrected the timing issue you have referenced. Comment 2 b) The SDT disagrees and believes that "fixed" should be reported on a annual basis while "variable" should be reported monthly due to the nature of the calculation. Comment 3) The SDT believes that Point C is not needed for the methodology being recommended. The revised FRS Form 1 and the new Form 2 provide clarification concerning Point A and Point B.		
Alberta Electric System Operator	Is there any relation or coordination between the work of this standard and the effort on "NERC RS Position Paper on Frequency Response" ? The AESO believes these two projects should be coordinated.The AESO has also signed on to comments submitted by the SRC. We see the SRC comments as continent wide and these AESO comments as more Alberta specific.	
Response: The NERC RS Position Paper on Frequency Response is not a product of this standard. It is an information paper requested by the NERC OC. The RS posted the document and received industry comments that were incorporated. In addition, some of the Frequency Response SDT membership are also members of the NERC RS. Please refer to our comments to SRC.		
Kansas City Power & Light		No other comments.

Standard Development Roadmap

This section is maintained by the drafting team during the development of the standard and will be removed when the standard becomes effective.

Development Steps Completed:

1. The Standards Committee approved the SAR for posting on January 13, 2005.
2. The SAR was posted for industry comment from January 17, 2005 through February 17, 2005.
3. Reply comments and a revised SAR were posted for a second industry comment period from April 4, 2006 through May 3, 2006.
4. Reply comments and a revised SAR were posted for a third industry comment period from February 8, 2007 through March 9, 2007.
5. Standards Committee approved moving the project into the standards development phase on July 12, 2007.
6. The Standards Committee appointed the Standard Drafting Team on August 13, 2007.
7. The draft standard was posted for a 30 day formal comment period from February 4, 2011 through March 7, 2011.

Proposed Action Plan and Description of Current Draft:

This is the second posting of the proposed standard and its associated documents for a 45 day formal comment period and a successive 10 day ballot, from October 24, 2011through December 7, 2011.

Future Development Plan:

Anticipated Actions	Anticipated Date
1. Respond to comments submitted within the comment period and with the successive ballot.	December, 2011
2. Conduct a recirculation ballot for ten days.	January, 2012
3. BOT adoption.	March, 2012

Definitions of Terms used in the Standard

Frequency Response Measure (FRM)

The median of all the Frequency Response observations reported annually on FRS Form 1.

Frequency Response Obligation (FRO)

The Balancing Authority's share of the required Frequency Response needed for the reliable operation of an Interconnection.

Frequency Bias Setting

A number, either fixed or variable, usually expressed in MW/0.1 Hz, included in a Balancing Authority's Area Control Error equation to account for the Balancing Authority's Frequency Response contribution to the Interconnection, and discourage response withdrawal through secondary control systems.

A. Introduction

Title: Frequency Response and Frequency Bias Setting

Number: BAL-003-1

Purpose: To require sufficient Frequency Response from the Balancing Authority to maintain Interconnection Frequency within predefined bounds by arresting frequency deviations and supporting frequency until the frequency is restored. To provide consistent methods for measuring Frequency Response and determining the Frequency Bias Setting.

Applicability:

1.1. Balancing Authority

1.2. Reserve Sharing Group (where applicable)

Effective Date:

1.3. In those jurisdictions where regulatory approval is required, Requirements R2, R3 R4 and R5 of this standard shall become effective the first calendar day of the first calendar quarter 12 months after applicable regulatory approval. In those jurisdictions where no regulatory approval is required, Requirements R2, R3, R4 and R5 of this standard shall become effective the first calendar day of the first calendar quarter 12 months after Board of Trustees adoption.

1.4. In those jurisdictions where regulatory approval is required, Requirements R1 of this standard shall become effective the first calendar day of the first calendar quarter 24 months after applicable regulatory approval. In those jurisdictions where no regulatory approval is required, Requirements R1 of this standard shall become effective the first calendar day of the first calendar quarter 24 months after Board of Trustees adoption.

B. Requirements

R1. Each Balancing Authority (BA) or Reserve Sharing Group (RSG) shall achieve an annual Frequency Response Measure (FRM) (as detailed in Attachment A and calculated on FRS Form 1) that is equal to or more negative than its Frequency Response Obligation (FRO) to ensure that sufficient Frequency Response is provided by each BA or RSG to maintain an adequate level of Frequency Response in the Interconnection. *[Risk Factor: Medium][Time Horizon: Operations Assessment]*

R2. Each Balancing Authority not participating in Overlap Regulation Service shall implement the Frequency Bias Setting (fixed or variable) validated by the ERO, into its Area Control Error (ACE) calculation beginning on the date specified by the ERO to ensure effectively coordinated Tie Line Bias control. *[Risk Factor: Medium][Time Horizon: Operations Planning]*

R3. Each Balancing Authority not receiving Overlap Regulation Service shall operate its Automatic Generation Control (AGC) in Tie Line Bias mode to ensure effectively

coordinated control, unless such operation would have an Adverse Reliability Impact on the Balancing Authority's Area. *[Risk Factor: Medium][Time Horizon: Real-time Operations]*

R4. Each Balancing Authority that is performing Overlap Regulation Service shall modify its Frequency Bias Setting in its ACE calculation to be equivalent to the sum of the Frequency Bias Settings of the participating Balancing Authorities as validated by the ERO or calculate the Frequency Bias Setting based on the entire area being combined and thereby represent the Frequency Response for the combined area being controlled. *[Risk Factor: Medium][Time Horizon: Operations Planning]*

R5. In order to ensure adequate control response, each Balancing Authority shall use a monthly average Frequency Bias Setting whose absolute value is at least equal to one of the following: *[Risk Factor: Medium][Time Horizon: Operations Planning]*

- The minimum percentage of the Balancing Authority Area's estimated yearly Peak Demand within its metered boundary per 0.1 Hz change as specified by the ERO in accordance with Attachment B.

- The minimum percentage of the Balancing Authority Area's estimated yearly peak generation for a generation-only Balancing Authority, per 0.1 Hz change as specified by the ERO in accordance with Attachment B.

C. Measures

M1. The Balancing Authority or Reserve Sharing Group shall have FRS Form 1 with data to show that its FRM is equal to or more negative than FRO to demonstrate compliance with Requirement R1.

M2. The Balancing Authority shall have evidence such as a dated document in hard copy or electronic format showing the ERO validated Frequency Bias Setting was entered into its ACE calculation on the date specified or other evidence to demonstrate compliance with Requirement R2.

M3. The Balancing Authority shall have evidence such as a dated operating log, database or list in hard copy or electronic format or operator interviews supported by other evidence showing the AGC operating mode including explanation when operating in other than Tie Line Bias mode to demonstrate compliance with Requirement R3.

M4. The Balancing Authority shall have evidence such as a dated operating log, database or list in hard copy or electronic format showing when Overlap Regulation Service is provided including Frequency Bias Setting calculation to demonstrate compliance with Requirement R4.

M5. The Balancing Authority shall have evidence such as dated data plus documented formula to support the calculation retained in either hardcopy or electronic format showing the monthly average Frequency Bias Setting or other evidence to demonstrate compliance with Requirement R5.

D. Compliance

1. Compliance Monitoring Process

1.1. Compliance Enforcement Authority

The Regional Entity is the Compliance Enforcement Authority except where the responsible entity works for the Regional Entity. Where the responsible entity works for the Regional Entity, the Regional Entity will establish an agreement with the ERO or another entity approved by the ERO and FERC (i.e. another Regional Entity), to be responsible for compliance enforcement.

1.2. Compliance Monitoring and Assessment Processes:

Compliance Audits

Self-Certifications

Spot Checking

Compliance Violation Investigations

Self-Reporting

Complaints

Periodic Data Submittals

1.3. Data Retention

The Balancing Authority shall retain data or evidence to show compliance with Requirements R1, R2, R3, R4 and R5, Measures M1, M2, M3, M4, and M5 for the current year plus three calendar years unless directed by its Compliance Enforcement Authority to retain specific evidence for a longer period of time as part of an investigation.

The Reserve Sharing Group shall retain data or evidence to show compliance with Requirement R1 and Measure M1 for the current year plus three calendar years unless directed by its Compliance Enforcement Authority to retain specific evidence for a longer period of time as part of an investigation.

If a Balancing Authority or Reserve Sharing Group is found non-compliant, it shall keep information related to the non-compliance until found compliant or for the time period specified above, whichever is longer.

The Compliance Enforcement Authority shall keep the last audit records and all subsequent requested and submitted records.

1.4. Additional Compliance Information

For Interconnections that are also Balancing Authorities, Tie Line Bias control and Flat Frequency control are equivalent and either is acceptable.

2.0 Violation Severity Levels

R#	Lower VSL	Medium VSL	High VSL	Severe VSL
R1	The summation of the Balancing Authorities' FRM within an Interconnection was equal to or more negative than the Interconnection's FRO and the Balancing Authority's, or Reserve Sharing Groups, FRM was less negative than its FRO by more than 1% but by at most 30% or 15 MW/0.1 Hz, whichever one is the greater deviation from its FRO	The summation of the Balancing Authorities' FRM within an Interconnection was equal to or more negative than the Interconnection's FRO and the Balancing Authority's, or Reserve Sharing Groups, FRM was less negative than its FRO by more than 30% or by more than 15 MW/0.1 Hz, whichever is the greater deviation from its FRO	The summation of the Balancing Authorities' FRM within an Interconnection did not meet its FRO and the Balancing Authority's, or Reserve Sharing Groups, FRM was less negative than its FRO by more than 1% but by at most 30% or 15 MW/0.1 Hz, whichever one is the greater deviation from its FRO	The summation of the Balancing Authorities' FRM within an Interconnection did not meet its FRO and the Balancing Authority's, or Reserve Sharing Groups, FRM was less negative than its FRO by more than 30% or by more than 15 MW/0.1 Hz, whichever is the greater deviation from its FRO
R2	The Balancing Authority not receiving Overlap Regulation Service failed to implement the validated Frequency Bias Setting value into its ACE calculation on the date specified but did so within 5 calendar days following the date specified by the ERO.	The Balancing Authority not receiving Overlap Regulation Service implemented the validated Frequency Bias Setting value into its ACE calculation in more than 5 calendar days but less than or equal to 15 calendar days following the date specified by the ERO.	The Balancing Authority not receiving Overlap Regulation Service implemented the validated Frequency Bias Setting value into its ACE calculation in more than 15 calendar days but less than or equal to 25 calendar days following the date specified by the ERO.	The Balancing Authority not receiving Overlap Regulation Service did not implement the validated Frequency Bias Setting value into its ACE calculation in more than 25 calendar days following the date specified by the ERO.
R3	N/A	N/A	N/A	The Balancing Authority not receiving Overlap Regulation service failed to operate AGC in Tie Line Bias mode and such operation would not

				have had an Adverse Reliability Impact on the Balancing Authority's Area.
R4	The Balancing Authority incorrectly changed the Frequency Bias Setting value used in its ACE calculation when providing Overlap Regulation Services with combined footprint setting-error less than 5% of the correct value.	The Balancing Authority incorrectly changed the Frequency Bias Setting value used in its ACE calculation when providing Overlap Regulation Services with combined footprint setting-error more than 5% but less than or equal to 15% of the correct value.	The Balancing Authority incorrectly changed the Frequency Bias Setting value used in its ACE calculation when providing Overlap Regulation Services with combined footprint setting-error more than 15% but less than or equal to 25% of the correct value.	The Balancing Authority incorrectly changed the Frequency Bias Setting value used in its ACE calculation when providing Overlap Regulation Services with combined footprint setting-error more than 25% of the correct value. OR The Balancing Authority failed to change the Frequency Bias Setting value used in its ACE calculation when providing Overlap Regulation Services.
R5	The absolute value of the Balancing Authorities' calculated monthly average Frequency Bias Setting was less than or equal to 5% below the minimum specified by the ERO.	The absolute value of the Balancing Authorities' calculated monthly average Frequency Bias Setting was more than 5% but less than or equal to 15% below the minimum specified by the ERO.	The absolute value of the Balancing Authorities' calculated monthly average Frequency Bias Setting was more than 15% but less than or equal to 25% below the minimum specified by the ERO.	The absolute value of the Balancing Authorities' calculated monthly average Frequency Bias Setting was more than 25% below the minimum specified by the ERO.

E. Regional Variance

None

F. Associated Documents

Attachment A - Frequency Response Standard Supporting Document

Attachment B – Process for Adjusting Bias Setting Floor

FRS Form 1

FRS Form 2

Frequency Response Standard Background Document

G. Version History

Version	Date	Action	Change Tracking
0	April 1, 2005	Effective Date	New
1		Complete Revision under Project 2007-12	Revision

Standard Development Roadmap

This section is maintained by the drafting team during the development of the standard and will be removed when the standard becomes effective.

Development Steps Completed:

1. The Standards Committee approved the SAR for posting on January 13, 2005.
2. The SAR was posted for industry comment from January 17, 2005 through February 17, 2005.
3. Reply comments and a revised SAR were posted for a second industry comment period from April 4, 2006 through May 3, 2006.
4. Reply comments and a revised SAR were posted for a third industry comment period from February 8, 2007 through March 9, 2007.
5. Standards Committee approved moving the project into the standards development phase on July 12, 2007.
6. The Standards Committee appointed the Standard Drafting Team on August 13, 2007.
7. The draft standard was posted for a 30 day formal comment period from February 4, 2011 through March 7, 2011.

Proposed Action Plan and Description of Current Draft:

This is the second posting of the proposed standard and its associated documents for a 45 day formal comment period and a successive 10 day ballot, from October ~~21~~24, 2011through December ~~5~~7, 2011.

Future Development Plan:

Anticipated Actions	Anticipated Date
1. Respond to comments submitted within the comment period and with the successive ballot.	December, 2011
2. Conduct a recirculation ballot for ten days.	January, 2012
3. BOT adoption.	March, 2012

Definitions of Terms used in the Standard

~~**Single Event Frequency Response Data (SEFRD)**~~

~~The individual sample of event data from a Balancing Authority which represents the change in Net Actual Interchange (NI_A), divided by the change in frequency, expressed in MW/0.1Hz.~~

Frequency Response Measure (FRM)

The median of all the Frequency Response ~~Single Event Frequency Response Data~~ observations reported annually on FRS Form 1.

Frequency Response Obligation (FRO)

The Balancing Authority's share of the required Frequency Response ~~contribution to the total aggregate Frequency Response~~ needed for the reliable operation of an Interconnection ~~assigned by the ERO~~.

Frequency Bias Setting

A number~~value~~, ~~(~~either ~~a~~ fixed or variable ~~Frequency Bias)~~, usually expressed in MW/0.1 Hz, included in~~set into~~ a Balancing Authority's Area Control Error equation to account for~~that allows~~ the Balancing Authority's Frequency Response contribution ~~to contribute its Frequency Response~~ to the Interconnection, and discourage response withdrawal through secondary control systems.

A. Introduction

Title: Frequency Response and Frequency Bias Setting

Number: BAL-003-1

Purpose: To require sufficient Frequency Response from the Balancing Authority to maintain Interconnection Frequency within predefined bounds by arresting frequency deviations and supporting frequency until the frequency is restored. To ~~schedule and~~ provide consistent methods for measuring Frequency Response and determining the Frequency Bias Setting.

Applicability:

1.1. Balancing Authority

1.2. Reserve Sharing Group (where applicable)

Effective Date:

1.3. In those jurisdictions where regulatory approval is required, Requirements R2, R3 ~~and~~ R4 and R5 of this standard shall become effective the first calendar day of the first calendar quarter 12 months after applicable regulatory approval. In those jurisdictions where no regulatory approval is required, Requirements R2, ~~and~~ R3, R4 and R5 of this standard shall become effective the first calendar day of the first calendar quarter 12 months after Board of Trustees adoption.

1.4. In those jurisdictions where regulatory approval is required, Requirements R1 of this standard shall become effective the first calendar day of the first calendar quarter 24 months after applicable regulatory approval. In those jurisdictions where no regulatory approval is required, Requirements R1 of this standard shall become effective the first calendar day of the first calendar quarter 24 months after Board of Trustees adoption.

B. Requirements

R1. Each Balancing Authority (BA) or Reserve Sharing Group (RSG) shall achieve an annual Frequency Response Measure (FRM) (as detailed in Attachment A and calculated on FRS Form 1) that is equal to or more negative than its Frequency Response Obligation (FRO) to ensure that sufficient Frequency Response is provided by each BA or RSG to maintain an adequate level of Frequency Response in the Interconnection. *[Risk Factor: Medium][Time Horizon: Operations Assessment]*

~~**R1.**~~**R2.** Each Balancing Authority not participating in Overlap Regulation Service shall implement the Frequency Bias Setting (fixed or variable) validated~~provided~~ by the ERO, into its Area Control Error (ACE) calculation beginning on the date specified by the ERO to ensure effectively coordinated Tie Line Bias~~secondary~~ control~~, using the results from the calculation methodology detailed in Attachment A~~. *[Risk Factor: Medium][Time Horizon: Operations Planning]*

~~R2.~~R3. Each Balancing Authority not receiving Overlap Regulation Service shall operate its Automatic Generation Control (AGC) in~~on~~ Tie Line Bias mode to ensure effectively coordinated control, unless such operation would have an Adverse Reliability Impact on the Balancing Authority's Area. *[Risk Factor: Medium][Time Horizon: Real-time Operations]*

R4. Each Balancing Authority that is performing Overlap Regulation Service shall modify~~increase~~ its Frequency Bias Setting in its ACE calculation to be equivalent to the sum of ~~by combining~~ the Frequency Bias Settings of the participating Balancing Authorities as validated by the ERO or calculate the Frequency Bias Setting based on the entire area being combined and thereby represent the Frequency Response for the combined~~entire~~ area being controlled. *[Risk Factor: Medium][Time Horizon: Operations Planning]*

R5. In order to ensure adequate control response, each Balancing Authority shall use a monthly average Frequency Bias Setting whose absolute value is at least equal to one of the following: *[Risk Factor: Medium][Time Horizon: Operations Planning]*

- The minimum percentage of the Balancing Authority Area's estimated yearly Peak Demand within its metered boundary per 0.1 Hz change as specified by the ERO in accordance with Attachment B.
- The minimum percentage of the Balancing Authority Area's estimated yearly peak generation for a generation-only Balancing Authority, per 0.1 Hz change as specified by the ERO in accordance with Attachment B.

C. Measures

~~Measures for each Requirement will be provided in the second posting of the proposed standard.~~

M1. The Balancing Authority or Reserve Sharing Group shall have FRS Form 1 with data to show that its FRM is equal to or more negative than FRO to demonstrate compliance with Requirement R1.

M2. The Balancing Authority shall have evidence such as a dated document in hard copy or electronic format showing the ERO validated Frequency Bias Setting was entered into its ACE calculation on the date specified or other evidence to demonstrate compliance with Requirement R2.

M3. The Balancing Authority shall have evidence such as a dated operating log, database or list in hard copy or electronic format or operator interviews supported by other evidence showing the AGC operating mode including explanation when operating in other than Tie Line Bias mode to demonstrate compliance with Requirement R3.

M4. The Balancing Authority shall have evidence such as a dated operating log, database or list in hard copy or electronic format showing when Overlap Regulation Service is provided including Frequency Bias Setting calculation to demonstrate compliance with Requirement R4.

~~M1.~~M5. The Balancing Authority shall have evidence such as dated data plus documented formula to support the calculation retained in either hardcopy or electronic format showing the monthly average Frequency Bias Setting or other evidence to demonstrate compliance with Requirement R5.

D. Compliance

1. Compliance Monitoring Process

1.1. Compliance Enforcement Authority

The Regional Entity is the Compliance Enforcement Authority except where the responsible entity works for the Regional Entity. Where the responsible entity works for the Regional Entity, the Regional Entity will establish an agreement with the ERO or another entity approved by the ERO and FERC (i.e. another Regional Entity), to be responsible for compliance enforcement.~~Regional Entity shall serve as the Compliance Enforcement Authority.~~

1.2. Compliance Monitoring and Assessment Processes:

Compliance Audits

Self-Certifications

Spot Checking

Compliance Violation Investigations

Self-Reporting

Complaints

Periodic Data Submittals

1.3. Data Retention

The Balancing Authority shall retain data or evidence to show compliance with Requirements R1, R2, R3, R4 and R5, Measures M1, M2, M3, M4, and M5 for the current year plus three calendar years unless directed by its Compliance Enforcement Authority to retain specific evidence for a longer period of time as part of an investigation.

The Reserve Sharing Group shall retain data or evidence to show compliance with Requirement R1 and Measure M1 for the current year plus three calendar years unless directed by its Compliance Enforcement Authority to retain specific evidence for a longer period of time as part of an investigation.

If a Balancing Authority or Reserve Sharing Group is found non-compliant, it shall keep information related to the non-compliance until found compliant or for the time period specified above, whichever is longer.

The Compliance Enforcement Authority shall keep the last audit records and all subsequent requested and submitted records.

1.4. Additional Compliance Information

~~**R1 Supplemental Information**~~

~~Each Balancing Authority shall report its previous year's Frequency Response Measure (FRM) to the ERO on Form 1 by January 10 each year. If the ERO posts the official list of events after December 10, Balancing Authorities will be given 45 days from the date the ERO posts the official list of events to submit their FRS Form 1.~~

~~A Balancing Authority may elect to fulfill its Frequency Response Obligation by participating as a member of a Reserve Sharing Group (RSG). If a Balancing Authority elects to report as an RSG, the total of the participating Balancing Authorities' FRO will be compared to the total of the participating Balancing Authorities' FRM.~~

~~**R2 Supplemental Information.**~~

~~Each Balancing Authority shall report its current year requested Frequency Bias Setting and Frequency Bias type (fixed or variable) to the ERO on FRS Form 1 by January 10 each year. If the ERO posts the official list of events after December 10, Balancing Authorities will be given 45 days from the date NERC posts the official list of events to submit their FRS Form 1. Once the FRM and Frequency Bias Settings have been validated by the ERO, the ERO will disseminate the Frequency Bias Settings Report for all Balancing Authorities in each Interconnection along with the implementation date.~~

~~Balancing Authorities with variable Frequency Bias Settings shall calculate monthly average Frequency Bias Settings. The previous year's monthly averages will be reported annually on FRS Form 1.~~ For Interconnections that are also Balancing Authorities, Tie Line Bias control and Flat Frequency control are equivalent and either is acceptable.

2.0 Violation Severity Levels

R#	Lower VSL	Medium VSL	High VSL	Severe VSL
R1	The summation of the Balancing Authorities' FRM within an Interconnection was equal to or more negative than the Interconnection's FRO and the Balancing Authority's, or Reserve Sharing Groups, FRM was	The summation of the Balancing Authorities' FRM within an Interconnection was equal to or more negative than the Interconnection's FRO and the Balancing Authority's, or Reserve Sharing Groups, FRM was	The summation of the Balancing Authorities' FRM within an Interconnection did not meet its FRO and the Balancing Authority's, or Reserve Sharing Groups, FRM was less negative than its FRO by more than 1% but by at most	The summation of the Balancing Authorities' FRM within an Interconnection did not meet its FRO and the Balancing Authority's, or Reserve Sharing Groups, FRM was less negative than its FRO by more than 30% or by more

	less negative than its FRO by more than 1% but by at most 30% or 15 MW/0.1 Hz, whichever one is the greater deviation from its FRO	less negative than its FRO by more than 30% or by more than 15 MW/0.1 Hz, whichever is the greater deviation from its FRO	30% or 15 MW/0.1 Hz, whichever one is the greater deviation from its FRO	than 15 MW/0.1 Hz, whichever is the greater deviation from its FRO
R2	The Balancing Authority not receiving Overlap Regulation Service failed to implement the validated Frequency Bias Setting value into its ACE calculation on the date specified but did so within 5 calendar days following the date specified by the ERO.	The Balancing Authority not receiving Overlap Regulation Service implemented the validated Frequency Bias Setting value into its ACE calculation in more than 5 calendar days but less than or equal to 15 calendar days following the date specified by the ERO.	The Balancing Authority not receiving Overlap Regulation Service implemented the validated Frequency Bias Setting value into its ACE calculation in more than 15 calendar days but less than or equal to 25 calendar days following the date specified by the ERO.	The Balancing Authority not receiving Overlap Regulation Service did not implement the validated Frequency Bias Setting value into its ACE calculation in more than 25 calendar days following the date specified by the ERO.
R3	N/A	N/A	N/A	The Balancing Authority not receiving Overlap Regulation service failed to operate AGC in Tie Line Bias mode and such operation would not have had an Adverse Reliability Impact on the Balancing Authority's Area.
R4	The Balancing Authority incorrectly changed the Frequency Bias Setting value used in its ACE calculation when providing Overlap Regulation Services with combined footprint	The Balancing Authority incorrectly changed the Frequency Bias Setting value used in its ACE calculation when providing Overlap Regulation Services with combined footprint	The Balancing Authority incorrectly changed the Frequency Bias Setting value used in its ACE calculation when providing Overlap Regulation Services with combined footprint	The Balancing Authority incorrectly changed the Frequency Bias Setting value used in its ACE calculation when providing Overlap Regulation Services with combined footprint

	setting-error less than 5% of the correct value.	setting-error more than 5% but less than or equal to 15% of the correct value.	setting-error more than 15% but less than or equal to 25% of the correct value.	setting-error more than 25% of the correct value. OR The Balancing Authority failed to change the Frequency Bias Setting value used in its ACE calculation when providing Overlap Regulation Services.
R5	The absolute value of the Balancing Authorities' calculated monthly average Frequency Bias Setting was less than or equal to 5% below the minimum specified by the ERO.	The absolute value of the Balancing Authorities' calculated monthly average Frequency Bias Setting was more than 5% but less than or equal to 15% below the minimum specified by the ERO.	The absolute value of the Balancing Authorities' calculated monthly average Frequency Bias Setting was more than 15% but less than or equal to 25% below the minimum specified by the ERO.	The absolute value of the Balancing Authorities' calculated monthly average Frequency Bias Setting was more than 25% below the minimum specified by the ERO.

E. Regional Variance

None

F. Associated Documents

Attachment A - Frequency Response Standard Supporting Document~~Background Document~~

Attachment B – Process for Adjusting Bias Setting Floor

FRS Form 1

FRS Form 21 ~~Instructions~~

Frequency Response Standard Background Document

G. Version History

Version	Date	Action	Change Tracking
0	April 1, 2005	Effective Date	New
1		Complete Revision under Project 2007-12	Revision

Attachment A

BAL-003-1 Frequency Response & Frequency Bias Setting Standard

Supporting Document

Background

This document outlines the ERO process for supporting the Frequency Response Standard (FRS).

Event Selection Criteria

The ERO will use the following criteria to select FRS frequency excursion events for analysis.

1. The evaluation period for performing the annual Frequency Bias Setting and the Frequency Response Measure (FRM) calculation is December 1 of the prior year through November 30 of the current year.
2. The ERO will identify at least 25 frequency excursion events in each Interconnection for calculating the Frequency Bias Setting and the FRM. If the ERO cannot identify in a given evaluation period 25 frequency excursion events satisfying the limits specified in criteria 3 below, then similar acceptable events from the previous evaluation period also satisfying listed criteria will be included with the data set by the ERO for determining FRS compliance.
3. The ERO will use two limits to determine if an acceptable frequency excursion event for determining FRM has occurred:
    a. The change in frequency (delta F) and the arresting frequency (Point C) must exceed the excursion threshold values specified for the Interconnection in Table 1 below. Point C is the arrested value of frequency observed within 8 seconds following the start of the excursion.

		Point C	
Interconnection	**Delta F**	**Under Frequency**	**Over Frequency**
East	0.04Hz	< 59.97	> 60.03
West	0.05Hz	< 59.97	> 60.03
Texas	0.15Hz	< 59.90	> 60.10
HQ	0.20Hz	< 59.85	> 60.15

Table 1: Interconnection Frequency Excursion Threshold Values

    b. The time from the start of the rapid change in frequency until the point at which Frequency has stabilized within a narrow range should be less than 18 seconds.

4. Pre-disturbance frequency should be relatively steady and near 60.000 Hz. The A Value is computed as an average over the period from -16 seconds to 0 seconds before the frequency transient begins to decline.
5. Events that coincide with a second event that does not stabilize before the first scan used in the B-Value will not be considered.
6. Frequency excursion events occurring during periods when large interchange schedule ramping or load change is happening, and frequency excursion events occurring within 5 minutes of the top of the hour, should be excluded from consideration if other acceptable frequency excursion events can be used for analysis.
7. Select the cleanest 2 or 3 frequency excursion events occurring monthly that satisfy selection criteria. If there are not 2 frequency excursion events satisfying selection criteria occurring during the month, then other frequency excursion events from the same season of the year satisfying selection criteria should be considered for use if necessary.

To assist Balancing Authority preparation for complying with this standard, the ERO will provide quarterly posting of candidate frequency excursion events for the current year FRM calculation. The ERO will post the final list of frequency excursion events used for standard compliance by December 15 each year. Balancing Authorities are encouraged to develop scanning tools that identify candidate frequency excursion events so they are ready to access data files when needed.

NOTE: *The ERO may use for analysis of Interconnection frequency performance, but not for Balancing Authority Frequency Response, additional frequency excursion events not satisfying the criteria specified.*

Frequency Response Obligation (FRO) for the Interconnection

Each Interconnection will establish target contingency protection criteria. The default target listed in Table 2 is based on the largest category C (N-2) event identified. However, this contingency protection criterion includes a safety margin to prevent Point C from encroaching on the interconnection's highest Under Frequency Load Shed (UFLS) step for credible contingencies.

	Eastern	Western	Texas	HQ	
Starting Frequency	60	60	60	60	Hz
*Highest UFLS	59.6	59.5	59.3	58.5	Hz
Contingency Protection Criteria	4500	2740	2750	1700	MW
**Base Obligation	1125	548	229	113	MW/0.1Hz
With 25% Safety Margin	1406	685	286	141	MW/0.1Hz

Table 2: Interconnection Frequency Response Obligations

*The Eastern Interconnection set point listed is a compromise value for the highest UFLS step setting of 59.5Hz used in the east and the special protection scheme's highest UFLS step setting of 59.7Hz used in Florida. It is extremely unlikely that an event elsewhere in the Eastern Interconnection would cause the Florida UFLS special protection scheme to "false trip".

**In the Base Obligation measure for Texas, 1150 MW (Load Resources triggered by Under Frequency Relays at 59.70 Hz) was reduced from its Contingency Protection Criteria level of 2750 MW to get 229 MW/0.1 Hz. This was reduced to accurately account for designed response from Load Resources within 30 cycles.

An Interconnection may propose alternate FRO protection criteria to the ERO. The ERO will confirm the proposed alternate FRO protection criteria.

Balancing Authority Frequency Response Obligation (FRO) and Frequency Bias Setting

The ERO will manage the administrative procedure for annually assigning an FRO and Frequency Bias Setting to each Balancing Authority.

For a multiple Balancing Authority interconnection, the Interconnection Frequency Response Obligation is allocated based on either the Balancing Authority Peak Demand or peak generation. Initial FRO allocation will be based on the following method:

$$\left[\frac{\text{Projected BA Peak Load + BA installed capacity}}{\text{Projected Interconnection Peak Load + Interconnection installed capacity}}\right] \times \text{Interconnection FRO}$$

Each Balancing Authority shall report its previous year's Frequency Response Measure (FRM), Frequency Bias Setting and Frequency Bias type (fixed or variable) to the ERO on FRS Form 1 by January 10 each year. If the ERO posts the official list of events after December 10, Balancing Authorities will be given 30 days from the date the ERO posts the official list of events to submit their FRS Form 1.

Once the ERO validates the data for all Balancing Authorities, the ERO will use FRS Form 1 data to post the following information for each Balancing Authority for the upcoming year:

- Frequency Bias Setting
- Frequency Response Obligation (FRO)

Frequency Bias Setting will be the greater of (in absolute terms) the FRM or the Interconnection minimum (as defined in Attachment B). FRS Form 1 will automatically calculate the Balancing Authority's Bias Settings. Balancing Authorities that provide Overlap Regulation will submit a FRS Form 1 that represents both the provider's and the recipient(s)' footprint. Once the data listed above is fully posted, the ERO will announce the implementation date for changing the Frequency Bias Setting.

Frequency Response Measure (FRM)

The FRM will be computed from Single Event Frequency Response Data (SEFRD), defined as: "the data from an individual event from a Balancing Authority that is used to calculate its Frequency Response, expressed in MW/0.1Hz" as calculated on FRS Form 2. The SEFRD for a typical Balancing Authority in an Interconnection with more than one Balancing Authority is basically the change in its Net Actual Interchange on its tie lines with its adjacent Balancing Authorities divided by the change in Interconnection frequency. (Some Balancing Authorities may choose to apply corrections to their Net Actual Interchange values to account for factors such as nonconforming loads. FRS Form 1 shows the types of adjustments that are allowed.) The ERO will use a standardized sampling interval of 20 to 52 seconds in the computation of SEFRD values.

Assuming data entry is correct FRS Form 1 will automatically calculate the Balancing Authority's FRM for the past 12 months as the median of the SEFRD values. A Balancing Authority electing to report as an RSG or a provider of Overlap Regulation Service will provide an FRS Form 1 for the aggregate of its participants.

BAL-003-1 Frequency Response & Frequency Bias Setting Standard
Attachment B

Process for Adjusting Minimum Frequency Bias Setting

Interconnection frequency performance is improved the closer all Balancing Authorities' (BAs') natural Frequency Response is to Frequency Bias Setting (Cohn, 1966).

The BA calculates its natural Frequency Response based on the events in FRS Form 1. The BA will set its Frequency Bias Setting to the greater of (in absolute value):

- Natural Frequency Response
- Interconnection Minimum (initially 1% of peak in BAL-003-0.1b).

For purposes of calculating the minimum Frequency Bias Setting, a Reserve Sharing Group or a Balancing Authority providing Overlap Regulation will report the projected peak demand and generation of its combined BAs' areas on FRS Form 1.

This attachment outlines the process the ERO is to use for modifying minimum Frequency Bias Settings to better meet reliability needs. The ERO may adjust the Frequency Bias Setting minimum in accordance with this Attachment B.

The ERO will post the minimum Frequency Bias Setting values on the ERO website along with other balancing standard limits.

The initial minimum Frequency Bias Settings are outlined in the following table.

Interconnection	Minimum Frequency Bias Setting (in MW/0.1Hz)
Eastern	0.8% of peak load or generation
Western	0.8% of peak load or generation
Texas	0.8% of peak load or generation
HQ	0.8% of peak load or generation

Table 1. Initial Frequency Bias Setting Minimums

The ERO will annually review Frequency Bias Setting data submitted by BAs. If an Interconnection's total minimum Frequency Bias Setting exceeds (in absolute value) the Interconnection's total natural Frequency Response by more (in absolute value) than 0.2 percentage points (of peak load expressed in MW/0.1Hz), the ERO may reduce (in absolute value) the minimum Frequency Bias Setting for BAs within that Interconnection, by 0.1 percentage point to better match that Frequency Bias Setting and natural Frequency Response.

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Implementation Plan for BAL-003-1 – Frequency Response & Frequency Bias Setting Standard

Prerequisite Approvals

There are no other reliability standards or Standard Authorization Requests (SARs), in progress or approved, that must be implemented before this standard can be implemented.

Modified Standards

BAL-003-0.1b should be retired at midnight of the day immediately prior to the Effective Date of BAL-003-1 in the Jurisdiction in which the new standard is becoming effective.

New or Modified Definitions

The following definitions shall become effective when BAL-003-1 Requirements R2, R3, R4 and R5 become effective:

Frequency Response Measure (FRM): The median of all the Frequency Response observations reported annually on FRS Form 1.

Frequency Response Obligation (FRO): The Balancing Authority's share of the required Frequency Response needed for the reliable operation of an Interconnection.

Frequency Bias Setting: A number~~value~~, either fixed or variable, usually expressed in MW/0.1 Hz, included in~~set into~~ a Balancing Authority's Area Control Error equation to account for ~~algorithm that allows~~ the Balancing Authority's Frequency Response contribution~~to contribute its frequency response~~ to the Interconnection and discourage withdrawal through secondary control systems.

The existing definition of Frequency Bias Setting should be retired at midnight of the day immediately prior to the Effective Date of BAL-003-1 in the Jurisdiction in which the new standard is becoming effective.

The proposed revised definition for "Frequency Bias Setting" is incorporated in the following NERC approved standards:

- BAL-001-0.1a Real Power Balancing Control Performance
- BAL-004-0 Time Error Correction
- BAL-004-1 Time Error Correction
- BAL-005-0.1b Automatic Generation Control

Compliance with Standards

Once this standard becomes effective, the responsible entities identified in the applicability section of the standard must comply with the requirements. These include:

- Balancing Authorities
- Reserve Sharing Groups

Proposed Effective Date

Compliance with BAL-003-1 shall be implemented over a two-year period, as follows:

- In those jurisdictions where regulatory approval is required, Requirements R2, R3, R4 and R5 of this standard shall become effective the first calendar day of the first calendar quarter 12 months after applicable regulatory approval. In those jurisdictions where no regulatory approval is required, Requirements R2, R3, R4 and R5 of this standard shall become effective the first calendar day of the first calendar quarter 12 months after Board of Trustees adoption.

- In those jurisdictions where regulatory approval is required, Requirements R1 of this standard shall become effective the first calendar day of the first calendar quarter 24 months after applicable regulatory approval. In those jurisdictions where no regulatory approval is required, Requirements R1 of this standard shall become effective the first calendar day of the first calendar quarter 24 months after Board of Trustees adoption.

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Implementation Plan for BAL-003-1 – Frequency Response & Frequency Bias Setting Standard

Prerequisite Approvals

There are no other reliability standards or Standard Authorization Requests (SARs), in progress or approved, that must be implemented before this standard can be implemented.

Modified Standards

BAL-003-0.1b ~~Requirements R1, R2, R3, R4 and R6~~ should be retired midnight of the day immediately prior to the Effective Date of~~when~~ BAL-003-1 in the Jurisdiction in which the new standard is becoming ~~becomes~~ effective.

~~BAL-003-0 Re1quirement R5 should be retired as outlined in the following table.~~

~~For those Balancing Authorities that serve native load:~~

- ~~May 2011 through December 2011 -0.8% of peak/0.1 Hz~~
- ~~January 2012 through December 2012 -0.6% of peak/0.1 Hz~~
- ~~January 2013 through December 2013 -0.4% of peak/0.1 Hz~~
- ~~January 2014 through December 2014 -0.2% of peak/0.1 Hz~~
- ~~January 2015 through -0.0% of peak/0.1 Hz~~

~~For those Balancing Authorities that do not serve native load:~~

- ~~May 2011 through December 2011 -0.8% of upcoming years maximum generation/0.1 Hz~~
- ~~January 2012 through December 2012 -0.6% of upcoming years maximum generation/0.1 Hz~~
- ~~January 2013 through December 2013 -0.4% of upcoming years maximum generation/0.1 Hz~~
- ~~January 2014 through December 2014 -0.2% of upcoming years maximum generation/0.1 Hz~~
- ~~January 2015 through -0.0% of upcoming years maximum generation/0.1 Hz~~

~~The FRR drafting team, NERC and the NERC Resources Subcommittee will observe the impact on frequency and will implement a reversion plan should frequency performance decline.~~

New or Modified Definitions

The following definitions shall become effective when BAL-003-1 Requirements R2, R3, R4 and R5 become effective:

116-390 Village Boulevard, Princeton, New Jersey 08540-5721
Phone: 609.452.8060 ▪ Fax: 609.452.9550 ▪ www.nerc.com

Frequency Response Measure (FRM): The median of all the Frequency Response observations reported annually on FRS Form 1.

Frequency Response Obligation (FRO): The Balancing Authority's share of the required Frequency Response needed for the reliable operation of an Interconnection.

Frequency Bias Setting: A number, either a fixed or variable, usually expressed in MW/0.1 Hz, included in a Balancing Authority's Area Control Error equation to account for the Balancing Authority's Frequency Response contribution to the Interconnection, and discourage response withdrawal through secondary control systems.

The existing definition of Frequency Bias Setting should be retired midnight of the day immediately prior to the Effective Date of BAL-003-1 in the Jurisdiction in which the new standard is becoming effective.

The proposed revised definition for "Frequency Bias Setting" is incorporated in the following NERC approved standards:

- BAL-001-0.1a Real Power Balancing Control Performance
- BAL-004-0 Time Error Correction
- BAL-004-1 Time Error Correction
- BAL-005-0.1b Automatic Generation Control

Compliance with Standards

Once this standard becomes effective, the responsible entities identified in the applicability section of the standard must comply with the requirements. These include:

- Balancing Authorities
- Reserve Sharing Groups

Proposed Effective Date

Compliance with BAL-003-1 shall be implemented over a two-year period, as follows:

- In those jurisdictions where regulatory approval is required, Requirements R2~~1~~, R3, R4 and R5~~4~~ of this standard shall become effective the first calendar day of the first calendar quarter 12 months after applicable regulatory approval. In those jurisdictions where no regulatory approval is required, Requirements R2~~1~~, R3, R4 and R5~~4~~ of this standard shall become effective the first calendar day of the first calendar quarter 12 months after Board of Trustees adoption.
- In those jurisdictions where regulatory approval is required, Requirements R1~~2~~ of this standard shall become effective the first calendar day of the first calendar quarter 24 months after applicable regulatory approval. In those jurisdictions where no regulatory approval is required, Requirements R1~~2~~ of this standard shall become effective the first calendar day of the first calendar quarter 24 months after Board of Trustees adoption.

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Frequency Response Standard Background Document

October 2011

RELIABILITY | ACCOUNTABILITY




3353 Peachtree Road NE
Suite 600, North Tower
Atlanta, GA 30326
404-446-2560 | www.nerc.com

Table of Contents

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Introduction

This document provides background on the development, testing and implementation of BAL-003-1 - Frequency Response Standard (FRS). The intent is to explain the rationale and considerations for the Requirements and their associated compliance information. The document also provides good practices and tips for Balancing Authorities with regard to Frequency Response.

In Order No. 693, the FERC directed additional changes to BAL-003-0.1b. This document explains how those directives are met by BAL-003-1.

The original Standards Authorization Request (SAR), finalized on June 30, 2007~~, assumed~~, assumed the Frequency Response currently available to be adequate in all the North American Interconnections. The goal of the SAR was to update the Standard to make the measurement process more objective and to provide this objective data to Planners and Operators for improved modeling. The improved models will improve understanding of the trends in Frequency Response to determine if reliability limits were being approached. The Standard would also lay the process groundwork for a transition to a performance-based Standard if reliability limits were approached.

This document will be periodically updated by the FRS Drafting Team until the Standard is approved (expected to occur during ~~Spring~~spring of 2012). Once approved, this document will then be maintained and updated by the ERO and the NERC Resources Subcommittee.

Background and Rationale by Requirement

Requirement 1

R1. Each Balancing Authority (BA) or Reserve Sharing Group (RSG) shall achieve an annual Frequency Response Measure (FRM) (as detailed in Attachment A and calculated on FRS Form 1) that is equal to or more negative than its Frequency Response Obligation (FRO) to ensure that sufficient Frequency Response is provided by each BA or RSG to maintain an adequate level of Frequency Response in the Interconnection.

Background and Rationale

R1 is intended to meet the following primary objectives:

- Determine whether a Balancing Authority (BA) has sufficient Frequency Response for reliable operations.
- Provide the feeder information needed to calculate CPS limits and Frequency Bias Settings.

With regard to the first objective, FRS Form 1 and the process in Attachment A provide the method for determining the Interconnections' necessary amount of Frequency Response and allocating it to the Balancing Authorities. The field trial for BAL-003-1 is testing an allocation methodology based on the amount of load and generation in the BA. This is to accommodate the wide spectrum of BAs from generation-only all the way to load-only.

The basic Frequency Response Obligation is based on non-coincident peak load and generation data reported in FERC Form 714 for the previous full calendar year. The basic allocation formula used by NERC is:

$$FRO_{BA} = FRO_{Int} \times \frac{Peak\ Gen_{BA} + Peak\ Load_{BA}}{Peak\ Gen_{Int} + Peak\ Load_{Int}}$$

Where:

- Peak GenBA is the average of monthly "Output of Generating Plants", FERC Form 714, column f of Part II - Schedule 3.
- Peak LoadBA is the average of "Monthly Peak Demand (MW)", FERC Form 714, column j of Part II - Schedule 3.
- Peak GenInt is the sum of all BAs' in that interconnection reported average monthly peak generation.
- Peak LoadInt is the sum of all BAs in that interconnection reported average monthly peak demand.

Balancing Authorities can approximate their FRO by multiplying their Interconnection's FRO by their share of Interconnection bias.

Balancing Authorities that merge or that transfer load or generation need to notify the ERO of the change in footprint and corresponding changes in allocation such that the net obligation for the Interconnection remains the same.

Note: The methodology for determining the Interconnection's Frequency Response Obligation and allocating it to BAs may change on the basis of field trial results. The drafting team is evaluating a risk-based approach for basing the Interconnection Frequency Response Obligation on an historic probability density of frequency error, and for allocating the obligation on the basis of the Balancing Authority's average annual ACE share of frequency error.

Attachment A proposes the following Interconnection event criteria as a basis to determine an Interconnection's Frequency Response Obligation:

- Largest category C loss-of-resource (N-2) event
- Largest total generating plant with common voltage switchyard
- Largest loss of generation in the interconnection in the last 10 years

Given the fact that the Interconnections currently have sufficient Frequency Response, few BAs should encounter problems meeting R1, particularly with the options the Standard provides with regard to obtaining Frequency Response.

With regard to the second objective above (determining Frequency Bias Settings and CPS limits), Balancing Authorities have been asked to perform annual reviews of their Frequency Bias Settings by measuring their Frequency Response, dating back to Policy 1. This obligation

was carried forward into BAL-003-01.b. While the associated training document provided useful information, it left many of the details to the judgment of the person doing the analysis. The FRS Form 1 and FRS Form 2 provide a consistent, objective process for calculating Frequency Response to develop an annual measure, the FRM.

The FRM will be computed from Single Event Frequency Response Data (SEFRD), defined as: "the data from an individual event from a Balancing Authority that is used to calculate its Frequency Response, expressed in MW/0.1Hz". The SEFRD for a typical Balancing Authority in an Interconnection with more than one Balancing Authority is basically the change its Net Actual Interchange on its tie lines with its adjacent Balancing Authorities divided by the change in Interconnection frequency. (Some Balancing Authorities may choose to apply corrections to their Net Actual Interchange values to account for factors such as nonconforming loads. FRS Form 1 shows the types of adjustments that are allowed.)

A standardized sampling interval of 20 to 52 seconds will be used in the computation of SEFRD values. Microsoft Excel® spreadsheet interfaces for EMS scan rates of 2 through 6 seconds will be provided to support the computation. During the field trial, other sampling intervals will be evaluated as well to determine if another sampling interval is more appropriate.

In an attempt to balance the workload of Balancing Authorities with the need for accuracy in the FRM, the field trial will require at least 25 samples selected during the course of the year to compute the FRM. Research conducted by the Frequency Responsive Reserve Standard Drafting Team (FRSDT) indicated that a Balancing Authority's FRM will converge to a reasonably stable value with 20 to 25 samples. The FRSDT will re-evaluate the required number of samples during the field trial.

The FRSDT also evaluated different approaches for "averaging" individual event observations to compute a technically sound estimate of Frequency Response Measure (FRM). The MW contribution for a single BA in a multi-BA Interconnection is small compared to the minute to minute changes in load, interchange and generation. For example, a 3000 MW BA in the east may only be called on to contribute 10MW for the loss of a 1000MW. The 10 MW of governor and load response may easily be masked ay a coincident change in load. Because of this large "noise to signal" ratio, the mean did not prove to be an appropriate measure of true typical performance.

In general, statisticians use the median as the best measure of central tendency when a population has outliers. Two independent reviews by the FRSDT has shown the Median to be less influenced by noise in the measurement process and the team has chosen the median as the initial metric for calculating the BAs' Frequency Response Measure.
In addition, The FRSDT is evaluating the linear regression as a means to estimate the BA's typical frequency response. This calculation is embedded in FRS Form 1 and will be evaluated during the field trial. Initial review implies that the linear regression tends to skew calculated FRM due to the influence of outliers. The outliers are being evaluated by the FRSDT as they may point to needed improvements in the measurement process or training issues for the BA in question.

In order to support field trial evaluations of sample size, sampling intervals, and aggregation techniques, the FRSDT will be retrieving scan rate data from the Balancing Authorities for each SEFRD. Additional frequency events may also be requested for research purposes, though they will not be included in the FRM computation.

FERC Order No. 693 directed the ERO to define the number of Frequency Response surveys that were conducted each year and to define a necessary amount of Frequency Response. R1 addresses both of these directives:

- There is a single annual survey of at least 25-30 events each year.
- The FRM calculated on FRS Form 1 is compared by the ERO against the FRO determined 12 months earlier (when the last FRS Form 1 was submitted) to verify the Balancing Authority provided its share of Interconnection Frequency Response.

FERC Order No. 693 also directed that the Standard should identify methods for Balancing Authorities to obtain Frequency Response. Requirement R1 allows Balancing Authorities to participate in Reserve Sharing Groups (RSGs) to provide or obtain Frequency Response. These may be the same RSGs that cooperate for BAL-002-0 or may be RSGs that form for the purposes of BAL-003-1.

If BAs participate as an RSG for BAL-003-1, compliance is based on the sum of the participants' performance.

Two other ways that BAs could obtain Frequency Response are through Supplemental Service or Overlap Regulation Service:

- No special action is needed if a BA provides or receives supplemental regulation. If the regulation occurs via Pseudo Tie, the transfer occurs automatically as part of Net Actual Interchange (NIA) and in response to information transferred from recipient to provider.
- If a BA provides overlap regulation, its FRS Form 1 will include the Frequency Bias setting as well as peak load and generation of the combined Balancing Authority Areas. The FRM event data will be calculated on the sum of the provider's and recipient's performance.

In the Violation Severity Levels for Requirement R1, the impact of a BA not having enough frequency response depends on two factors:

- Does the Interconnection have sufficient response?
- How short is the BA in providing its FRO?

The VSL takes these factors into account.

Requirement 2

R2. Each Balancing Authority not participating in Overlap Regulation Service shall implement the Frequency Bias Setting (fixed or variable) validated by the ERO, into its Area Control Error

(ACE) calculation beginning on the date specified by the ERO to ensure effectively coordinated Tie Line Bias control.

Background and Rationale

Attachment A of the Standard discusses the process the ERO will follow to validate the BA's FRS Form 1 data and publish the official Frequency Bias Settings. Historically, it has taken multiple rounds of validation and outreach to confirm each BA's data due to transcription errors, misunderstanding of instructions, and other issues. While BAs historically submit Bias Setting data by January 1, it often takes one or more months to complete the process.

The target is to have BAs submit their data by January 10. The BAs are given 30 days to assemble their data since the BAs are dependent on the ERO to provide ~~them with~~them with FRS Form 1, and there may be process delays in distributing the forms since they rely on identification of frequency events through November 30 of the preceding year.

Frequency Bias Settings generally change little from year to year. Given the fact that BAs can encounter staffing or EMS change issues coincident with the date the ERO sets for new Frequency Bias Setting implementation, the standard provides a 24 hour window on each side of the target date.

To recap the annual process:

1. The ERO posts the official list of frequency events to be used for this Standard in early December. The FRS Form 1for each Interconnection will be posted shortly thereafter.
2. The Balancing Authority submits its revised annual Frequency Bias Setting value to NERC by January 10.
3. The ERO and the Resources Subcommittee validate Frequency Bias Setting values, perform error checking, and calculate, validate, and update CPS2 L10 values. This data collection and validation process can take as long as two months.
4. Once the L10 and Frequency Bias Setting values are validated, The ERO posts the values for the upcoming year and also informs the Balancing Authorities of the date on which to implement revised Frequency Bias Setting values. Implementation typically would be on or about March 1st of each year.

Requirement 3

R3. Each Balancing Authority not receiving Overlap Regulation Service shall operate its Automatic Generation Control (AGC) in Tie Line Bias mode to ensure effectively coordinated control, unless such operation would have an Adverse Reliability Impact on the Balancing Authority's Area.

Background and Rationale

This requirement serves several functions. The primary reason for operating in Tie Line Bias is so ACE is calculated properly for performance purposes. Even if a BA temporarily operated in manual mode, as long as CPS is properly calculated and the BA met CPS, it is operating reliably.

There are legitimate reasons for taking AGC out of Tie Line Bias or operating manually including:

- Telemetry problems that lead the operator to believe ACE is significantly in error.
- The frequency input to AGC is not reflective of the BA's true frequency (such as if the control center were operating a local generator and disconnected from the Interconnection).
- During restoration (where one BA might be controlling frequency while another to which it is connected is managing interchange between them).
- For training purposes.
- Many AGC systems will automatically switch to an alternate mode if the EMS determines Tie Line Bias control could lead to problems.
- For single BA Interconnections, Flat Frequency and Tie Line Bias are equivalent.

Because it is rare that temporary operation out of Tie Line Bias can lead to reliability problems, the VSLs for this requirement are structured accordingly.

Requirement 4

R4. Each Balancing Authority that is performing Overlap Regulation Service shall modify its Frequency Bias Setting in its ACE calculation to be equivalent to the sum of the Frequency Bias Settings of the participating Balancing Authorities as validated by the ERO or calculate the Frequency Bias Setting based on the entire area being combined and thereby represent the Frequency Response for the combined area being controlled.

Background and Rationale

This requirement reflects the operating principles first established by NERC Policy 1 and is similar to Requirement R6 of the approved BAL-003-0.1b standard. Overlap Regulation Service is a method of providing regulation service in which the Balancing Authority providing the regulation service incorporates another Balancing Authority's actual interchange, frequency response, and schedules into the providing Balancing Authority's AGC/ACE equation.

As noted earlier, a BA that is providing Overlap Regulation will report the sum of the Bias Settings in its FRS Form 1. Balancing Authorities receiving Overlap Regulation Service have an ACE and Frequency Bias Setting equal to zero (0).

Requirement 5

R5. In order to ensure adequate control response each Balancing Authority shall use a monthly average Frequency Bias Setting whose absolute value is at least equal to one of the following:

- *The minimum percentage of the Balancing Authority Area's estimated yearly Peak Demand within its metered boundary per 0.1 Hz change as specified by the ERO in accordance with Attachment B.*

- *The minimum percentage of the Balancing Authority Area's estimated yearly peak generation for a generation- only BA, per 0.1 Hz change as specified by the ERO in accordance with Attachment B.*

Background and Rationale

BAL-003-0.1b standard requires a minimum Frequency Bias Setting equal in absolute value to one percent of the Balancing Authority's estimated yearly peak demand (or maximum generation level if native load is not served). For most Balancing Authorities this calculated amount of Frequency Bias is significantly greater in absolute value than their actual Frequency Response characteristic (which represents an over-bias condition) resulting in over-control since a larger magnitude response is realized. This is especially true in the Eastern Interconnection where this condition requires excessive secondary frequency control response which degrades overall system performance and increases operating cost as compared to requiring an appropriate balance of primary and secondary frequency control response.

Balancing Authorities were given a minimum Frequency Bias Setting obligation because there had never been a mandatory Frequency Response Obligation. This historic "one percent of peak per 0.1Hz" obligation, dating back to NERC's predecessor, NAPSIC, was intended to ensure all BAs provide some support to Interconnection frequency.

The ideal system control state exists when the Frequency Bias Setting of the Balancing Authority exactly matches the actual Frequency Response characteristic of the Balancing Authority. If this is not achievable, over-bias is significantly better from a control perspective than under-bias with the caveat that Frequency Bias is set relatively close in magnitude to the Balancing Authority actual Frequency Response characteristic. Setting the Frequency Bias to better approximate the Balancing Authority natural Frequency Response characteristic will improve the quality and accuracy of ACE control, CPS & DCS and general AGC System control response. This is the technical basis for recommending an adjustment to the long standing "1% of peak/0.1Hz" Frequency Bias Setting. Attachment B is intended to bring the Balancing Authorities' Frequency Bias Setting closer to their natural Frequency Response. Attachment B balances the following objectives:

- Bring the Frequency Bias Setting and Frequency Response closer together.
- Ensure there is no negative impact on other Standards (CPS, BAAL and to a lesser extent DCS) by adjustments in the minimum Frequency Bias Setting, by accommodating only minor adjustments.
- Do not allow the Frequency Bias Setting minimum to drop below natural Frequency Response, because under-biasing could affect an Interconnection adversely.

Finally, for BAs using variable bias, FRS Form 1 has a data entry location for the previous year's average monthly bias. The Balancing Authority and the ERO can compare this value to the previous year's Frequency Bias Setting minimum to ensure R5 has been met.

How this Standard Meets the FERC Order 693 Directives

FERC Directive

The following is the relevant paragraph of Order No. 693.

> *Accordingly, the Commission approves Reliability Standard BAL-003-0 as mandatory and enforceable. In addition, the Commission directs the ERO to develop a modification to BAL-003-0 through the Reliability Standards development process that: (1) includes Levels of Non-Compliance; (2) determines the appropriate periodicity of frequency response surveys necessary to ensure that Requirement R2 and other requirements of the Reliability Standard are being met, and to modify Measure M1 based on that determination and (3) defines the necessary amount of Frequency Response needed for Reliable Operation for each balancing authority with methods of obtaining and measuring that the frequency response is achieved.*

1. Levels of Non-Compliance

VRFs and VSLs are an equally effective way of assigning compliance elements to the standard.

2. Determine the appropriate periodicity of frequency response surveys necessary to ensure that Requirement R2 and other Requirements of the Reliability Standard are met

BAL-003 V0 R2 (the basis of Order No. 693) deals with the calculation of Frequency Bias Setting such that it reflects natural Frequency Response.

The drafting team has determined that a sample size on the order of at least 25-30 events is necessary to have a high confidence in the estimate of a BA's Frequency Response. Selection of the frequency excursion events used for analysis will be done via a method outlined in Attachment A to the Standard.

On average, these events will represent the largest 2-3 "clean" frequency excursions occurring each month.

Since Frequency Bias Setting is an annual obligation, the survey of the at least 25-30 frequency excursion events will occur once each year.

3. Define the necessary amount of Frequency Response needed for Reliable Operation for each Balancing Authority with methods of obtaining and measuring that the frequency response is achieved

Necessary Amount of Frequency Response

The drafting team has proposed the following approach to defining the necessary amount of frequency response. In general, the goal is to avoid triggering the first step of under-frequency load shedding (UFLS) in the given Interconnection for reasonable contingencies expected. The

methodology for determining each Interconnection's and Balancing Authority's obligation is outlined in Attachment A to the Standard.

It should be noted that the standard cannot guarantee that there will never be a triggering of UFLS as the magnitude of "point C" differs throughout an interconnection during a disturbance and there are local areas that see much wider swings in frequency.

The contingency protection criterion is the largest reasonably expected contingency in the Interconnection. This can be based on the largest observed credible contingency in the previous 10 years or the largest Category C event for the Interconnection.

The Safety Margin included addresses the difference between Points B and C and accounts for variables.

For multiple BA interconnections, the Frequency Response Obligation is allocated to BAs based on size. This allocation will be based on the following calculation:

$$FRO_{BA} = FRO_{Int} \times \frac{Peak\ Gen_{BA} + Peak\ Load_{BA}}{Peak\ Gen_{Int} + Peak\ Load_{Int}}$$

Methods of Obtaining Frequency Response

The drafting team believes the following are valid methods of obtaining Frequency Response:

- Supplemental regulation.
- Overlap regulation.
- Contractual service (The drafting team has developed an approach to obtain a contractual share of Frequency Response from Adjacent Balancing Authorities. See FRS Form 1). While the final rules with regard to contractual services are being defined, the current expectation is that the ERO and the associated Region(s) should be notified beforehand and that the service be at least 6 months in duration.
- Through a tariff (e.g. Frequency Response and regulation service).
- From generators through an interconnection agreement.
- Contract with an internal resource or loads (The drafting team encourages the development of a NAESB business practice for Frequency Response service for linear (droop) and stepped (e.g. LaaR in Texas) response).

Measuring that the Frequency Response is Achieved

FRS Form 1 and the underlying data retained by the BA will be used for measuring whether Frequency Response was provided. FRS Form 1 will provide the guidance on how to account for and measure Frequency Response.

Going Beyond the Directive

Based on the combined operating experience of the SDT, the drafting team believes each Interconnection has sufficient Frequency Response. If margins decline, there may be a need for additional standards or tools. The drafting team and the Resources Subcommittee are working with the ERO on its Frequency Response Initiative to develop processes and good practices so the Interconnections are prepared. These good practices and tools are described in the following section.

The drafting team is also evaluating a risk-based approach for basing the Interconnection Frequency Response Obligation on an historic probability density of frequency error, and for allocating the obligation on the basis of the Balancing Authority's average annual ACE share of frequency error. This allocation method uses the inverse of the rationale for allocating the CPS1 epsilon requirement by Bias share.

Good Practices and Tools

Good Practices

Knowing the quantity and depth of frequency responsive reserves in real time is a possible next step to being better prepared for the next event. The challenge in achieving this is having the knowledge of the capabilities of all sources of frequency response. Presently the primary source of frequency response remains with the generation resources in our fleets. Understanding how each of these sources performs to changes in system frequency and knowing their limitations would improve the BA's ability to measure frequency responsive reserves. Presently there are only guidelines, criteria and protocols in some regions of the industry that identify specific settings and performance expectations of primary frequency response of resources. One method of gaining better understanding of performance is to measure performance during actual events that occur on the system. This approach would only provide feedback for performance during that specific event and would not provide insight into depth of response or other limitations. Repeated measurements will increase confidence in expected performance. NERC modeling standards are in process to be revised that will improve the BA's insight into predicting available frequency responsive reserves. However, knowing how resources are operated, what modes of operation provide sustained primary frequency response and knowing the operating range of this response would give the BA the knowledge to accurately predict frequency response and the amount of frequency responsive reserves available in real time.

Some benefits on several interconnections have been realized by communicating to generation resources (GO) the importance of operating in modes that allow primary frequency response to be sustained by the control systems of the resource. Other improvements in implementation of primary frequency response have been achieved through improved settings on turbine governors through the elimination of "step" frequency response with the simultaneous reduction in governor dead-band settings. Improvements in the full AGC control loop of the

generating resource, which accounts for the expected primary frequency response, have improved the delivery of quality primary frequency response while minimizing secondary control actions of generators. Some of these actions can provide quick improvement in delivery of primary frequency response.

Once primary frequency response sources are known the BA could calculate available reserves that are frequency responsive. Planning for these reserves during normal and emergency operations could be developed and added to the normal planning process.

Tools

Single generating resource primary frequency response performance evaluation tools for steam turbine, combustion turbine (simple cycle or combined cycle) and for intermittent resources are available at the following link.
http://texasre.org/standards_rules/standardsdev/rsc/sar003/Pages/Default.aspx.

These tools and the regional standard associated with them are in their final stages of development in the Texas region.

These tools will be posted on the NERC website.

Field Trial

This section is a summary of the Field Trial activities that have been or will be conducted by the ERO, the Resources Subcommittee and the FRS Drafting Team.

1. The NERC BA recommendation (alert) and observations.√
2. The NERC governor recommendation (alert) and observations.√
3. The 2011 bias calculation √
    1. Evaluate measurement methodology√
    2. Serve as initial training for BAs√
    3. Evaluate median, mean, regression and possibly other measures√
    4. Evaluate sample size (to address the directive of frequency of surveys) √
    5. Evaluate impact of inclusion/exclusion of internal contingencies √
    6. Improve FRS Form 1√
4. Create supporting process for FRS Form 1 √
    1. For Interconnection benchmarking (proving adequacy of frequency response)
    2. Evaluating trend
    3. Test process for developing candidate list for FRS Form 1
5. 2012 bias calculation
    1. Further refinement of items in 2011 bias calculation
    2. Test the FRO allocation methodology
    3. Test approach for handling variable bias
    4. Evaluate 12 month vs. 24 month rolling average approach to performance
6. Evaluate reduction in bias setting floor below 1% (initially 0.8% in 2012) to evaluate impact on frequency and calculated CPS and BAAL performance.
7. Evaluate effectiveness of administrative process to support the standard.
8. Evaluate a risk-based approach for basing the Interconnection Frequency Response Obligation on an historic probability density of frequency error, and for allocating the obligation on the basis of the Balancing Authority's average annual ACE share of frequency error.

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Standard BAL-003-0.1b — Frequency Response and Bias

A. Introduction

1. **Title:** **Frequency Response and Bias**

2. **Number:** BAL-003-0.1b

3. **Purpose:** This standard provides a consistent method for calculating the Frequency Bias component of ACE.

4. **Applicability:**

   4.1. Balancing Authorities.

5. **Effective Date:** Immediately after approval of applicable regulatory authorities.

B. Requirements

R1. Each Balancing Authority shall review its Frequency Bias Settings by January 1 of each year and recalculate its setting to reflect any change in the Frequency Response of the Balancing Authority Area.

R1.1. The Balancing Authority may change its Frequency Bias Setting, and the method used to determine the setting, whenever any of the factors used to determine the current bias value change.

R1.2. Each Balancing Authority shall report its Frequency Bias Setting, and method for determining that setting, to the NERC Operating Committee.

R2. Each Balancing Authority shall establish and maintain a Frequency Bias Setting that is as close as practical to, or greater than, the Balancing Authority's Frequency Response. Frequency Bias may be calculated several ways:

R2.1. The Balancing Authority may use a fixed Frequency Bias value which is based on a fixed, straight-line function of Tie Line deviation versus Frequency Deviation. The Balancing Authority shall determine the fixed value by observing and averaging the Frequency Response for several Disturbances during on-peak hours.

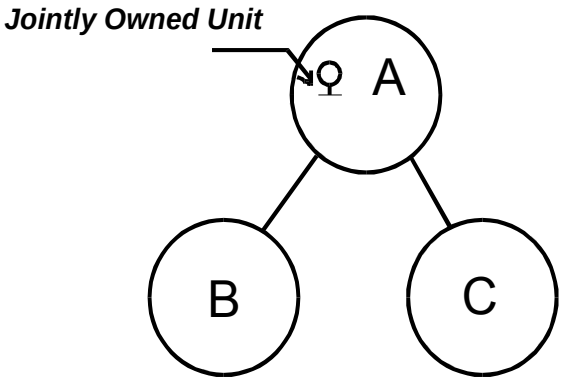
R2.2. The Balancing Authority may use a variable (linear or non-linear) bias value, which is based on a variable function of Tie Line deviation to Frequency Deviation. The Balancing Authority shall determine the variable frequency bias value by analyzing Frequency Response as it varies with factors such as load, generation, governor characteristics, and frequency.

R3. Each Balancing Authority shall operate its Automatic Generation Control (AGC) on Tie Line Frequency Bias, unless such operation is adverse to system or Interconnection reliability.

R4. Balancing Authorities that use Dynamic Scheduling or Pseudo-ties for jointly owned units shall reflect their respective share of the unit governor droop response in their respective Frequency Bias Setting.

R4.1. Fixed schedules for Jointly Owned Units mandate that Balancing Authority (A) that contains the Jointly Owned Unit must incorporate the respective share of the unit governor droop response for any Balancing Authorities that have fixed schedules (B and C). See the diagram below.

R4.2. The Balancing Authorities that have a fixed schedule (B and C) but do not contain the Jointly Owned Unit shall not include their share of the governor droop response in their Frequency Bias Setting.



R5. Balancing Authorities that serve native load shall have a monthly average Frequency Bias Setting that is at least 1% of the Balancing Authority's estimated yearly peak demand per 0.1 Hz change.

R5.1. Balancing Authorities that do not serve native load shall have a monthly average Frequency Bias Setting that is at least 1% of its estimated maximum generation level in the coming year per 0.1 Hz change.

R6. A Balancing Authority that is performing Overlap Regulation Service shall increase its Frequency Bias Setting to match the frequency response of the entire area being controlled. A Balancing Authority shall not change its Frequency Bias Setting when performing Supplemental Regulation Service.

C. Measures

M1. Each Balancing Authority shall perform Frequency Response surveys when called for by the Operating Committee to determine the Balancing Authority's response to Interconnection Frequency Deviations.

D. Compliance

Not Specified.

E. Regional Differences

None identified.

F. Associated Documents

1. Appendix 1 — Interpretation of Requirement R3 (October 23, 2007).

2. Appendix 2 — Interpretation of Requirements R2, R2.2, R5, and R5.1 (February 12, 2008).

Version History

Version	Date	Action	Change Tracking
0	April 1, 2005	Effective Date	New
0	August 8, 2005	Removed "Proposed" from Effective Date	Errata
0	March 16, 2007	FERC Approval — Order 693	New

0a	December 19, 2007	Added Appendix 1 — Interpretation of R3 approved by BOT on October 23, 2007	Addition
0a	July 21, 2008	FERC Approval of Interpretation of R3	Addition
0b	February 12, 2008	Added Appendix 2 — Interpretation of R2, R2.2, R5, and R5.1 approved by BOT on February 12, 2008	Addition
0.1b	January 16, 2008	Section F: added "1."; changed hyphen to "en dash." Changed font style for "Appendix 1" to Arial; updated version number to "0.1b"	Errata
0.1b	October 29, 2008	BOT approved errata changes	Errata
0.1a	May 13, 2009	FERC Approved errata changes – version changed to 0.1a (Interpretation of R2, R2.2, R5, and R5.1 not yet approved)	Errata
0.1b	May 21, 2009	FERC Approved Interpretation of R2, R2.2, R5, and R5.1	Addition

Appendix 1

Interpretation of Requirement 3

Request: *Does the WECC Automatic Time Error Control Procedure (WATEC) violate Requirement 3 of BAL-003-0?*

Interpretation:

Requirement 3 of BAL-003-0 — Frequency Response and Bias deals with Balancing Authorities using Tie-Line Frequency Bias as the normal mode of automatic generation control.

> **BAL-003-0**
> **R3.** Each Balancing Authority shall operate its Automatic Generation Control (AGC) on Tie Line Frequency Bias, unless such operation is adverse to system or Interconnection reliability.

- Tie-Line Frequency Bias is one of the three foundational control modes available in a Balancing Authority's energy management system. (The other two are flat-tie and flat-frequency.) Many Balancing Authorities layer other control objectives on top of their basic control mode, such as automatic inadvertent payback, CPS optimization, time control (in single BA Interconnections).
- As long as Tie-Line Frequency Bias is the underlying control mode and CPS1 is measured and reported on the associated ACE equation, there is no violation of BAL-003-0 Requirement 3:

$$ACE = (NI_A - NI_S) - 10B\,(F_A - F_S) - I_{ME}$$

Appendix 2

Interpretation of Requirements R2, R2.2, R5, R5.1

Request: *ERCOT specifically requests clarification that a Balancing Authority is entitled to use a variable bias value as authorized by Requirement R2.2, even though Requirement 5 seems not to account for the possibility of variable bias settings.*

Interpretation:

The consensus of the Resources Subcommittee is that BAL-003-0 — Frequency Response and Bias — Requirement R2 does not conflict with BAL-003-0 Requirement R5.

BAL-003-0 — Frequency Response and Bias Requirement 2 requires a Balancing Authority to analyze its response to frequency excursions as a first step in determining its frequency bias setting. The Balancing Authority may then choose a fixed bias (constant through the year) per Requirement 2.1, or a variable bias (varies with load, specific generators, etc.) per Requirement 2.2.

BAL-003-0

R2. Each Balancing Authority shall establish and maintain a Frequency Bias Setting that is as close as practical to, or greater than, the Balancing Authority's Frequency Response. Frequency Bias may be calculated several ways:

- **R2.1.** The Balancing Authority may use a fixed Frequency Bias value which is based on a fixed, straight-line function of Tie Line deviation versus Frequency Deviation. The Balancing Authority shall determine the fixed value by observing and averaging the Frequency Response for several Disturbances during on-peak hours.
- **R2.2.** The Balancing Authority may use a variable (linear or non-linear) bias value, which is based on a variable function of Tie Line deviation to Frequency Deviation. The Balancing Authority shall determine the variable frequency bias value by analyzing Frequency Response as it varies with factors such as load, generation, governor characteristics, and frequency.

BAL-003-0 — Frequency Response and Bias Requirement 5 sets a minimum contribution for all Balancing Authorities toward stabilizing interconnection frequency. The 1% bias setting establishes a minimum level of automatic generation control action to help stabilize frequency following a disturbance. By setting a floor on bias, Requirement 5 also helps ensure a consistent measure of control performance among all Balancing Authorities within a multi-Balancing Authority interconnection. However, ERCOT is a single Balancing Authority interconnection. The bias settings ERCOT uses do produce, on average, the best level of automatic generation control action to meet control performance metrics. The bias value in a single Balancing Authority interconnection does not impact the measure of control performance.

BAL-003-0

R5. Balancing Authorities that serve native load shall have a monthly average Frequency Bias Setting that is at least 1% of the Balancing Authority's estimated yearly peak demand per 0.1 Hz change.

- **R5.1.** Balancing Authorities that do not serve native load shall have a monthly average Frequency Bias Setting that is at least 1% of its estimated maximum generation level in the coming year per 0.1 Hz change.

Unofficial Comment Form

Frequency Response (Project 2007-12)

Please **DO NOT** use this form to submit comments. Please use the electronic comment form to submit comments on the first formal posting for Project 2007-12—Frequency Response. The electronic comment form must be completed by **December 8, 2011**.

2007-12 Project Page

If you have questions please contact Darrel Richardson at darrel.richardson@nerc.net or 609.613.1848.

Background

Frequency Response, a measure of an Interconnection's ability to stabilize frequency immediately following the sudden loss of generation or load, is a critical component to the reliable operation of the bulk power system, particularly during disturbances and restoration. There is evidence of continuing decline in Frequency Response over the past 10 years, but no confirmed reason for the apparent decline. The proposed standard requires entities to provide data so that Frequency Response in each of the Interconnections can be analyzed, and the reasons for the decline in Frequency Response can be identified. The standard would set a minimum Frequency Response obligation for each Balancing Authority, provide a uniform calculation of Frequency Response and Frequency Bias Settings that transition to values closer to natural Frequency Response, and encourage coordinated AGC operation.

The Drafting Team would like to receive industry comments on this standard.

You do not have to answer all questions. Enter all comments in Simple Text Format.

1. The SDT has made minor modifications to the proposed definitions to provide additional clarity. Do you agree that these modifications provide sufficient clarity? If not, please explain in the comment area.

   ☐ Yes
   ☐ No

   Comments:

2. The SDT has made minor modifications to the Requirements R1 through R4 to provide additional clarity. Do you agree that these modifications provide sufficient clarity to comply with the standard? If not, please explain in the comment area.

   ☐ Yes
   ☐ No

   Comments:

3. The SDT has developed VRFs for the proposed Requirements within this standard. Do you agree that these VRFs are appropriately set? If not, please explain in the comment area.

   ☐ Yes
   ☐ No

   Comments:

4. The SDT has developed Measures for the proposed Requirements within this standard. Do you agree with the proposed Measures in this standard? If not, please explain in the comment area.

   ☐ Yes
   ☐ No

   Comments:

5. The SDT has developed VSLs for the proposed Requirements within this standard. Do you agree with these VSLs? If not, please explain in the comment area.

   ☐ Yes
   ☐ No

   Comments:

6. The SDT divided the previously posted "Attachment A – Background Document" into two documents to provide additional clarity. The first document "Attachment A- Supporting Document" which details the methods used to develop the events to be analyzed, the FRO, FRM and Frequency Bias Setting. Do you agree that the revised Attachment A – Supporting Document provides sufficient clarity on the methodologies to be used? If not, please explain in the comment area.

   ☐ Yes
   ☐ No

   Comments:

7. The second document "BAL-003-1 Background Document" provides information behind the development of the standard. Do you agree that this new document provides sufficient clarity as to the development of the standard? If not, please explain in the comment area.

   ☐ Yes
   ☐ No

   Comments:

8. The SDT has developed a new document titled Attachment B – Process for Adjusting Bias Setting Floor. This document is intended to provide the methodology the ERO will use to reduce the minimum Frequency Bias Setting to become closer to natural Frequency Response. Do you agree that this document provides clear and concise instructions for the ERO to follow? If not, please explain in the comment area.

☐ Yes
☐ No
Comments:

9. The SDT has provided an additional spreadsheet, FRS Form 2, to assist the Balancing Authority in providing the data needed to comply with the proposed standard. Do you agree that this spreadsheet is useful and the instructions are meaningful? If not, please explain in the comment area.

☐ Yes
☐ No
Comments:

10. Please provide any other comments (that you have not already provided in response to the questions above) that you have on the draft standard BAL-003-1.

Comments:

Standard: BAL-003-1 Frequency Response and Frequency Bias Setting		
Requirement in Approved Standard	**Translation to New Standard or Other Action**	**Proposed Language in BAL-003-1/Comments**
R1. Each Balancing Authority shall review its Frequency Bias Settings by January 1 of each year and recalculate its setting to reflect any change in the Frequency Response of the Balancing Authority Area. R1.1. The Balancing Authority may change its Frequency Bias Setting, and the method used to determine the setting, whenever any of the factors used to determine the current bias value change. R1.2. Each Balancing Authority shall report its Frequency Bias Setting, and method for determining that setting, to the NERC Operating Committee.	This Requirement has been moved into BAL-003-1 Attachment A & FRS Form 1	Attachment A Each Balancing Authority shall report its previous year's Frequency Response Measure (FRM), Frequency Bias Setting and Frequency Bias type (fixed or variable) to the ERO on FRS Form 1 by January 10 each year. If the ERO posts the official list of events after December 10, Balancing Authorities will be given 30 days from the date the ERO posts the official list of events to submit their FRS Form 1. AND FRS Form 1 Note : Balancing Authorities with variable Frequency Bias Settings shall calculate monthly average Frequency Bias Settings. The previous year's monthly averages will be reported annually on FRS Form 1.
R2. Each Balancing Authority shall establish and maintain a Frequency	This Requirement	R2. Each Balancing Authority not participating in Overlap Regulation Service shall implement the Frequency Bias Setting

Standard: BAL-003-1 Frequency Response and Frequency Bias Setting		
Requirement in Approved Standard	**Translation to New Standard or Other Action**	**Proposed Language in BAL-003-1/Comments**
Bias Setting that is as close as practical to, or greater than, the Balancing Authority's Frequency Response. Frequency Bias may be calculated several ways: **R2.1.** The Balancing Authority may use a fixed Frequency Bias value which is based on a fixed, straight-line function of Tie Line deviation versus Frequency Deviation. The Balancing Authority shall determine the fixed value by observing and averaging the Frequency Response for several Disturbances during on-peak hours. **R2.2.** The Balancing Authority may use a variable (linear or non-linear) bias value, which is based on a variable function of Tie Line deviation to Frequency Deviation. The Balancing Authority shall determine the variable frequency bias value by	is included in BAL-003-1 as described in the Proposed Language Section.	(fixed or variable) validated by the ERO, into its Area Control Error (ACE) calculation beginning on the date specified by the ERO to ensure effectively coordinated Tie Line Bias control. AND Attachment A Each Balancing Authority shall report its previous year's Frequency Response Measure (FRM), Frequency Bias Setting and Frequency Bias type (fixed or variable) to the ERO on FRS Form 1 by January 10 each year. If the ERO posts the official list of events after December 10, Balancing Authorities will be given 30 days from the date the ERO posts the official list of events to submit their FRS Form 1. AND FRS Form 1 Note : Balancing Authorities with variable Frequency Bias Settings shall calculate monthly average Frequency Bias Settings. The previous year's monthly averages will be reported annually on FRS Form 1. AND

Standard: BAL-003-1 Frequency Response and Frequency Bias Setting		
Requirement in Approved Standard	**Translation to New Standard or Other Action**	**Proposed Language in BAL-003-1/Comments**
analyzing Frequency Response as it varies with factors such as load, generation, governor characteristics, and frequency.		A portion of this Requirement is being phased out in accordance with the process detailed in Attachment B. This phase out is intended to bring the Frequency Bias Setting closer or equal to the natural Frequency Response.
R3. Each Balancing Authority shall operate its Automatic Generation Control (AGC) on Tie Line Frequency Bias, unless such operation is adverse to system or Interconnection reliability.	This Requirement has been moved into BAL-003-1 Requirement R3.	R3. Each Balancing Authority not receiving Overlap Regulation Service shall operate its Automatic Generation Control (AGC) in Tie Line Bias mode to ensure effectively coordinated control, unless such operation would have an Adverse Reliability Impact on the Balancing Authority's Area. In this instance, the Balancing Authority shall document the reasons for such operation.
R4. Balancing Authorities that use Dynamic Scheduling or Pseudo-ties for jointly owned units shall reflect their respective share of the unit governor droop response in their respective Frequency Bias Setting. R4.1. Fixed schedules for Jointly Owned Units mandate that Balancing Authority (A) that contains the Jointly Owned Unit must incorporate the respective share of the unit governor droop response for any Balancing	This Requirement has been removed from the BAL-003-1 standard.	This Requirement addresses how to calculate Frequency Bias Settings. This is no longer needed since the Frequency Bias Settings are calculated in FRS Form 1 using Frequency Response associated with the "official" list of events and a couple of "floor or ceiling" limits (% of peak load/gen and FRO). The entire calculation is built into the FRS Form 1 workbook.

Standard: BAL-003-1 Frequency Response and Frequency Bias Setting		
Requirement in Approved Standard	**Translation to New Standard or Other Action**	**Proposed Language in BAL-003-1/Comments**
Authorities that have fixed schedules (B and C). R4.2. The Balancing Authorities that have a fixed schedule (B and C) but do not contain the Jointly Owned Unit shall not include their share of the governor droop response in their Frequency Bias Setting.		
R5. Balancing Authorities that serve native load shall have a monthly average Frequency Bias Setting that is at least 1% of the Balancing Authority's estimated yearly peak demand per 0.1 Hz change. **R5.1.** Balancing Authorities that do not serve native load shall have a monthly average Frequency Bias Setting that is at least 1% of its estimated maximum generation level in the coming year per 0.1 Hz change.	This Requirement has been moved into BAL-003-1 Requirement R5.	R5. Each Balancing Authority shall use a monthly average Frequency Bias Setting whose absolute value is at least equal to one of the following: • The minimum percentage of the Balancing Authority Area's estimated yearly Peak Demand within its metered boundary per 0.1 Hz change as specified by the ERO in accordance with Attachment B. • The minimum percentage of the Balancing Authority Area's estimated yearly peak generation for a generation-only Balancing Authority, per 0.1 Hz change as specified by the ERO in accordance with Attachment B.
R6. A Balancing Authority that is performing Overlap Regulation Service shall increase its Frequency	This Requirement has been	R4. Each Balancing Authority that is performing Overlap Regulation Service shall modify its Frequency Bias Setting in its ACE calculation to be equivalent to the sum of the

Standard: BAL-003-1 Frequency Response and Frequency Bias Setting		
Requirement in Approved Standard	**Translation to New Standard or Other Action**	**Proposed Language in BAL-003-1/Comments**
Bias Setting to match the frequency response of the entire area being controlled. A Balancing Authority shall not change its Frequency Bias Setting when performing Supplemental Regulation Service.	moved into BAL-003-1 Requirement R4.	Frequency Bias Settings of the participating Balancing Authorities as validated by the ERO or calculate the Frequency Bias Setting based on the entire area being combined and thereby represent the Frequency Response for the combined area being controlled.

Instructions

Step 1	Enter data in all green cells on the "Data Entry" worksheet.
Step 2	For identified events in column B of the "Data Entry" worksheet, collect data and complete one FRS Form 2 workbook for each event in the list.
Step 3	PasteSpecial/Values data from FRS Form 2 "Form 1 Summary Data" worksheet into "BA Form 2 Event Data" worksheet of this workbook. Do this for each event in the list.
Step 4	Save this workbook using the following file name format:NYISO_yyyy_FRS_Form1.xlsx and send a copy of this workbook and all FRS_Form 2 workbooks to NERC. (where NYISO is replaced with your Balancing Authority abbreviation)
Step 5	"Summary" worksheet contains each event's results for your Balancing Authority.
Note	Balancing Authorities with variable Frequency Bias Settings shall calculate monthly average Frequency Bias Settings. The previous year's monthly averages will be reported annually on FRS Form 1.

Balancing Authority: MyBA

NERC FRS FORM 1 20 to 52 second Value B

Enter Addition Data in column R ==>

Select Reason(s) for adjustment

Event Number	Date/Time (Central Prevailing)	DelFreq	BA Time	BA DelFreq	Value "A" Information NAI	Value "A" Information Adjustment	Value "B" Information NAI	Value "B" Information Adjustment	SEFRD (MW/0.1Hz)	Exclude for data error *	Event MW Loss	Information Value "A" Load	Information Value "B" Load	Reason(s)
1	12/3/2010 17:28	-0.044	0:00:00	0.000	0.0	0.0	0.0	0.0	#DIV/0!	N		0.0	0.0	
2	12/19/2010 23:50	-0.037	0:00:00	0.000	0.0	0.0	0.0	0.0	#DIV/0!	N	1186	0.0	0.0	
3	1/21/2011 7:36	-0.043	0:00:00	0.000	0.0	0.0	0.0	0.0	#DIV/0!	N		0.0	0.0	
4	2/16/2011 10:54	-0.042	0:00:00	0.000	0.0	0.0	0.0	0.0	#DIV/0!	N		0.0	0.0	
5	4/20/2011 6:27	-0.065	0:00:00	0.000	0.0	0.0	0.0	0.0	#DIV/0!	N	1306	0.0	0.0	
6	4/20/2011 16:34	-0.046	0:00:00	0.000	0.0	0.0	0.0	0.0	#DIV/0!	N	1203	0.0	0.0	
7	4/22/2011 10:53	-0.050	0:00:00	0.000	0.0	0.0	0.0	0.0	#DIV/0!	N	1400	0.0	0.0	
8	4/26/2011 20:20	-0.059	0:00:00	0.000	0.0	0.0	0.0	0.0	#DIV/0!	N		0.0	0.0	
9	4/27/2011 16:36	-0.082	0:00:00	0.000	0.0	0.0	0.0	0.0	#DIV/0!	N	2783	0.0	0.0	
10	5/12/2011 14:37	-0.051	0:00:00	0.000	0.0	0.0	0.0	0.0	#DIV/0!	N	1179	0.0	0.0	
11			0:00:00	0.000	0.0	0.0	0.0	0.0		Y		0.0	0.0	
12			0:00:00	0.000	0.0	0.0	0.0	0.0		Y		0.0	0.0	
13			0:00:00	0.000	0.0	0.0	0.0	0.0		Y		0.0	0.0	
14			0:00:00	0.000	0.0	0.0	0.0	0.0		Y		0.0	0.0	
15			0:00:00	0.000	0.0	0.0	0.0	0.0		Y		0.0	0.0	
16			0:00:00	0.000	0.0	0.0	0.0	0.0		Y		0.0	0.0	
17			0:00:00	0.000	0.0	0.0	0.0	0.0		Y		0.0	0.0	
18			0:00:00	0.000	0.0	0.0	0.0	0.0		Y		0.0	0.0	
19			0:00:00	0.000	0.0	0.0	0.0	0.0		Y		0.0	0.0	
20			0:00:00	0.000	0.0	0.0	0.0	0.0		Y		0.0	0.0	
21			0:00:00	0.000	0.0	0.0	0.0	0.0		Y		0.0	0.0	
22			0:00:00	0.000	0.0	0.0	0.0	0.0		Y		0.0	0.0	
23			0:00:00	0.000	0.0	0.0	0.0	0.0		Y		0.0	0.0	
24			0:00:00	0.000	0.0	0.0	0.0	0.0		Y		0.0	0.0	
25			0:00:00	0.000	0.0	0.0	0.0	0.0		Y		0.0	0.0	
26			0:00:00	0.000	0.0	0.0	0.0	0.0		Y		0.0	0.0	
27			0:00:00	0.000	0.0	0.0	0.0	0.0		Y		0.0	0.0	
28			0:00:00	0.000	0.0	0.0	0.0	0.0		Y		0.0	0.0	
29			0:00:00	0.000	0.0	0.0	0.0	0.0		Y		0.0	0.0	
30			0:00:00	0.000	0.0	0.0	0.0	0.0		Y		0.0	0.0	
31			0:00:00	0.000	0.0	0.0	0.0	0.0		Y		0.0	0.0	
32			0:00:00	0.000	0.0	0.0	0.0	0.0		Y		0.0	0.0	
33			0:00:00	0.000	0.0	0.0	0.0	0.0		Y		0.0	0.0	
34			0:00:00	0.000	0.0	0.0	0.0	0.0		Y		0.0	0.0	
35			0:00:00	0.000	0.0	0.0	0.0	0.0		Y		0.0	0.0	
36			0:00:00	0.000	0.0	0.0	0.0	0.0		Y		0.0	0.0	
37			0:00:00	0.000	0.0	0.0	0.0	0.0		Y		0.0	0.0	
38			0:00:00	0.000	0.0	0.0	0.0	0.0		Y		0.0	0.0	
39			0:00:00	0.000	0.0	0.0	0.0	0.0		Y		0.0	0.0	
40			0:00:00	0.000	0.0	0.0	0.0	0.0		Y		0.0	0.0	
41			0:00:00	0.000	0.0	0.0	0.0	0.0		Y		0.0	0.0	
42			0:00:00	0.000	0.0	0.0	0.0	0.0		Y		0.0	0.0	

Enter Data in Green Highlighted Cells
Send copy to: Chris.Scheetz@nerc.net

2012	Bias Calculation Form Year
Eastern	Interconnection
MyBA	Balancing Authority
	Contact Name
	Contact Phone #
	Contact e-mail
	Current Year's Actual Peak
	Internal Generating Capacity
	Next Year's Projected Peak
2011	Current year
-70.0	**2011 Frequency Response Obligation (FRO)**

Summary Statistics

#DIV/0!	Average Frequency Response (MW/0.1Hz)
-33.8	Regression Estimate of Frequency Response (MW/0.1Hz)

	Next Year's
-70.0	**2012 Frequency Response Obligation (FRO)**
#DIV/0!	**2012 Frequency Bias Setting - (minimum of FRM, next year's FRO, or 0.8% of Projected Peak [Load + Gen]/2)**
#DIV/0!	**2011 FRM - Median Frequency Response (MW/0.1Hz)**

N	Do you RECEIVE Overlap regulation? If Yes, list the BA name and the associated Bias of that BA

Bias -MW/0.1 Hz	Balancing Authority

N	Do you PROVIDE Overlap regulation? If Yes, list the BA name and the associated Bias of that BA

Bias -MW/0.1 Hz	Balancing Authority

Instructions

Step 1	Enter data in all green cells on this "Data Entry" worksheet.
Step 2	For identified events in column B, collect data and complete FRS Form 2 for each event in the list.
Step 3	PasteSpecial/Values data from FRS Form 2 "Form 1 Summary Data" into "BA Form 2 Data" worksheet of this workbook. Do this for each event in the list.
Step 4	Save this workbook using the following file name format:NYISO_yyyy_FRS_Form1.xlsx and send a copy of this workbook and all FRS_Form 2 workbooks to NERC. (where NYISO is replaced with your BA name)
Note:	Only one set of average periods of evaluation is displayed. Other worksheets for the additional average periods are hidden.

-0.058	23.2	Dynamic schedules for joint-owned units (DS)
-0.066	27.7	Nonconforming load (NL)
-0.040	10.7	Pumped hydro (PH)
-0.05252493	80.66089	Ramping units (RU)
-0.07090523	-26.89761	Xfred Frequency Response (TFR)
-0.05190677	9.955449	Contingent BA adjustment for loss of units (CBA)
-0.0580477	3.367024	DS & NL
-0.07557242	36.33443	DS & PH
-0.0563805	0.488253	DS & RU
-0.0573329	2.758037	DS & TFR
-0.0517609	13.64342	DS & CBA
-0.04999924	11.10075	DS & NL & PH
-0.052	-19.90685	DS & NL & RU
-0.05599976	12.32546	JOU DS & NL & TFR
-0.05849838	0.750192	DS & NL & CBA
-0.04850006	2.230058	DS & NL & PH & RU
-0.04500008	9.477859	DS & NL & PH & TFR
-0.03750229	0.355309	DS & NL & PH & CBA
-0.04750061	2.170702	DS & NL & PH & RU & TFR
-0.05550003	29.38207	DS & NL & PH & RU & CBA
-0.047	4.601381	DS & NL & PH & RU & TFR & CBA
-0.06	1.593515	NL & PH
-0.06	52.37091	NL & RU
-0.051	33.94787	NL & TFR
-0.1	100	NL & CBA
		NL & PH & RU
		NL & PH & TFR
		NL & PH & BAA
		NL & PH & RU & TFR

N	NL & PH & RU & CBA
Y	NL & PH & RU & TFR & CBA
	PH & RU
	PH & TFR
	PH & CBA
	PH & RU & TFR
	PH & RU & CBA
	PH & TFR
	PH & CBA
	PH & RU & TFR
	PH & RU & CBA
	PH & TFR
	PH & CBA
	PH & RU & TFR & CBA
	RU & TFR
	RU & CBA
	RU & TFR & CBA
	TFR & CBA

N
Y

Event Number	Balancing Authority	MyBA	JOU Dynamic Schedules		Non conforming Load		Pumped Hydro		Ramping Units		Transferred Frequency Response		Contingent BA Adjustment		Net Total Adjustments
	Date/Time (Central Prevailing)	DelFreq	Value A Adjustment	Value B Adjustment	Value A Adjustment	Value B Adjustment	Value A Adjustment	Value B Adjustment	Value A Adjustment	Value B Adjustment	Value A Adjustment	Value B Adjustment	Value A Adjustment	Value B Adjustment	Value B 12 to 24 seconds
1	12/3/2010 17:28	-0.044	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2	12/19/2010 23:50	-0.037	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3	1/21/2011 7:36	-0.043	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
4	2/16/2011 10:54	-0.042	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5	4/20/2011 6:27	-0.065	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
6	4/20/2011 16:34	-0.046	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
7	4/22/2011 10:53	-0.050	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
8	4/26/2011 20:20	-0.059	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
9	4/27/2011 16:36	-0.082	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
10	5/12/2011 14:37	-0.051	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
11			0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
12			0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
13			0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
14			0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
15			0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
16			0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
17			0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
18			0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
19			0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
20			0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
21			0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
22			0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
23			0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
24			0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
25			0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
26			0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
27			0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
28			0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
29			0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
30			0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
31			0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
32			0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
33			0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
34			0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
35			0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
36			0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
37			0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
38			0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
39			0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
40			0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
41			0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
42			0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Sign Convention for scan data collected in Form 2	Imports: MWs are - Exports: MWs are +	Loads in MW as -	Load MW as - Generation MW as +	Enter Gen MW as +	The transactional amount in MW Receiver enters - Deliverer enters + on Form 2 Data sheet	Generation MW as + (If load occurs due to gen loss, enter MW as - at value B)

Notes:

1) Balancing Authorities making adjustments must retain evidence to verify:
   - Adjustment values are determined from scan-cycle data using Value A and Value B averaging periods. Scan-cycle data must be available if adjustments are made.
   - Adjustments are necessary to improve accuracy of calculations compared to using Net Actual Interchange (contingency size for single BA interconnections) solely. Said differently, unless an adjustment compensates for significant known error, it should not be made. However, as noted in the next item, once a decision to include an adjustment for one or more of the six types is made for one event, the entity must calculate adjustments for that (those) type(s) for all events.
   - Adjustments are included consistently for all events (e.g. if adjustments for nonconforming load are made for one event, the load must be included for all events, etc.).

2) Dynamic Schedules:
   - Values use schedule sign convention.
   - Adjustments should include only dynamic schedules accounting for joint-owned units. Other dynamic schedules should be ignored.

3) Nonconforming Loads:
   - Values must be entered as negative numbers.

4) Pumped Hydro:
   - Values for pumping must be entered as negative values.
   - Values for generating must be entered as positive values.

5) Rampling Units:
   - Values are entered as positive values.

6) Transferred Frequency Response:
   - This value is the amount agreed upon between the entities expressed in MW/0.1 Hz. Form 2 will adjust this amount for the frequency deviation experienced. (e.g. if an entity agrees to provide 20 MW/0.1 Hz to another entity and a frequency event with a deviation of 50 mHz occurs, the delivering entity should enter +20 in the data column of Form 2 and the receiving entity should enter - 20. The spreadsheet will adjust the SEFRD for each entity by the 10 for this event.)
   - Values for the entity receiving the response must be entered as a negative number.
   - Values for the entity delivering the response must be entered as a positive number.
   - Values between entities must sum to zero.

7) Contingent Balancing Authority Adjustment:
   - Value for Value A is the pre-contingency generation from the contingent unit(s).
   - Value for Value B is usually 0 MW, but may be the load that remains on the system that was "netted" out by the now offline generation.

NERC FRS FORM 1

Balancing Authority **MyBA**

Event Number	Date/Time (Central Prevailing)	DelFreq	BA Time	BA DelFreq	12 to 24 SEFRD	18 to 30 SEFRD	20 to 40 SEFRD	18 to 52 SEFRD	20 to 52 SEFRD	Exclude for data error *	12 to 24 P.U. Performance			18 to 30 P.U. Performance			20 to 40 P.U. Performance			18 to 52 P.U. Performance			20 to 52 P.U. Performance		
											Initial Adjusted	Initial Unadjusted	Sustained	Initial Adjusted	Initial Unadjusted	Sustained	Initial Adjusted	Initial Unadjusted	Sustained	Initial Adjusted	Initial Unadjusted	Sustained	Initial Adjusted	Initial Unadjusted	Sustained
1	12/3/2010 17:28	-0.044	0:00:00	0.000	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	N	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2	12/19/2010 23:50	-0.037	0:00:00	0.000	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	N	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
3	1/21/2011 7:36	-0.043	0:00:00	0.000	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	N	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
4	2/16/2011 10:54	-0.042	0:00:00	0.000	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	N	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5	4/20/2011 6:27	-0.065	0:00:00	0.000	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	N	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
6	4/20/2011 16:34	-0.046	0:00:00	0.000	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	N	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
7	4/22/2011 10:53	-0.050	0:00:00	0.000	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	N	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
8	4/26/2011 20:20	-0.059	0:00:00	0.000	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	N	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
9	4/27/2011 16:36	-0.082	0:00:00	0.000	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	N	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
10	5/12/2011 14:37	-0.051	0:00:00	0.000	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	N	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
11	1-0-00 0:00:00	0.000	0:00:00	0.000						Y	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
12	1-0-00 0:00:00	0.000	0:00:00	0.000						Y	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
13	1-0-00 0:00:00	0.000	0:00:00	0.000						Y	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
14	1-0-00 0:00:00	0.000	0:00:00	0.000						Y	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
15	1-0-00 0:00:00	0.000	0:00:00	0.000						Y	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
16	1-0-00 0:00:00	0.000	0:00:00	0.000						Y	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
17	1-0-00 0:00:00	0.000	0:00:00	0.000						Y	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
18	1-0-00 0:00:00	0.000	0:00:00	0.000						Y	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
19	1-0-00 0:00:00	0.000	0:00:00	0.000						Y	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
20	1-0-00 0:00:00	0.000	0:00:00	0.000						Y	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
21	1-0-00 0:00:00	0.000	0:00:00	0.000						Y	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
22	1-0-00 0:00:00	0.000	0:00:00	0.000						Y	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
23	1-0-00 0:00:00	0.000	0:00:00	0.000						Y	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
24	1-0-00 0:00:00	0.000	0:00:00	0.000						Y	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
25	1-0-00 0:00:00	0.000	0:00:00	0.000						Y	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
26	1-0-00 0:00:00	0.000	0:00:00	0.000						Y	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
27	1-0-00 0:00:00	0.000	0:00:00	0.000						Y	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
28	1-0-00 0:00:00	0.000	0:00:00	0.000						Y	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
29	1-0-00 0:00:00	0.000	0:00:00	0.000						Y	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
30	1-0-00 0:00:00	0.000	0:00:00	0.000						Y	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
31	1-0-00 0:00:00	0.000	0:00:00	0.000						Y	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
32	1-0-00 0:00:00	0.000	0:00:00	0.000						Y	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
33	1-0-00 0:00:00	0.000	0:00:00	0.000						Y	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
34	1-0-00 0:00:00	0.000	0:00:00	0.000						Y	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
35	1-0-00 0:00:00	0.000	0:00:00	0.000						Y	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
36	1-0-00 0:00:00	0.000	0:00:00	0.000						Y	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
37	1-0-00 0:00:00	0.000	0:00:00	0.000						Y	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
38	1-0-00 0:00:00	0.000	0:00:00	0.000						Y	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
39	1-0-00 0:00:00	0.000	0:00:00	0.000						Y	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
40	1-0-00 0:00:00	0.000	0:00:00	0.000						Y	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
41	1-0-00 0:00:00	0.000	0:00:00	0.000						Y	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
42	1-0-00 0:00:00	0.000	0:00:00	0.000						Y	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

	12 to 24	18 to 30	20 to 40	18 to 52	20 to 52
Average Frequency Response (MW/0.1Hz)	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
2012 FRM - Median Frequency Response (MW/0.1Hz)	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
Regression Estimate of Frequency Response (MW/0.1Hz)	-33.77	-33.77	-33.77	-33.77	-33.77
2012 Frequency Response Obligation (FRO)	-70	-70	-70	-70	-70

Month	Minimum FBS* for month	Maximum FBS* for month	Time weighted ** average FBS* for month	
January			-10.0	
Feburary			-7.0	
March			-12.0	
April			-8.0	
May			-27.0	
June			-8.7	
July			-8.0	
August			-8.0	
September			-8.2	
October			-8.0	
November			-8.0	
December			-12.0	
			-10.4	Average Annual Bias

*** Frequency Bias Setting (FBS)**
**** Based on the one minute values used in BAL 001**

PasteSpecial/Values the data copied from FRS Form 2 for each event.

Interconnection Performance

Event Number	Date/Time Central Prevailing	DelFreq	Date	A Point Time	FPointA Hz	A Value Hz	t(0) Time	C Value Hz				Value B 12 to 24 sec Average Frequency	FR B 12 to 24 sec Average MW	Value B 18 to 30 sec Average Frequency	FR B 18 to 30 sec Average MW	Value B 20 to 40 sec Average Frequency	FR B 20 to 40 sec Average MW	Value B 18 to 52 sec Average Frequency	FR B 18 to 52 sec Average MW	Value B 20 to 52 sec Average Frequency
1	12/3/2010 17:28	-0.044																		
2	12/19/2010 23:50	-0.037																		
3	1/21/2011 7:36	-0.043																		
4	2/16/2011 10:54	-0.042																		
5	4/20/2011 6:27	-0.065																		
6	4/20/2011 16:34	-0.046																		
7	4/22/2011 10:53	-0.05																		
8	4/26/2011 20:20	-0.059																		
9	4/27/2011 16:36	-0.082																		
10	5/12/2011 14:37	-0.051																		
11	1/0/1900 0:00	0																		
12	1/0/1900 0:00	0																		
13	1/0/1900 0:00	0																		
14	1/0/1900 0:00	0																		
15	1/0/1900 0:00	0																		
16	1/0/1900 0:00	0																		
17	1/0/1900 0:00	0																		
18	1/0/1900 0:00	0																		
19	1/0/1900 0:00	0																		
20	1/0/1900 0:00	0																		
21	1/0/1900 0:00	0																		
22	1/0/1900 0:00	0																		
23	1/0/1900 0:00	0																		
24	1/0/1900 0:00	0																		
25	1/0/1900 0:00	0																		
26	1/0/1900 0:00	0																		
27	1/0/1900 0:00	0																		
28	1/0/1900 0:00	0																		
29	1/0/1900 0:00	0																		
30	1/0/1900 0:00	0																		
31	1/0/1900 0:00	0																		
32	1/0/1900 0:00	0																		
33	1/0/1900 0:00	0																		
34	1/0/1900 0:00	0																		
35	1/0/1900 0:00	0																		
36	1/0/1900 0:00	0																		
37	1/0/1900 0:00	0																		
38	1/0/1900 0:00	0																		
39	1/0/1900 0:00	0																		
40	1/0/1900 0:00	0																		
41	1/0/1900 0:00	0																		
42	1/0/1900 0:00	0																		

	Value A Data	BA Performance											Value B	12 to 24 second Average Period Evaluation								
FR B 20 to 52 sec Average MW	Frequency Hz	Net Actual Interchange MW	JOU Dynamic Schedules Imp(-) Exp (+) MW	Non-Conforming Load Load (-) MW	Pumped Hydro Load (-) Gen (+) MW	Ramping Units Gen (+) MW	Transferred Frequency Response Rec (-) Del (+) MW	Contingent BA Lost Generation Load (-) Gen (+) MW	BA Bias Setting MW/0.1 Hz	BA Load MW	Bias Setting EPFR MW		Frequency Hz	Net Actual Interchange MW	JOU Dynamic Schedules Imp(-) Exp (+) MW	Non-Conforming Load Load (-) MW	Pumped Hydro Load (-) Gen (+) MW	Ramping Units Gen (+) MW	Transferred Frequency Response Rec (-) Del (+) MW	Contingent BA Lost Generation Load (-) Gen (+) MW	Initial Performance Adjusted P.U.

					Value B	18 to 30 second Average Period Evaluation													Value B	20 to 40 s	
Initial Performance Unadjusted P.U.	Sustained Performance P.U.	BA Bias Setting MW/0.1 Hz	BA Load MW	Bias Setting EPFR MW	Frequency Hz	Net Actual Interchange MW	JOU Dynamic Schedules Imp(-) Exp (+) MW	Non-Conforming Load Load (-) MW	Pumped Hydro ad (-) Gen MW	Ramping Units Gen (+) MW	Transferred Frequency Response Rec (-) Del (+) MW/0.1 Hz	Contingent BA Lost Generation Load (-) Gen (+) MW	Initial Performance Adjusted P.U.	Initial Performance Unadjusted P.U.	Sustained Performance P.U.	BA Bias Setting MW	BA Load MW	Bias Setting EPFR MW	Frequency Hz	Net Actual Interchange MW

econd Average Period Evaluation

Value B

18 to 52 second Average Period Evaluation

JOU Dynamic Schedules Imp(-) Exp (+) MW	Non-Conforming Load Load (-) MW	Pumped Hydro Load (-) Gen (+) MW	Ramping Units Gen (+) MW	Transferred Frequency Response Rec (-) Del (+) MW/0.1 Hz	Contingent BA Lost Generation Load (-) Gen (+) MW	Initial Performance Adjusted P.U.	Initial Performance Unadjusted P.U.	Sustained Performance P.U.	BA Bias Setting MW	BA Load MW	Bias Setting EPFR MW	Frequency Hz	Net Actual Interchange MW	JOU Dynamic Schedules Imp(-) Exp (+) MW	Non-Conforming Load Load (-) MW	Pumped Hydro Load (-) Gen (+) MW	Ramping Units Gen (+) MW	Transferred Frequency Response Rec (-) Del (+) MW	Contingent BA Lost Generation Load (-) Gen (+) MW

Value B 20 to 52 second Average Period Evaluation

Initial Performance Adjusted P.U.	Initial Performance Unadjusted P.U.	Sustained Performance P.U.	BA Bias Setting MW/0.1 Hz	BA Load MW	Bias Setting EPFR MW	Frequency Hz	Net Actual Interchange MW	JOU Dynamic Schedules Imp(-) Exp (+) MW	Non-Conforming Load Load (-) MW	Pumped Hydro Load (-) Gen (+) MW	Ramping Units Gen (+) MW	Transferred Frequency Response Rec (-) Del (+) MW	Contingent BA Lost Generation Load (-) Gen (+) MW	Initial Performance Adjusted P.U.	Initial Performance Unadjusted P.U.	Sustained Performance P.U.	BA Bias Setting MW/0.1 Hz	BA Load MW	Bias Setting EPFR MW

Instructions

Step 1	Enter data in all green cells on the "Data Entry" worksheet.
Step 2	For identified events in column B of the "Data Entry" worksheet, collect data and complete one FRS Form 2 workbook for each event in the list.
Step 3	PasteSpecial/Values data from FRS Form 2 "Form 1 Summary Data" worksheet into "BA Form 2 Event Data" worksheet of this workbook. Do this for each event in the list.
Step 4	Save this workbook using the following file name format:NYISO_yyyy_FRS_Form1.xlsx and send a copy of this workbook and all FRS_Form 2 workbooks to NERC. (where NYISO is replaced with your Balancing Authority abbreviation)
Step 5	"Summary" worksheet contains each event's results for your Balancing Authority.
Note	Balancing Authorities with variable Frequency Bias Settings shall calculate monthly average Frequency Bias Settings. The previous year's monthly averages will be reported annually on FRS Form 1.

Balancing Authority ERCO

NERC FRS FORM 1 20 to 52 second Value B

Enter Addition Data in column R ==>

Event Number	Date/Time (Central Prevailing)	DelFreq	BA Time	BA DelFreq	Value "A" Information MW Lost	Value "A" Information Adjustment	Value "B" Information MW Lost	Value "B" Information Adjustment	SEFRD (MW/0.1Hz)	Exclude for data error *
1	12/6/2010 11:25	-0.101	11:25:50	-0.095	755.1	0.0	0.0	0.0	-798.1	N
2	12/9/2010 17:34	-0.074	17:34:12	-0.107	753.1	0.0	0.0	0.0	-703.0	N
3	12/11/2010 23:38	-0.166	23:38:26	-0.198	821.1	0.0	0.0	0.0	-414.1	N
4	12/16/2010 15:16	-0.074	15:15:58	-0.078	617.1	0.0	0.0	0.0	-788.7	N
5	12/19/2010 2:39	-0.111	2:39:20	-0.133	720.3	0.0	0.0	0.0	-541.6	N
6	12/26/2010 8:23	-0.066	8:32:02	-0.039	494.4	0.0	0.0	0.0	-1252.2	N
7	1/9/2011 18:52	-0.108	18:51:58	-0.108	575.2	0.0	0.0	0.0	-534.9	N
8	1/11/2011 6:50	-0.091	6:50:14	-0.091	456.9	0.0	0.0	0.0	-499.9	N
9	1/20/2011 0:01	-0.198	0:01:52	-0.198	786.1	0.0	0.0	0.0	-397.4	N
10	1/21/2011 3:46	-0.171	3:46:26	-0.171	650.0	0.0	0.0	0.0	-379.6	N
11	1/23/2011 14:53	-0.149	14:53:18	-0.149	403.7	0.0	0.0	0.0	-271.6	N
12	1-28-11 5:21:00	-0.058	5:21:44	-0.056	311.5	0.0	0.0	0.0	-556.6	N
13	1/29/2011 22:29	-0.122	22:29:28	-0.082	646.2	0.0	351.3	0.0		Y
14	2-1-11 22:28:00	-0.078	22:27:46	-0.078	459.3	0.0	0.0	0.0	-589.5	N
15	2-2-11 2:18:00	-0.158	2:18:42	-0.158	716.9	0.0	0.0	0.0	-452.5	N
16	2-2-11 5:39:00	-0.125	5:39:12	-0.124	578.5	0.0	0.0	0.0	-466.9	N
17	2-2-11 8:24:00	-0.188	8:24:28	-0.187	775.3	0.0	0.0	0.0	-413.6	N
18	2-2-11 10:55:00	-0.190	10:55:38	-0.190	840.9	0.0	0.0	0.0	-443.7	N
19	2-9-11 13:01:00	-0.114	13:01:36	-0.114	598.7	0.0	11.2	0.0	-516.3	N
20	2-15-11 16:40:00	-0.216	16:40:02	-0.216	770.0	0.0	0.0	0.0	-356.7	N
21	2-16-11 9:25:00	-0.197	9:25:36	-0.175	569.9	0.0	0.0	0.0	-324.9	N
22	3-3-11 11:17:00	-0.094	11:17:34	-0.094	440.5	0.0	0.0	0.0	-467.5	N
23	3-14-11 6:09:00	-0.208	6:09:32	-0.208	970.7	0.0	0.0	0.0	-467.5	N
24	3-14-11 7:08:00	-0.127	7:08:12	-0.127	487.0	0.0	0.0	0.0	-382.5	N
25	3-16-11 20:45:00	-0.074	20:45:06	-0.074	397.6	0.0	0.0	0.0	-538.3	N
26	3-23-11 14:46:00	-0.063	14:46:46	-0.063	621.2	0.0	0.0	0.0	-993.6	N
27	3-24-11 13:59:00	-0.182	13:59:06	-0.177	498.3	0.0	0.0	0.0	-281.5	N
28	3-25-11 16:13:00	-0.172	16:13:26	-0.168	553.4	0.0	67.1	0.0	-288.8	N
29	3-29-11 6:43:00	-0.099	6:43:06	-0.099	742.8	0.0	0.0	0.0	-747.0	N
30	3-31-11 12:21:00	-0.112	12:21:24	-0.112	421.0	0.0	0.0	0.0	-376.6	N
31	4-5-11 22:02:00	-0.090	22:02:04	-0.090	518.5	0.0	0.0	0.0	-578.3	N
32	4-20-11 13:40:00	-0.145	13:40:54	-0.145	785.5	0.0	0.0	0.0	-543.4	N
33	4-27-11 23:27:00	-0.133	23:27:04	-0.133	691.8	0.0	0.0	0.0	-520.5	N
34	5-11-11 14:04:00	-0.121	14:04:46	-0.121	726.0	0.0	0.0	0.0	-598.8	N
35	5-16-11 8:06:00	-0.101	8:06:36	-0.101	471.1	0.0	0.0	0.0	-464.3	N
36	5-19-11 14:08:00	-0.197	14:07:56	-0.197	995.1	0.0	0.0	0.0	-504.6	N
37	5-23-11 17:34:00	-0.092	17:34:38	-0.092	533.3	0.0	0.0	0.0	-579.2	N
38	5-29-11 22:03:00	-0.118	22:03:06	-0.118	762.3	0.0	0.0	0.0	-646.4	N
39	6-22-11 13:18:00	0.080	13:18:38	0.031	-258.6	0.0	0.0	0.0	-825.6	N
40	6-27-11 12:54:00	-0.149	12:54:00	-0.131	661.2	0.0	0.0	0.0	-504.4	N
41	7-18-11 9:13:00	-0.097	9:13:14	-0.094	386.3	0.0	0.0	0.0	-409.7	N
42	7-18-11 20:50:00	-0.119	20:50:38	-0.128	596.1	0.0	0.0	0.0	-466.9	N

Enter Data in Green Highlighted Cells
Send copy to: Chris.Scheetz@nerc.net

2012	Bias Calculation Form Year
Texas	Interconnection
ERCO	Balancing Authority
Ken McIntyre	Contact Name
512-248-3969	Contact Phone #
kmcintyre@ercot.com	Contact e-mail
63453	Current Year's Actual Peak
75314	Internal Generating Capacity
63783	Next Year's Projected Peak
2011	Current year
-286.0	**2011 Frequency Response Obligation (FRO)**
Summary Statistics	
-533.8	Average Frequency Response (MW/0.1Hz)
-33.8	Regression Estimate of Frequency Response (MW/0.1Hz)
	Next Year's
-286.0	**2012 Frequency Response Obligation (FRO)**
-556.4	**2012 Frequency Bias Setting - (minimum of FRM, next year's FRO, or 0.8% of Projected Peak [Load + Gen]/2)**
-504.4	**2011 FRM - Median Frequency Response (MW/0.1Hz)**

N	Do you RECEIVE Overlap regulation?
	If Yes, list the BA name and the associated Bias of that BA

Bias -MW/0.1 Hz	Balancing Authority

N	Do you PROVIDE Overlap regulation?
	If Yes, list the BA name and the associated Bias of that BA

Event MW Loss	Information Value "A" Load	Value "B" Load
755.3	35688.6	35469.9
718.8	34418.4	34111.3
819.5	29590.8	29403.0
615.8	31769.4	31741.1
719.8	30239.7	30135.2
538	39597.9	39185.6
516.3	40357.4	40269.5
523	48145.5	48054.2
784.9	28998.6	28794.7
624	40462.5	40291.5
400.1	31488.8	31483.8
324.9	32641.7	32711.8
532	27749.0	27729.3
459.3	51871.7	51714.3
717	49441.4	49290.7
520	52943.4	52864.7
776	52047.5	51917.7
840.91	52733.0	52604.6
581.8	50685.2	50619.1
770	31612.4	31388.7
601.6	31135.6	31020.1
440.9	31497.4	31443.5
924	26752.6	26597.6
487.4	29065.2	29088.1
397.8	33412.6	33257.8
1013.6	38733.6	38255.9
568.8	35353.8	35240.8
591.4	40151.5	39989.1
735.3	31093.9	31034.9
420.3	31970.4	31774.6
519.4	30986.5	30848.3
787.9	41620.0	41463.4
697.2	29943.1	29703.5
723	42265.9	42113.4
471	30202.7	30136.8
1162.3	42909.6	42610.2
552	50589.7	50488.3
761.9	44769.7	44478.0
-258.56	44769.2	44457.0
659.5	56971.1	56832.7
464	45315.0	45296.7
593.3	57050.3	56884.0

Bias -MW/0.1 Hz	Balancing Authority

Instructions

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Step 2	For identified events in column B, collect data and complete FRS Form 2 for each event in the list.
Step 3	PasteSpecial/Values data from FRS Form 2 "Form 1 Summary Data" into "BA Form 2 Data" worksheet of this workbook. Do this for each event in the list.
Step 4	Save this workbook using the following file name format:NYISO_yyyy_FRS_Form1.xlsx and send a copy of this workbook and all FRS_Form 2 workbooks to NERC. (where NYISO is replaced with your BA name)
Note:	Only one set of average periods of evaluation is displayed. Other worksheets for the additional average periods are hidden.

Select Reason(s) for adjustment

Reason(s)

-0.058	23.2	Dynamic schedules for joint-owned units (DS)
-0.066	27.7	Nonconforming load (NL)
-0.040	10.7	Pumped hydro (PH)
-0.05252493	80.66089	Ramping units (RU)
-0.07090523	-26.89761	Xfred Frequency Response (TFR)
-0.05190677	9.955449	Contingent BA adjustment for loss of units (CBA)
-0.0580477	3.367024	DS & NL
-0.07557242	36.33443	DS & PH
-0.0563805	0.488253	DS & RU
-0.0573329	2.758037	DS & TFR
-0.0517609	13.64342	DS & CBA
-0.04999924	11.10075	DS & NL & PH
-0.052	-19.90685	DS & NL & RU
-0.05599976	12.32546	JOU DS & NL & TFR
-0.05849838	0.750192	DS & NL & CBA
-0.04850006	2.230058	DS & NL & PH & RU
-0.04500008	9.477859	DS & NL & PH & TFR
-0.03750229	0.355309	DS & NL & PH & CBA
-0.04750061	2.170702	DS & NL & PH & RU & TFR
-0.05550003	29.38207	DS & NL & PH & RU & CBA
-0.047	4.601381	DS & NL & PH & RU & TFR & CBA
-0.06	1.593515	NL & PH
-0.06	52.37091	NL & RU
-0.051	33.94787	NL & TFR
-0.1	100	NL & CBA
		NL & PH & RU
		NL & PH & TFR
		NL & PH & BAA
		NL & PH & RU & TFR
N		NL & PH & RU & CBA
Y		NL & PH & RU & TFR & CBA
		PH & RU
		PH & TFR
		PH & CBA
		PH & RU & TFR
		PH & RU & CBA
		PH & TFR
		PH & CBA
		PH & RU & TFR
		PH & RU & CBA
		PH & TFR
		PH & CBA
		PH & RU & TFR & CBA
		RU & TFR
		RU & CBA
		RU & TFR & CBA
		TFR & CBA

N
Y

Event Number	Balancing Authority	ERCO	JOU Dynamic Schedules		Non conforming Load		Pumped Hydro		Ramping Units		Transferred Frequency Response		Contingent BA Adjustment	
	Date/Time (Central Prevailing)	DelFreq	Value A Adjustment	Value B Adjustment	Value A Adjustment	Value B Adjustment	Value A Adjustment	Value B Adjustment	Value A Adjustment	Value B Adjustment	Value A Adjustment	Value B Adjustment	Value A Adjustment	Value B Adjustment
1	12/6/2010 11:25	-0.101	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2	12/9/2010 17:34	-0.074	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3	12/11/2010 23:38	-0.166	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
4	12/16/2010 15:16	-0.074	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5	12/19/2010 2:39	-0.111	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
6	12/26/2010 8:23	-0.066	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
7	1/9/2011 18:52	-0.108	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
8	1/11/2011 6:50	-0.091	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
9	1/20/2011 0:01	-0.198	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
10	1/21/2011 3:46	-0.171	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
11	1/23/2011 14:53	-0.149	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
12	1-28-11 5:21:00	-0.058	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
13	1/29/2011 22:29	-0.122	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
14	2-1-11 22:28:00	-0.078	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
15	2-2-11 2:18:00	-0.158	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
16	2-2-11 5:39:00	-0.125	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
17	2-2-11 8:24:00	-0.188	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
18	2-2-11 10:55:00	-0.190	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
19	2-9-11 13:01:00	-0.114	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
20	2-15-11 16:40:00	-0.216	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
21	2-16-11 9:25:00	-0.197	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
22	3-3-11 11:17:00	-0.094	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
23	3-14-11 6:09:00	-0.208	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
24	3-14-11 7:08:00	-0.127	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
25	3-16-11 20:45:00	-0.074	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
26	3-23-11 14:46:00	-0.063	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
27	3-24-11 13:59:00	-0.182	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
28	3-25-11 16:13:00	-0.172	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
29	3-29-11 6:43:00	-0.099	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
30	3-31-11 12:21:00	-0.112	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
31	4-5-11 22:02:00	-0.090	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
32	4-20-11 13:40:00	-0.145	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
33	4-27-11 23:27:00	-0.133	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
34	5-11-11 14:04:00	-0.121	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
35	5-16-11 8:06:00	-0.101	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
36	5-19-11 14:08:00	-0.197	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
37	5-23-11 17:34:00	-0.092	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
38	5-29-11 22:03:00	-0.118	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
39	6-22-11 13:18:00	0.080	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
40	6-27-11 12:54:00	-0.149	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
41	4-27-11 23:27:00	-0.133	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

42	5-11-11 14:04:00	-0.121	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Sign Convention for scan data collected in Form 2	**Imports: MWs are - Exports: MWs are +**	**Loads in MW as -**	**Load MW as - Generation MW as +**	**Enter Gen MW as +**	**The transactional amount in MW Receiver enters - Deliverer enters + on Form 2 Data sheet**	**Generation MW as + (If load occurs due to gen loss, enter MW as - at value B)**

Notes:

1) Balancing Authorities making adjustments must retain evidence to verify:
   - Adjustment values are determined from scan-cycle data using Value A and Value B averaging periods. Scan-cycle data must be available if adjustments are made.
   - Adjustments are necessary to improve accuracy of calculations compared to using Net Actual Interchange (contingency size for single BA interconnections) solely. Said differently, unless an adjustment compensates for significant known error, it should not be made. However, as noted in the next item, once a decision to include an adjustment for one or more of the six types is made for one event, the entity must calculate adjustments for that (those) type(s) for all events.
   - Adjustments are included consistently for all events (e.g. if adjustments for nonconforming load are made for one event, the load must be included for all events, etc.).

2) Dynamic Schedules:
   - Values use schedule sign convention.
   - Adjustments should include only dynamic schedules accounting for joint-owned units. Other dynamic schedules should be ignored.

3) Nonconforming Loads:
   - Values must be entered as negative numbers.

4) Pumped Hydro:
   - Values for pumping must be entered as negative values.
   - Values for generating must be entered as positive values.

5) Rampling Units:
   - Values are entered as positive values.

6) Transferred Frequency Response:
   - This value is the amount agreed upon between the entities expressed in MW/0.1 Hz. Form 2 will adjust this amount for the frequency deviation experienced. (e.g. if an entity agrees to provide 20 MW/0.1 Hz to another entity and a frequency event with a deviation of 50 mHz occurs, the delivering entity should enter +20 in the data column of Form 2 and the receiving entity should enter - 20. The spreadsheet will adjust the SEFRD for each entity by the 10 for this event.)
   - Values for the entity receiving the response must be entered as a negative number.
   - Values for the entity delivering the response must be entered as a positive number.
   - Values between entities must sum to zero.

7) Contingent Balancing Authority Adjustment:
   - Value for Value A is the pre-contingency generation from the contingent unit(s).
   - Value for Value B is usually 0 MW, but may be the load that remains on the system that was "netted" out by the now offline generation.

Net Total Adjustments
Value B 12 to 24 seconds
0.0
0.0
0.0
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0.0

0.0

Balancing Authority **ERCO**

NERC FRS FORM 1 12 to 24 second Value B

Event Number	Date/Time (Central Prevailing)	DelFreq	BA Time	BA DelFreq	Value "A" Information MW Lost	Value "A" Information Adjustment	Value "B" Information MW Lost	Value "B" Information Adjustment	SEFRD (MW/0.1Hz)	Exclude for data error *
1	12/6/2010 11:25	-0.101	11:25:50	-0.103	755.1	0.0	0.0	0.0	-735.7	N
2	12/9/2010 17:34	-0.074	17:34:12	-0.111	753.1	0.0	0.0	0.0	-675.8	N
3	12/11/2010 23:38	-0.166	23:38:26	-0.185	821.1	0.0	0.0	0.0	-443.5	N
4	12/16/2010 15:16	-0.074	15:15:58	-0.082	617.1	0.0	0.0	0.0	-755.3	N
5	12/19/2010 2:39	-0.111	2:39:20	-0.112	720.3	0.0	0.0	0.0	-643.2	N
6	12/26/2010 8:23	-0.066	8:32:02	-0.060	494.4	0.0	0.0	0.0	-828.5	N
7	1/9/2011 18:52	-0.108	18:51:58	-0.122	575.2	0.0	0.0	0.0	-472.6	N
8	1/11/2011 6:50	-0.091	6:50:14	-0.097	456.9	0.0	0.0	0.0	-473.4	N
9	1/20/2011 0:01	-0.198	0:01:52	-0.189	786.1	0.0	0.0	0.0	-415.7	N
10	1/21/2011 3:46	-0.171	3:46:26	-0.157	650.0	0.0	0.0	0.0	-412.8	N
11	1/23/2011 14:53	-0.149	14:53:18	-0.136	403.7	0.0	0.0	0.0	-297.1	N
12	1-28-11 5:21:00	-0.058	5:21:44	-0.068	311.5	0.0	0.0	0.0	-459.4	N
13	1/29/2011 22:29	-0.122	22:29:28	-0.123	646.2	0.0	113.9	0.0		Y
14	2-1-11 22:28:00	-0.078	22:27:46	-0.082	459.3	0.0	0.0	0.0	-563.6	N
15	2-2-11 2:18:00	-0.158	2:18:42	-0.155	716.9	0.0	0.0	0.0	-463.2	N
16	2-2-11 5:39:00	-0.125	5:39:12	-0.114	578.5	0.0	0.0	0.0	-508.2	N
17	2-2-11 8:24:00	-0.188	8:24:28	-0.167	775.3	0.0	0.0	0.0	-463.2	N
18	2-2-11 10:55:00	-0.190	10:55:38	-0.187	840.9	0.0	0.0	0.0	-448.6	N
19	2-9-11 13:01:00	-0.114	13:01:36	-0.105	598.7	0.0	17.3	0.0	-553.2	N
20	2-15-11 16:40:00	-0.216	16:40:02	-0.204	770.0	0.0	0.0	0.0	-377.7	N
21	2-16-11 9:25:00	-0.197	9:25:36	-0.177	569.9	0.0	0.0	0.0	-321.1	N
22	3-3-11 11:17:00	-0.094	11:17:34	-0.098	440.5	0.0	0.0	0.0	-449.9	N
23	3-14-11 6:09:00	-0.208	6:09:32	-0.205	970.7	0.0	0.0	0.0	-473.0	N
24	3-14-11 7:08:00	-0.127	7:08:12	-0.127	487.0	0.0	0.0	0.0	-383.2	N
25	3-16-11 20:45:00	-0.074	20:45:06	-0.089	397.6	0.0	0.0	0.0	-447.9	N
26	3-23-11 14:46:00	-0.063	14:46:46	-0.082	621.2	0.0	0.0	0.0	-753.3	N
27	3-24-11 13:59:00	-0.182	13:59:06	-0.186	498.3	0.0	0.0	0.0	-268.1	N
28	3-25-11 16:13:00	-0.172	16:13:26	-0.187	553.4	0.0	66.7	0.0	-260.9	N
29	3-29-11 6:43:00	-0.099	6:43:06	-0.123	742.8	0.0	0.0	0.0	-604.3	N
30	3-31-11 12:21:00	-0.112	12:21:24	-0.112	421.0	0.0	0.0	0.0	-375.7	N
31	4-5-11 22:02:00	-0.090	22:02:04	-0.083	518.5	0.0	0.0	0.0	-622.8	N
32	4-20-11 13:40:00	-0.145	13:40:54	-0.162	785.5	0.0	0.0	0.0	-483.9	N
33	4-27-11 23:27:00	-0.133	23:27:04	-0.132	691.8	0.0	0.0	0.0	-523.2	N
34	5-11-11 14:04:00	-0.121	14:04:46	-0.126	726.0	0.0	0.0	0.0	-574.0	N

2012
Texas
ERCO
Ken McIntyre
512-248-3969
kmcintyre@ercot.com
63453
75314
63783

Summary Statistics

-499.6

-33.8

-286

-556.4

-463.2

35	5-16-11 8:06:00	-0.101	8:06:36	-0.110	471.1	0.0	0.0	0.0	-427.2	N
36	5-19-11 14:08:00	-0.197	14:07:56	-0.223	995.1	0.0	0.0	0.0	-446.8	N
37	5-23-11 17:34:00	-0.092	17:34:38	-0.112	533.3	0.0	0.0	0.0	-475.9	N
38	5-29-11 22:03:00	-0.118	22:03:06	-0.133	762.3	0.0	0.0	0.0	-573.8	N
39	6-22-11 13:18:00	0.080	13:18:38	0.036	-258.6	0.0	0.0	0.0	-716.4	N
40	6-27-11 12:54:00	-0.149	12:54:00	-0.144	661.2	0.0	0.0	0.0	-459.1	N
41	7-18-11 9:13:00	-0.097	9:13:14	-0.096	386.3	0.0	0.0	0.0	-403.3	N
42	7-18-11 20:50:00	-0.119	20:50:38	-0.133	596.1	0.0	0.0	0.0	-447.5	N

	Information		
	Value "A" Load	**Value "B" Load**	
	35688.6	35448.9	
	34418.4	34067.3	
	29590.8	29332.9	
Bias Calculation Form Year	31769.4	31711.5	
Interconnection	30239.7	30095.9	
Balancing Authority	39597.9	39157.5	
Contact Name	40357.4	40313.0	
Contact Phone #	48145.5	48119.3	
Contact e-mail	28998.6	28706.9	
Current Year's Actual Peak	40462.5	40291.4	
Internal Generating Capacity	31488.8	31381.1	
Next Year's Projected Peak	32641.7	32677.9	
	27749.0	27564.7	
	51871.7	51739.1	
Current year	49441.4	49253.7	
2011 Frequency Response Obligation (FRO)	52943.4	52893.3	
	52047.5	51826.7	
	52733.0	52504.3	
Average Frequency Response (MW/0.1Hz)	50685.2	50470.3	
	31612.4	31207.5	
Regression Estimate of Frequency Response (MW/0.1Hz)	31135.6	30972.9	
	31497.4	31383.3	
	26752.6	26452.9	
	29065.2	29072.8	
	33412.6	33249.3	
	38733.6	38264.0	
Next Year's	35353.8	35176.6	
2012 Frequency Response Obligation (FRO)	40151.5	39958.5	
2012 Frequency Bias Setting - (minimum of FRM, next year's FRO, or 0.8% of Projected Peak [Load + Gen]/2)	31093.9	30933.8	
	31970.4	31779.5	
2011 FRM - Median Frequency Response (MW/0.1Hz)	30986.5	30797.5	
	41620.0	41377.9	
	29943.1	29643.5	
	42265.9	42054.1	

30202.7	30090.9	
42909.6	42474.0	
50589.7	50457.9	
44769.7	44439.2	
44769.2	44674.8	
56971.1	56795.9	
45315.0	45257.8	
57050.3	56857.6	

-0.058	23.2	Dynamic schedules for joint-owned units (DS)
-0.066	27.7	Nonconforming load (NL)
-0.040	10.7	Pumped hydro (PH)
-0.05252493	80.660891	Ramping units (RU)
-0.07090523	-26.89761	Xfred Frequency Response (TFR)
-0.05190677	9.9554492	Contingent BA adjustment for loss of units (CBA)
-0.0580477	3.367024	DS & NL
-0.07557242	36.334427	DS & PH
-0.0563805	0.488253	DS & RU
-0.0573329	2.7580369	DS & TFR
-0.0517609	13.643417	DS & CBA
-0.04999924	11.100746	DS & NL & PH
-0.052	-19.90685	DS & NL & RU
-0.05599976	12.325464	JOU DS & NL & TFR
-0.05849838	0.7501918	DS & NL & CBA
-0.04850006	2.2300578	DS & NL & PH & RU
-0.04500008	9.4778593	DS & NL & PH & TFR
-0.03750229	0.355309	DS & NL & PH & CBA
-0.04750061	2.1707019	DS & NL & PH & RU & TFR
-0.05550003	29.382074	DS & NL & PH & RU & CBA
-0.047	4.6013813	DS & NL & PH & RU & TFR & CBA
-0.06	1.5935149	NL & PH
-0.06	52.370908	NL & RU
-0.051	33.947874	NL & TFR
-0.1	100	NL & CBA
		NL & PH & RU
		NL & PH & TFR
		NL & PH & BAA
		NL & PH & RU & TFR
N		NL & PH & RU & CBA
Y		NL & PH & RU & TFR & CBA
		PH & RU
		PH & TFR
		PH & CBA

PH & RU & TFR
PH & RU & CBA
PH & TFR
PH & CBA
PH & RU & TFR
PH & RU & CBA
PH & TFR
PH & CBA
PH & RU & TFR & CBA
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RU & CBA
RU & TFR & CBA
TFR & CBA

N
Y

Balancing Authority **ERCO**

NERC FRS FORM 1 20 to 40 second Value B

Event Number	Date/Time (Central Prevailing)	DelFreq	BA Time	BA DelFreq	Value "A" Information MW Lost	Value "A" Information Adjustment	Value "B" Information MW Lost	Value "B" Information Adjustment	SEFRD (MW/0.1Hz)	Exclude for data error *	Information Value "A" Load	Information Value "B" Load
1	12/6/2010 11:25	-0.101	11:25:50	-0.098	755.1	0.0	0.0	0.0	-774.5	N	35688.6	35410.9
2	12/9/2010 17:34	-0.074	17:34:12	-0.105	753.1	0.0	0.0	0.0	-716.0	N	34418.4	34096.6
3	12/11/2010 23:38	-0.166	23:38:26	-0.200	821.1	0.0	0.0	0.0	-410.9	N	29590.8	29391.6
4	12/16/2010 15:16	-0.074	15:15:58	-0.083	617.1	0.0	0.0	0.0	-747.3	N	31769.4	31745.3
5	12/19/2010 2:39	-0.111	2:39:20	-0.133	720.3	0.0	0.0	0.0	-542.7	N	30239.7	30120.0
6	12/26/2010 8:23	-0.066	8:32:02	-0.047	494.4	0.0	0.0	0.0	-1048.4	N	39597.9	39182.0
7	1/9/2011 18:52	-0.108	18:51:58	-0.107	575.2	0.0	0.0	0.0	-535.8	N	40357.4	40236.2
8	1/11/2011 6:50	-0.091	6:50:14	-0.094	456.9	0.0	0.0	0.0	-485.3	N	48145.5	48020.9
9	1/20/2011 0:01	-0.198	0:01:52	-0.196	786.1	0.0	0.0	0.0	-401.5	N	28998.6	28787.2
10	1/21/2011 3:46	-0.171	3:46:26	-0.168	650.0	0.0	0.0	0.0	-386.0	N	40462.5	40282.2
11	1/23/2011 14:53	-0.149	14:53:18	-0.147	403.7	0.0	0.0	0.0	-275.2	N	31488.8	31481.5
12	1-28-11 5:21:00	-0.058	5:21:44	-0.062	311.5	0.0	0.0	0.0	-504.5	N	32641.7	32700.6
13	1/29/2011 22:29	-0.122	22:29:28	-0.121	646.2	0.0	203.7	0.0		Y	27749.0	27623.1
14	2-1-11 22:28:00	-0.078	22:27:46	-0.080	459.3	0.0	0.0	0.0	-575.8	N	51871.7	51712.3
15	2-2-11 2:18:00	-0.158	2:18:42	-0.156	716.9	0.0	0.0	0.0	-458.1	N	49441.4	49287.6
16	2-2-11 5:39:00	-0.125	5:39:12	-0.120	578.5	0.0	0.0	0.0	-482.9	N	52943.4	52850.2
17	2-2-11 8:24:00	-0.188	8:24:28	-0.185	775.3	0.0	0.0	0.0	-418.6	N	52047.5	51926.0
18	2-2-11 10:55:00	-0.190	10:55:38	-0.188	840.9	0.0	0.0	0.0	-448.3	N	52733.0	52612.4
19	2-9-11 13:01:00	-0.114	13:01:36	-0.114	598.7	0.0	17.3	0.0	-508.4	N	50685.2	50612.1
20	2-15-11 16:40:00	-0.216	16:40:02	-0.209	770.0	0.0	0.0	0.0	-368.4	N	31612.4	31367.8
21	2-16-11 9:25:00	-0.197	9:25:36	-0.175	569.9	0.0	0.0	0.0	-325.9	N	31135.6	31008.9
22	3-3-11 11:17:00	-0.094	11:17:34	-0.095	440.5	0.0	0.0	0.0	-462.4	N	31497.4	31438.9
23	3-14-11 6:09:00	-0.208	6:09:32	-0.207	970.7	0.0	0.0	0.0	-469.6	N	26752.6	26582.4
24	3-14-11 7:08:00	-0.127	7:08:12	-0.128	487.0	0.0	0.0	0.0	-379.6	N	29065.2	29079.8
25	3-16-11 20:45:00	-0.074	20:45:06	-0.079	397.6	0.0	0.0	0.0	-506.2	N	33412.6	33251.9
26	3-23-11 14:46:00	-0.063	14:46:46	-0.064	621.2	0.0	0.0	0.0	-963.4	N	38733.6	38253.7
27	3-24-11 13:59:00	-0.182	13:59:06	-0.174	498.3	0.0	0.0	0.0	-285.6	N	35353.8	35226.5
28	3-25-11 16:13:00	-0.172	16:13:26	-0.174	553.4	0.0	67.0	0.0	-280.3	N	40151.5	39984.1
29	3-29-11 6:43:00	-0.099	6:43:06	-0.101	742.8	0.0	0.0	0.0	-735.8	N	31093.9	31034.6
30	3-31-11 12:21:00	-0.112	12:21:24	-0.113	421.0	0.0	0.0	0.0	-372.2	N	31970.4	31784.3
31	4-5-11 22:02:00	-0.090	22:02:04	-0.087	518.5	0.0	0.0	0.0	-599.2	N	30986.5	30850.3
32	4-20-11 13:40:00	-0.145	13:40:54	-0.147	785.5	0.0	0.0	0.0	-533.8	N	41620.0	41449.8
33	4-27-11 23:27:00	-0.133	23:27:04	-0.132	691.8	0.0	0.0	0.0	-522.1	N	29943.1	29706.5
34	5-11-11 14:04:00	-0.121	14:04:46	-0.121	726.0	0.0	0.0	0.0	-598.5	N	42265.9	42114.1
35	5-16-11 8:06:00	-0.101	8:06:36	-0.103	471.1	0.0	0.0	0.0	-456.5	N	30202.7	30124.6
36	5-19-11 14:08:00	-0.197	14:07:56	-0.200	995.1	0.0	0.0	0.0	-498.0	N	42909.6	42598.7
37	5-23-11 17:34:00	-0.092	17:34:38	-0.097	533.3	0.0	0.0	0.0	-552.5	N	50589.7	50481.7
38	5-29-11 22:03:00	-0.118	22:03:06	-0.117	762.3	0.0	0.0	0.0	-649.0	N	44769.7	44483.3
39	6-22-11 13:18:00	0.080	13:18:38	0.033	-258.6	0.0	0.0	0.0	-792.0	N	44769.2	44477.2
40	6-27-11 12:54:00	-0.149	12:54:00	-0.133	661.2	0.0	0.0	0.0	-497.8	N	56971.1	56824.3
41	7-18-11 9:13:00	-0.097	9:13:14	-0.093	386.3	0.0	0.0	0.0	-416.6	N	45315.0	45285.6
42	7-18-11 20:50:00	-0.119	20:50:38	-0.128	596.1	0.0	0.0	0.0	-465.0	N	57050.3	56878.7

2012	Bias Calculation Form Year
Texas	Interconnection
ERCO	Balancing Authority
Ken McIntyre	Contact Name
512-248-3969	Contact Phone #
kmcintyre@ercot.com	Contact e-mail
63453	Current Year's Actual Peak
75314	Internal Generating Capacity
63783	Next Year's Projected Peak
2011	Current year
-286	**2011 Frequency Response Obligation (FRO)**

Summary Statistics

-523.2	Average Frequency Response (MW/0.1Hz)
-33.8	Regression Estimate of Frequency Response (MW/0.1Hz)

	Next Year's
-286	**2012 Frequency Response Obligation (FRO)**
-556.4	**2012 Frequency Bias Setting - (minimum of FRM, next year's FRO, or 0.8% of Projected Peak [Load + Gen]/2)**
-497.8	**2011 FRM - Median Frequency Response (MW/0.1Hz)**

-0.058	23.2	Dynamic schedules for joint-owned units (DS)
-0.066	27.7	Nonconforming load (NL)
-0.040	10.7	Pumped hydro (PH)
-0.05252493	80.66089	Ramping units (RU)
-0.07090523	-26.89761	Xfred Frequency Response (TFR)
-0.05190677	9.955449	Contingent BA adjustment for loss of units (CBA)
-0.0580477	3.367024	DS & NL
-0.07557242	36.33443	DS & PH
-0.0563805	0.488253	DS & RU
-0.0573329	2.758037	DS & TFR
-0.0517609	13.64342	DS & CBA
-0.04999924	11.10075	DS & NL & PH
-0.052	-19.90685	DS & NL & RU
-0.05599976	12.32546	JOU DS & NL & TFR
-0.05849838	0.750192	DS & NL & CBA
-0.04850006	2.230058	DS & NL & PH & RU
-0.04500008	9.477859	DS & NL & PH & TFR
-0.03750229	0.355309	DS & NL & PH & CBA
-0.04750061	2.170702	DS & NL & PH & RU & TFR
-0.05550003	29.38207	DS & NL & PH & RU & CBA
-0.047	4.601381	DS & NL & PH & RU & TFR & CBA
-0.06	1.593515	NL & PH
-0.06	52.37091	NL & RU
-0.051	33.94787	NL & TFR
-0.1	100	NL & CBA
		NL & PH & RU
		NL & PH & TFR
		NL & PH & BAA
		NL & PH & RU & TFR
N		NL & PH & RU & CBA
Y		NL & PH & RU & TFR & CBA
		PH & RU
		PH & TFR
		PH & CBA
		PH & RU & TFR
		PH & RU & CBA
		PH & TFR
		PH & CBA
		PH & RU & TFR
		PH & RU & CBA
		PH & TFR
		PH & CBA
		PH & RU & TFR & CBA
		RU & TFR
		RU & CBA
		RU & TFR & CBA
		TFR & CBA
N		
Y		

Balancing Authority ERCO

NERC FRS FORM 1 18 to 52 second Value B

Event Number	Date/Time (Central Prevailing)	DelFreq	BA Time	BA DelFreq	Value "A" Information MW Lost	Value "A" Information Adjustment	Value "B" Information MW Lost	Value "B" Information Adjustment	SEFRD (MW/0.1Hz)	Exclude for data error *
1	12/6/2010 11:25	-0.101	11:25:50	-0.095	755.1	0.0	0.0	0.0	-793.0	N
2	12/9/2010 17:34	-0.074	17:34:12	-0.107	753.1	0.0	0.0	0.0	-702.7	N
3	12/11/2010 23:38	-0.166	23:38:26	-0.198	821.1	0.0	0.0	0.0	-414.7	N
4	12/16/2010 15:16	-0.074	15:15:58	-0.078	617.1	0.0	0.0	0.0	-787.6	N
5	12/19/2010 2:39	-0.111	2:39:20	-0.132	720.3	0.0	0.0	0.0	-547.3	N
6	12/26/2010 8:23	-0.066	8:32:02	-0.041	494.4	0.0	0.0	0.0	-1216.6	N
7	1/9/2011 18:52	-0.108	18:51:58	-0.108	575.2	0.0	0.0	0.0	-532.1	N
8	1/11/2011 6:50	-0.091	6:50:14	-0.092	456.9	0.0	0.0	0.0	-498.4	N
9	1/20/2011 0:01	-0.198	0:01:52	-0.197	786.1	0.0	0.0	0.0	-399.0	N
10	1/21/2011 3:46	-0.171	3:46:26	-0.170	650.0	0.0	0.0	0.0	-381.3	N
11	1/23/2011 14:53	-0.149	14:53:18	-0.148	403.7	0.0	0.0	0.0	-272.5	N
12	1-28-11 5:21:00	-0.058	5:21:44	-0.057	311.5	0.0	0.0	0.0	-549.8	N
13	1/29/2011 22:29	-0.122	22:29:28	-0.085	646.2	0.0	338.1	0.0		Y
14	2-1-11 22:28:00	-0.078	22:27:46	-0.078	459.3	0.0	0.0	0.0	-588.0	N
15	2-2-11 2:18:00	-0.158	2:18:42	-0.158	716.9	0.0	0.0	0.0	-452.8	N
16	2-2-11 5:39:00	-0.125	5:39:12	-0.123	578.5	0.0	0.0	0.0	-469.4	N
17	2-2-11 8:24:00	-0.188	8:24:28	-0.186	775.3	0.0	0.0	0.0	-417.6	N
18	2-2-11 10:55:00	-0.190	10:55:38	-0.189	840.9	0.0	0.0	0.0	-444.6	N
19	2-9-11 13:01:00	-0.114	13:01:36	-0.113	598.7	0.0	11.5	0.0	-517.9	N
20	2-15-11 16:40:00	-0.216	16:40:02	-0.215	770.0	0.0	0.0	0.0	-358.0	N
21	2-16-11 9:25:00	-0.197	9:25:36	-0.175	569.9	0.0	0.0	0.0	-324.7	N
22	3-3-11 11:17:00	-0.094	11:17:34	-0.094	440.5	0.0	0.0	0.0	-466.8	N
23	3-14-11 6:09:00	-0.208	6:09:32	-0.208	970.7	0.0	0.0	0.0	-467.0	N
24	3-14-11 7:08:00	-0.127	7:08:12	-0.127	487.0	0.0	0.0	0.0	-382.6	N
25	3-16-11 20:45:00	-0.074	20:45:06	-0.074	397.6	0.0	0.0	0.0	-536.8	N
26	3-23-11 14:46:00	-0.063	14:46:46	-0.063	621.2	0.0	0.0	0.0	-987.3	N
27	3-24-11 13:59:00	-0.182	13:59:06	-0.178	498.3	0.0	0.0	0.0	-280.5	N
28	3-25-11 16:13:00	-0.172	16:13:26	-0.169	553.4	0.0	67.0	0.0	-287.3	N
29	3-29-11 6:43:00	-0.099	6:43:06	-0.100	742.8	0.0	0.0	0.0	-740.8	N
30	3-31-11 12:21:00	-0.112	12:21:24	-0.112	421.0	0.0	0.0	0.0	-376.7	N
31	4-5-11 22:02:00	-0.090	22:02:04	-0.089	518.5	0.0	0.0	0.0	-584.2	N
32	4-20-11 13:40:00	-0.145	13:40:54	-0.146	785.5	0.0	0.0	0.0	-538.8	N
33	4-27-11 23:27:00	-0.133	23:27:04	-0.133	691.8	0.0	0.0	0.0	-521.9	N
34	5-11-11 14:04:00	-0.121	14:04:46	-0.121	726.0	0.0	0.0	0.0	-598.9	N
35	5-16-11 8:06:00	-0.101	8:06:36	-0.102	471.1	0.0	0.0	0.0	-462.3	N
36	5-19-11 14:08:00	-0.197	14:07:56	-0.198	995.1	0.0	0.0	0.0	-501.6	N
37	5-23-11 17:34:00	-0.092	17:34:38	-0.093	533.3	0.0	0.0	0.0	-572.4	N
38	5-29-11 22:03:00	-0.118	22:03:06	-0.119	762.3	0.0	0.0	0.0	-642.1	N
39	6-22-11 13:18:00	0.080	13:18:38	0.032	-258.6	0.0	0.0	0.0	-819.7	N
40	6-27-11 12:54:00	-0.149	12:54:00	-0.132	661.2	0.0	0.0	0.0	-501.7	N
41	7-18-11 9:13:00	-0.097	9:13:14	-0.094	386.3	0.0	0.0	0.0	-409.1	N
42	7-18-11 20:50:00	-0.119	20:50:38	-0.128	596.1	0.0	0.0	0.0	-466.0	N

2012	Bias Calculation Form Year
Texas	Interconnection
ERCO	Balancing Authority
Ken McIntyre	Contact Name
512-248-3969	Contact Phone #
kmcintyre@ercot.com	Contact e-mail
63453	Current Year's Actual Peak
75314	Internal Generating Capacity
63783	Next Year's Projected Peak
2011	Current year
-286	**2011 Frequency Response Obligation (FRO)**

Summary Statistics

-532.0	Average Frequency Response (MW/0.1Hz)
-33.8	Regression Estimate of Frequency Response (MW/0.1Hz)

Next Year's

-286	**2012 Frequency Response Obligation (FRO)**
-556.4	**2012 Frequency Bias Setting - (minimum of FRM, next year's FRO, or 0.8% of Projected Peak [Load + Gen]/2)**
-501.6	**2011 FRM - Median Frequency Response (MW/0.1Hz)**

Information

Value "A" Load	Value "B" Load
35688.6	35459.3
34418.4	34109.5
29590.8	29398.7
31769.4	31741.9
30239.7	30135.7
39597.9	39184.3
40357.4	40275.8
48145.5	48065.0
28998.6	28794.4
40462.5	40291.0
31488.8	31481.8
32641.7	32710.6
27749.0	27719.2
51871.7	51714.6
49441.4	49289.6
52943.4	52861.2
52047.5	51915.6
52733.0	52601.5
50685.2	50613.5
31612.4	31388.5
31135.6	31018.5
31497.4	31440.9
26752.6	26588.3
29065.2	29087.1
33412.6	33257.7
38733.6	38257.8
35353.8	35238.1
40151.5	39989.9
31093.9	31031.3
31970.4	31774.8
30986.5	30845.4
41620.0	41460.3
29943.1	29700.8
42265.9	42111.6
30202.7	30134.4
42909.6	42602.5
50589.7	50486.4
44769.7	44476.4
44769.2	44473.3
56971.1	56831.1
45315.0	45294.9
57050.3	56882.9

-0.058	23.2	Dynamic schedules for joint-owned units (DS)
-0.066	27.7	Nonconforming load (NL)
-0.040	10.7	Pumped hydro (PH)
-0.05252493	80.66089	Ramping units (RU)
-0.07090523	-26.89761	Xfred Frequency Response (TFR)
-0.05190677	9.955449	Contingent BA adjustment for loss of units (CBA)
-0.0580477	3.367024	DS & NL
-0.07557242	36.33443	DS & PH
-0.0563805	0.488253	DS & RU
-0.0573329	2.758037	DS & TFR
-0.0517609	13.64342	DS & CBA
-0.04999924	11.10075	DS & NL & PH
-0.052	-19.90685	DS & NL & RU
-0.05599976	12.32546	JOU DS & NL & TFR
-0.05849838	0.750192	DS & NL & CBA
-0.04850006	2.230058	DS & NL & PH & RU
-0.04500008	9.477859	DS & NL & PH & TFR
-0.03750229	0.355309	DS & NL & PH & CBA
-0.04750061	2.170702	DS & NL & PH & RU & TFR
-0.05550003	29.38207	DS & NL & PH & RU & CBA
-0.047	4.601381	DS & NL & PH & RU & TFR & CBA
-0.06	1.593515	NL & PH
-0.06	52.37091	NL & RU
-0.051	33.94787	NL & TFR
-0.1	100	NL & CBA
		NL & PH & RU
		NL & PH & TFR
		NL & PH & BAA
		NL & PH & RU & TFR

N	NL & PH & RU & CBA
Y	NL & PH & RU & TFR & CBA
	PH & RU
	PH & TFR
	PH & CBA
	PH & RU & TFR
	PH & RU & CBA
	PH & TFR
	PH & CBA
	PH & RU & TFR
	PH & RU & CBA
	PH & TFR
	PH & CBA
	PH & RU & TFR & CBA
	RU & TFR
	RU & CBA
	RU & TFR & CBA
	TFR & CBA

N
Y

NERC FRS FORM 1

Event Number	Balancing Authority / Date/Time (Central Prevailing)	ERCO DelFreq	BA Time	BA DelFreq	12 to 24 SEFRD	18 to 30 SEFRD	20 to 40 SEFRD	18 to 52 SEFRD	20 to 52 SEFRD	Exclude for data error *	12 to 24 P.U. Performance Initial Adjusted	Initial Unadjusted	Sustained	18 to 30 P.U. Performance Initial Adjusted	Initial Unadjusted	Sustained
1	12/6/2010 11:25	-0.101	11:25:50	-0.101	-736.4	-750.9	-775.5	-795.7	-800.4	N	2.57	2.57	No Evaluatio	2.62	2.62	No Evaluation
2	12/9/2010 17:34	-0.074	17:34:12	-0.105	-682.1	-720.0	-716.6	-703.6	-703.9	N	2.36	2.36	No Evaluatio	2.51	2.51	No Evaluation
3	12/11/2010 23:38	-0.166	23:38:26	-0.200	-445.3	-411.1	-411.6	-415.2	-414.6	N	1.55	1.55	No Evaluatio	1.43	1.43	No Evaluation
4	12/16/2010 15:16	-0.074	15:15:58	-0.085	-757.2	-723.3	-750.8	-794.9	-796.4	N	2.64	2.64	No Evaluatio	2.53	2.53	No Evaluation
5	12/19/2010 2:39	-0.111	2:39:20	-0.126	-653.2	-578.6	-545.3	-550.3	-543.4	N	2.25	2.25	No Evaluatio	2.01	2.01	No Evaluation
6	12/26/2010 8:23	-0.066	8:32:02	-0.054	-833.0	-921.5	-1074.5	-1364.9	-1396.9	N	2.90	2.90	No Evaluatio	3.20	3.20	No Evaluation
7	1/9/2011 18:52	-0.108	18:51:58	-0.111	-476.0	-518.9	-536.4	-532.8	-535.5	N	1.65	1.65	No Evaluatio	1.81	1.81	No Evaluation
8	1/11/2011 6:50	-0.091	6:50:14	-0.095	-473.9	-482.1	-485.8	-499.6	-501.2	N	1.66	1.66	No Evaluatio	1.69	1.69	No Evaluation
9	1/20/2011 0:01	-0.198	0:01:52	-0.198	-417.2	-398.3	-401.9	-399.4	-397.8	N	1.45	1.45	No Evaluatio	1.39	1.39	No Evaluation
10	1/21/2011 3:46	-0.171	3:46:26	-0.164	-413.4	-396.2	-386.3	-381.8	-380.0	N	1.44	1.44	No Evaluatio	1.38	1.38	No Evaluation
11	1/23/2011 14:53	-0.149	14:53:18	-0.145	-298.2	-279.1	-275.3	-272.7	-271.8	N	1.04	1.04	No Evaluatio	0.98	0.98	No Evaluation
12	1-28-11 5:21:00	-0.058	5:21:44	-0.065	-459.8	-479.0	-506.4	-564.4	-570.8	N	1.61	1.61	No Evaluatio	1.67	1.67	No Evaluation
13	1/29/2011 22:29	-0.122	22:29:28	-0.124						Y	1.51	1.51	No Evaluatio	1.50	1.50	No Evaluation
14	2-1-11 22:28:00	-0.078	22:27:46	-0.079	-564.6	-583.2	-576.1	-589.0	-590.5	N	1.97	1.97	No Evaluatio	2.04	2.04	No Evaluation
15	2-2-11 2:18:00	-0.158	2:18:42	-0.154	-463.3	-466.3	-458.4	-453.1	-452.8	N	1.62	1.62	No Evaluatio	1.63	1.63	No Evaluation
16	2-2-11 5:39:00	-0.125	5:39:12	-0.115	-508.5	-504.9	-484.2	-471.3	-468.7	N	1.78	1.78	No Evaluatio	1.76	1.76	No Evaluation
17	2-2-11 8:24:00	-0.188	8:24:28	-0.179	-464.7	-435.8	-419.7	-419.1	-414.4	N	1.62	1.62	No Evaluatio	1.51	1.51	No Evaluation
18	2-2-11 10:55:00	-0.190	10:55:38	-0.185	-448.9	-454.5	-448.4	-444.8	-443.9	N	1.57	1.57	No Evaluatio	1.59	1.59	No Evaluation
19	2-9-11 13:01:00	-0.114	13:01:36	-0.111	-560.3	-531.2	-514.4	-518.8	-516.8	N	1.93	1.93	No Evaluatio	1.84	1.84	No Evaluation
20	2-15-11 16:40:00	-0.216	16:40:02	-0.200	-379.1	-386.1	-369.7	-359.6	-358.2	N	1.32	1.32	No Evaluatio	1.35	1.35	No Evaluation
21	2-16-11 9:25:00	-0.197	9:25:36	-0.175	-321.2	-325.1	-326.0	-324.8	-325.0	N	1.12	1.12	No Evaluatio	1.14	1.14	No Evaluation
22	3-3-11 11:17:00	-0.094	11:17:34	-0.096	-450.3	-458.4	-462.9	-467.4	-468.1	N	1.57	1.57	No Evaluatio	1.60	1.60	No Evaluation
23	3-14-11 6:09:00	-0.208	6:09:32	-0.206	-473.2	-472.1	-469.7	-467.1	-467.6	N	1.65	1.65	No Evaluatio	1.65	1.65	No Evaluation
24	3-14-11 7:08:00	-0.127	7:08:12	-0.128	-383.2	-380.7	-379.7	-382.9	-382.7	N	1.34	1.34	No Evaluatio	1.33	1.33	No Evaluation
25	3-16-11 20:45:00	-0.074	20:45:06	-0.079	-455.9	-503.0	-507.2	-542.1	-543.8	N	1.57	1.57	No Evaluatio	1.76	1.76	No Evaluation
26	3-23-11 14:46:00	-0.063	14:46:46	-0.065	-807.2	-956.6	-964.2	-990.4	-996.3	N	2.63	2.63	No Evaluatio	3.34	3.34	No Evaluation
27	3-24-11 13:59:00	-0.182	13:59:06	-0.176	-268.8	-284.0	-285.7	-280.8	-281.7	N	0.94	0.94	No Evaluatio	0.99	0.99	No Evaluation
28	3-25-11 16:13:00	-0.172	16:13:26	-0.180	-261.0	-270.6	-280.8	-288.2	-289.6	N	0.91	0.91	No Evaluatio	0.95	0.95	No Evaluation
29	3-29-11 6:43:00	-0.099	6:43:06	-0.101	-630.9	-741.8	-737.6	-743.0	-748.6	N	2.11	2.11	No Evaluatio	2.58	2.58	No Evaluation
30	3-31-11 12:21:00	-0.112	12:21:24	-0.111	-375.8	-379.6	-372.4	-378.9	-379.0	N	1.31	1.31	No Evaluatio	1.33	1.33	No Evaluation
31	4-5-11 22:02:00	-0.090	22:02:04	-0.084	-628.6	-616.9	-599.8	-587.1	-580.0	N	2.18	2.18	No Evaluatio	2.15	2.15	No Evaluation
32	4-20-11 13:40:00	-0.145	13:40:54	-0.149	-486.6	-529.8	-534.3	-540.2	-544.2	N	1.69	1.69	No Evaluatio	1.85	1.85	No Evaluation
33	4-27-11 23:27:00	-0.133	23:27:04	-0.131	-524.9	-526.7	-522.4	-522.2	-520.8	N	1.83	1.83	No Evaluatio	1.84	1.84	No Evaluation
34	5-11-11 14:04:00	-0.121	14:04:46	-0.119	-577.2	-612.6	-599.1	-599.3	-599.2	N	2.01	2.01	No Evaluatio	2.14	2.14	No Evaluation
35	5-16-11 8:06:00	-0.101	8:06:36	-0.107	-427.7	-441.7	-457.1	-463.1	-465.0	N	1.49	1.49	No Evaluatio	1.54	1.54	No Evaluation
36	5-19-11 14:08:00	-0.197	14:07:56	-0.207	-449.0	-480.6	-498.7	-502.5	-505.2	N	1.56	1.56	No Evaluatio	1.68	1.68	No Evaluation
37	5-23-11 17:34:00	-0.092	17:34:38	-0.103	-476.7	-522.1	-555.2	-578.0	-583.9	N	1.66	1.66	No Evaluatio	1.82	1.82	No Evaluation
38	5-29-11 22:03:00	-0.118	22:03:06	-0.123	-574.8	-624.6	-651.2	-643.9	-647.9	N	2.01	2.01	No Evaluatio	2.17	2.17	No Evaluation
39	6-22-11 13:18:00	0.080	13:18:38	0.034	-721.6	-762.0	-795.0	-825.6	-831.2	N	2.50	2.50	No Evaluatio	2.66	2.66	No Evaluation
40	6-27-11 12:54:00	-0.149	12:54:00	-0.137	-459.8	-484.4	-498.1	-502.3	-504.8	N	1.61	1.61	No Evaluatio	1.69	1.69	No Evaluation
41	7-18-11 9:13:00	-0.097	9:13:14	-0.095	-403.4	-405.8	-417.1	-409.7	-410.3	N	1.41	1.41	No Evaluatio	1.42	1.42	No Evaluation
42	7-18-11 20:50:00	-0.119	20:50:38	-0.129	-448.2	-464.0	-465.1	-466.1	-467.0	N	1.56	1.56	No Evaluatio	1.62	1.62	No Evaluation
	Average Frequency Response (MW/0.1Hz)				-499.56	-517.56	-523.18	-532.02	-533.84		1.74	1.74		1.80	1.80	
	2012 FRM - Median Frequency Response (MW/0.1Hz)				-463.19	-481.99	-497.76	-501.63	-504.36							
	Regression Estimate of Frequency Response (MW/0.1Hz)				-33.77	-33.77	-33.77	-33.77	-33.77							
	2012 Frequency Response Obligation (FRO)				-286	-286	-286	-286	-286							

20 to 40 P.U. Performance			18 to 52 P.U. Performance			20 to 52 P.U. Performance		
Initial Adjusted	Initial Unadjusted	Sustained	Initial Adjusted	Initial Unadjusted	Sustained	Initial Adjusted	Initial Unadjusted	Sustained
2.71	2.71	No Evaluatic	2.77	2.77	No Evaluation	2.79	2.79	No Evaluation
2.50	2.50	No Evaluatic	2.46	2.46	No Evaluation	2.46	2.46	No Evaluation
1.44	1.44	No Evaluatic	1.45	1.45	No Evaluation	1.45	1.45	No Evaluation
2.61	2.61	No Evaluatic	2.75	2.75	No Evaluation	2.76	2.76	No Evaluation
1.90	1.90	No Evaluatic	1.91	1.91	No Evaluation	1.89	1.89	No Evaluation
3.67	3.67	No Evaluatic	4.25	4.25	No Evaluation	4.38	4.38	No Evaluation
1.87	1.87	No Evaluatic	1.86	1.86	No Evaluation	1.87	1.87	No Evaluation
1.70	1.70	No Evaluatic	1.74	1.74	No Evaluation	1.75	1.75	No Evaluation
1.40	1.40	No Evaluatic	1.39	1.39	No Evaluation	1.39	1.39	No Evaluation
1.35	1.35	No Evaluatic	1.33	1.33	No Evaluation	1.33	1.33	No Evaluation
0.96	0.96	No Evaluatic	0.95	0.95	No Evaluation	0.95	0.95	No Evaluation
1.76	1.76	No Evaluatic	1.92	1.92	No Evaluation	1.95	1.95	No Evaluation
1.28	1.28	No Evaluatic	1.27	1.27	No Evaluation	1.25	1.25	No Evaluation
2.01	2.01	No Evaluatic	2.06	2.06	No Evaluation	2.06	2.06	No Evaluation
1.60	1.60	No Evaluatic	1.58	1.58	No Evaluation	1.58	1.58	No Evaluation
1.69	1.69	No Evaluatic	1.64	1.64	No Evaluation	1.63	1.63	No Evaluation
1.46	1.46	No Evaluatic	1.46	1.46	No Evaluation	1.45	1.45	No Evaluation
1.57	1.57	No Evaluatic	1.55	1.55	No Evaluation	1.55	1.55	No Evaluation
1.78	1.78	No Evaluatic	1.81	1.81	No Evaluation	1.81	1.81	No Evaluation
1.29	1.29	No Evaluatic	1.25	1.25	No Evaluation	1.25	1.25	No Evaluation
1.14	1.14	No Evaluatic	1.14	1.14	No Evaluation	1.14	1.14	No Evaluation
1.62	1.62	No Evaluatic	1.63	1.63	No Evaluation	1.63	1.63	No Evaluation
1.64	1.64	No Evaluatic	1.63	1.63	No Evaluation	1.63	1.63	No Evaluation
1.33	1.33	No Evaluatic	1.34	1.34	No Evaluation	1.34	1.34	No Evaluation
1.77	1.77	No Evaluatic	1.88	1.88	No Evaluation	1.88	1.88	No Evaluation
3.37	3.37	No Evaluatic	3.45	3.45	No Evaluation	3.47	3.47	No Evaluation
1.00	1.00	No Evaluatic	0.98	0.98	No Evaluation	0.98	0.98	No Evaluation
0.98	0.98	No Evaluatic	1.00	1.00	No Evaluation	1.01	1.01	No Evaluation
2.57	2.57	No Evaluatic	2.59	2.59	No Evaluation	2.61	2.61	No Evaluation
1.30	1.30	No Evaluatic	1.32	1.32	No Evaluation	1.32	1.32	No Evaluation
2.10	2.10	No Evaluatic	2.04	2.04	No Evaluation	2.02	2.02	No Evaluation
1.87	1.87	No Evaluatic	1.88	1.88	No Evaluation	1.90	1.90	No Evaluation
1.83	1.83	No Evaluatic	1.82	1.82	No Evaluation	1.82	1.82	No Evaluation
2.09	2.09	No Evaluatic	2.09	2.09	No Evaluation	2.09	2.09	No Evaluation
1.60	1.60	No Evaluatic	1.62	1.62	No Evaluation	1.62	1.62	No Evaluation
1.74	1.74	No Evaluatic	1.75	1.75	No Evaluation	1.76	1.76	No Evaluation
1.93	1.93	No Evaluatic	2.00	2.00	No Evaluation	2.03	2.03	No Evaluation
2.27	2.27	No Evaluatic	2.25	2.25	No Evaluation	2.26	2.26	No Evaluation
2.77	2.77	No Evaluatic	2.87	2.87	No Evaluation	2.89	2.89	No Evaluation
1.74	1.74	No Evaluatic	1.75	1.75	No Evaluation	1.76	1.76	No Evaluation
1.46	1.46	No Evaluatic	1.43	1.43	No Evaluation	1.43	1.43	No Evaluation
1.63	1.63	No Evaluatic	1.63	1.63	No Evaluation	1.63	1.63	No Evaluation
1.82	1.82		1.85	1.85		1.85	1.85	

Month	Minimum FBS* for month	Maximum FBS* for month	Time weighted ** average FBS* for month	
January			-10.0	
Feburary			-7.0	
March			-12.0	
April			-8.0	
May			-27.0	
June			-8.7	
July			-8.0	
August			-8.0	
September			-8.2	
October			-8.0	
November			-8.0	
December			-12.0	
			-10.4	Average Annual Bias

*** Frequency Bias Setting (FBS)**
**** Based on the one minute values used in BAL 001**

PasteSpecial/Values the data copied from FRS Form 2 for each event.

Interconnection Performance

Event Number	Date/Time Central Prevailing	DelFreq	Date	A Point Time	FPointA Hz	A Value Hz	t(0) Time	C Value Hz	Value B 12 to 24 sec Average Frequency	FR B 12 to 24 sec Average MW	Value B 18 to 30 sec Average Frequency	FR B 18 to 30 sec Average MW	Value B 20 to 40 sec Average Frequency	FR B 20 to 40 sec Average MW	Value B 18 to 52 sec Average Frequency	FR B 18 to 52 sec Average MW	Value B 20 to 52 sec Average Frequency
1	12/6/2010 11:25	-0.101	Monday, December 06, 2010	11:25:50	59.9970	59.9965	11:25:52	59.8100	59.8939	-736.38	59.8959	-750.94	59.9019	-775.46	59.9013	-795.67	59.9019
2	12/9/2010 17:34	-0.074	Thursday, December 09, 2010	17:34:12	59.9930	59.9980	17:34:14	59.8040	59.8866	-682.10	59.8933	-720.02	59.8909	-716.56	59.8908	-703.56	59.8909
3	12/11/2010 23:38	-0.166	Saturday, December 11, 2010	23:38:26	60.0090	60.0061	23:38:28	59.7470	59.8210	-445.26	59.8059	-411.13	59.8078	-411.60	59.8081	-415.20	59.8078
4	12/16/2010 15:16	-0.074	Thursday, December 16, 2010	15:15:58	59.9710	59.9731	15:16:00	59.8110	59.8914	-757.17	59.8877	-723.27	59.8949	-750.84	59.8948	-794.94	59.8949
5	12/19/2010 2:39	-0.111	Sunday, December 19, 2010	2:39:20	59.9930	59.9870	2:39:22	59.8060	59.8750	-653.15	59.8614	-578.56	59.8540	-545.29	59.8554	-550.26	59.8540
6	12/26/2010 8:23	-0.066	Sunday, December 26, 2010	8:32:02	59.9340	59.9443	8:32:04	59.8260	59.8846	-832.97	59.8903	-921.48	59.9048	-1074.55	59.9036	-1364.88	59.9048
7	1/9/2011 18:52	-0.108	Sunday, January 09, 2011	18:51:58	59.9880	59.9880	18:52:00	59.8410	59.8663	-475.95	59.8770	-518.87	59.8805	-536.43	59.8799	-532.79	59.8805
8	1/11/2011 6:50	-0.091	Tuesday, January 11, 2011	6:50:14	59.9780	59.9805	6:50:16	59.8700	59.8840	-473.93	59.8857	-482.14	59.8891	-485.78	59.8888	-499.63	59.8891
9	1/20/2011 0:01	-0.198	Thursday, January 20, 2011	0:01:52	60.0170	60.0062	0:01:54	59.7610	59.8171	-417.20	59.8086	-398.27	59.8085	-401.89	59.8092	-399.42	59.8085
10	1/21/2011 3:46	-0.171	Friday, January 21, 2011	3:46:26	60.0440	60.0447	3:46:28	59.8870	59.8873	-413.44	59.8806	-396.16	59.8735	-386.30	59.8743	-381.81	59.8735
11	1/23/2011 14:53	-0.149	Sunday, January 23, 2011	14:53:18	59.9780	59.9999	14:53:20	59.8600	59.8640	-298.19	59.8551	-279.13	59.8512	-275.33	59.8517	-272.72	59.8512
12	1/28/2011 5:21	-0.058	Friday, January 28, 2011	5:21:44	59.9660	59.9734	5:21:46	59.8760	59.9056	-459.82	59.9083	-478.96	59.9174	-506.40	59.9167	-564.36	59.9174
13	1/29/2011 22:29	-0.122	Saturday, January 29, 2011	22:29:28	60.0010	59.9997	22:29:30	59.8390	59.8767	-239.96	59.8753	-237.09	59.9174	-244.00	59.9152	1547.87	59.9174
14	2/1/2011 22:28	-0.078	Tuesday, February 01, 2011	22:27:46	59.9690	59.9695	22:27:48	59.8750	59.8880	-564.61	59.8907	-583.21	59.8916	-576.14	59.8914	-588.96	59.8916
15	2/2/2011 2:18	-0.158	Wednesday, February 02, 2011	2:18:42	60.0150	60.0135	2:18:44	59.8410	59.8587	-463.28	59.8597	-466.26	59.8551	-458.39	59.8552	-453.12	59.8551
16	2/2/2011 5:39	-0.125	Wednesday, February 02, 2011	5:39:12	59.9210	59.9233	5:39:14	59.8060	59.8094	-508.54	59.8086	-504.87	59.7994	-484.21	59.8000	-471.29	59.7994
17	2/2/2011 8:24	-0.188	Wednesday, February 02, 2011	8:24:28	60.0360	60.0354	8:24:30	59.8530	59.8680	-464.75	59.8563	-435.76	59.8479	-419.66	59.8497	-419.13	59.8479
18	2/2/2011 10:55	-0.19	Wednesday, February 02, 2011	10:55:38	60.0090	60.0077	10:55:40	59.8020	59.8203	-448.89	59.8227	-454.49	59.8182	-448.43	59.8186	-444.78	59.8182
19	2/9/2011 13:01	-0.114	Wednesday, February 09, 2011	13:01:36	60.0250	60.0224	13:01:38	59.9100	59.9173	-560.29	59.9117	-531.22	59.9086	-514.37	59.9090	-518.79	59.9086
20	2/15/2011 16:40	-0.216	Tuesday, February 15, 2011	16:40:02	60.0300	60.0341	16:40:04	59.7570	59.8303	-379.14	59.8344	-386.14	59.8182	-369.70	59.8191	-359.56	59.8182
21	2/16/2011 9:25	-0.197	Wednesday, February 16, 2011	9:25:36	59.9800	59.9919	9:25:38	59.8000	59.8144	-321.17	59.8166	-325.14	59.8165	-325.96	59.8164	-324.83	59.8165
22	3/3/2011 11:17	-0.094	Thursday, March 03, 2011	11:17:34	59.9710	59.9666	11:17:36	59.8390	59.8687	-450.25	59.8704	-458.40	59.8724	-462.92	59.8723	-467.40	59.8724
23	3/14/2011 6:09	-0.208	Monday, March 14, 2011	6:09:32	60.0280	60.0315	6:09:34	59.7900	59.8263	-473.15	59.8259	-472.10	59.8239	-469.73	59.8237	-467.13	59.8239
24	3/14/2011 7:08	-0.127	Monday, March 14, 2011	7:08:12	60.0120	60.0054	7:08:14	59.8410	59.8783	-383.22	59.8774	-380.67	59.8781	-379.65	59.8781	-382.86	59.8781
25	3/16/2011 20:45	-0.074	Wednesday, March 16, 2011	20:45:06	59.9850	59.9876	20:45:08	59.8660	59.8989	-455.89	59.9086	-503.02	59.9138	-507.23	59.9136	-542.06	59.9138
26	3/23/2011 14:46	-0.063	Wednesday, March 23, 2011	14:46:46	59.9950	59.9897	14:46:48	59.7060	59.9073	-807.19	59.9247	-956.57	59.9272	-964.25	59.9268	-990.42	59.9272
27	3/24/2011 13:59	-0.182	Thursday, March 24, 2011	13:59:06	59.9770	59.9981	13:59:08	59.7990	59.8123	-268.77	59.8224	-283.96	59.8211	-285.69	59.8205	-280.78	59.8211
28	3/25/2011 16:13	-0.172	Friday, March 25, 2011	16:13:26	59.9960	60.0142	16:13:28	59.8130	59.8277	-261.02	59.8344	-270.59	59.8458	-280.76	59.8449	-288.20	59.8458
29	3/29/2011 6:43	-0.099	Tuesday, March 29, 2011	6:43:06	59.9620	59.9635	6:43:08	59.7460	59.8406	-630.95	59.8629	-741.81	59.8641	-737.61	59.8632	-743.02	59.8641
30	3/31/2011 12:21	-0.112	Thursday, March 31, 2011	12:21:24	59.9870	59.9865	12:21:26	59.8600	59.8744	-375.78	59.8756	-379.60	59.8747	-372.38	59.8747	-378.88	59.8747
31	4/5/2011 22:02	-0.09	Tuesday, April 05, 2011	22:02:04	59.9120	59.9182	22:02:06	59.7170	59.8350	-628.65	59.8339	-616.94	59.8286	-599.76	59.8295	-587.13	59.8286
32	4/20/2011 13:40	-0.145	Wednesday, April 20, 2011	13:40:54	60.0220	60.0246	13:40:56	59.8240	59.8623	-486.59	59.8759	-529.84	59.8801	-534.28	59.8788	-540.17	59.8801
33	4/27/2011 23:27	-0.133	Wednesday, April 27, 2011	23:27:04	60.0030	60.0075	23:27:06	59.7910	59.8753	-524.88	59.8760	-526.70	59.8746	-522.43	59.8749	-522.21	59.8746
34	5/11/2011 14:04	-0.121	Wednesday, May 11, 2011	14:04:46	60.0175	60.0087	14:04:48	59.8533	59.8822	-577.22	59.8901	-612.63	59.8874	-599.12	59.8875	-599.33	59.8874
35	5/16/2011 8:06	-0.101	Monday, May 16, 2011	8:06:36	60.0020	59.9986	8:06:38	59.8701	59.8883	-427.67	59.8920	-441.67	59.8972	-457.14	59.8967	-463.10	59.8972
36	5/19/2011 14:08	-0.197	Thursday, May 19, 2011	14:07:56	59.9758	59.9756	14:07:58	59.7176	59.7529	-449.01	59.7684	-480.64	59.7784	-498.65	59.7772	-502.47	59.7784
37	5/23/2011 17:34	-0.092	Monday, May 23, 2011	17:34:38	59.9351	59.9352	17:34:40	59.8174	59.8231	-476.74	59.8325	-522.12	59.8431	-555.20	59.8420	-577.96	59.8431
38	5/29/2011 22:03	-0.118	Sunday, May 29, 2011	22:03:06	59.9060	59.9060	22:03:08	59.7480	59.7731	-574.81	59.7834	-624.61	59.7881	-651.17	59.7873	-643.95	59.7881
39	6/22/2011 13:18	0.08	Wednesday, June 22, 2011	13:18:38	60.0130	60.0336	13:18:40	60.0810	60.0697	-721.62	60.0676	-761.98	60.0649	-794.96	60.0652	-825.60	60.0649
40	6/27/2011 12:54	-0.149	Monday, June 27, 2011	12:54:00	59.9770	59.9738	12:54:02	59.8200	59.8297	-459.82	59.8371	-484.44	59.8426	-498.14	59.8419	-502.30	59.8426
41	7/18/2011 9:13	-0.097	Monday, July 18, 2011	9:13:14	59.9570	59.9576	9:13:16	59.8590	59.8619	-403.41	59.8624	-405.78	59.8634	-417.13	59.8632	-409.72	59.8634
42	7/18/2011 20:50	-0.119	Monday, July 18, 2011	20:50:38	60.0070	60.0084	20:50:40	59.8660	59.8751	-448.21	59.8799	-463.99	59.8807	-465.09	59.8804	-466.09	59.8807

	Value A Data	BA Performance										Value B	12 to 24 second Average Period Evaluation							
FR B 20 to 52 sec Average MW	Frequency Hz	Net Actual Interchange MW	JOU Dynamic Schedules Imp(-) Exp (+) MW	Non-Conforming Load Load (-) MW	Pumped Hydro Load (-) Gen (+) MW	Ramping Units Gen (+) MW	Transferred Frequency Response Rec (-) Del (+) MW	Contingent BA Lost Generation Load (-) Gen (+) MW	BA Bias Setting MW/0.1 Hz	BA Load MW	Bias Setting EPFR MW	Frequency Hz	Net Actual Interchange MW	JOU Dynamic Schedules Imp(-) Exp (+) MW	Non-Conforming Load Load (-) MW	Pumped Hydro Load (-) Gen (+) MW	Ramping Units Gen (+) MW	Transferred Frequency Response Rec (-) Del (+) MW	Contingent BA Lost Generation Load (-) Gen (+) MW	Initial Performance Adjusted P.U.
-800.37	59.9965	755.11	0.00	0.00	0.00	0.00	0.00	0.00	-653.00	35689	22.86	59.8939	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.57
-703.93	59.9980	753.07	0.00	0.00	0.00	0.00	0.00	0.00	-653.00	34418	13.06	59.8866	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.36
-414.61	60.0061	821.10	0.00	0.00	0.00	0.00	0.00	0.00	-653.00	29591	-40.00	59.8210	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.55
-796.39	59.9731	617.09	0.00	0.00	0.00	0.00	0.00	0.00	-653.00	31769	175.50	59.8914	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.64
-543.40	59.9870	720.33	0.00	0.00	0.00	0.00	0.00	0.00	-653.00	30240	84.89	59.8750	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.25
-1396.89	59.9443	494.44	0.00	0.00	0.00	0.00	0.00	0.00	-653.00	39598	364.04	59.8846	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.90
-535.46	59.9880	575.22	0.00	0.00	0.00	0.00	0.00	0.00	-653.00	40357	78.37	59.8663	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.65
-501.17	59.9805	456.86	0.00	0.00	0.00	0.00	0.00	0.00	-653.00	48146	127.33	59.8840	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.66
-397.82	60.0062	786.05	0.00	0.00	0.00	0.00	0.00	0.00	-653.00	28999	-40.81	59.8171	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.45
-380.03	60.0447	650.00	0.00	0.00	0.00	0.00	0.00	0.00	-653.00	40462	-292.21	59.8873	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.44
-271.79	59.9999	403.71	0.00	0.00	0.00	0.00	0.00	0.00	-653.00	31489	0.81	59.8640	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.04
-570.77	59.9734	311.47	0.00	0.00	0.00	0.00	0.00	0.00	-653.00	32642	173.86	59.9056	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.61
1653.06	59.9997	646.21	0.00	0.00	0.00	0.00	0.00	0.00	-653.00	27749	1.63	59.8767	113.91	0.00	0.00	0.00	0.00	0.00	0.00	1.51
-590.45	59.9695	459.33	0.00	0.00	0.00	0.00	0.00	0.00	-653.00	51872	199.16	59.8880	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.97
-452.82	60.0135	716.93	0.00	0.00	0.00	0.00	0.00	0.00	-653.00	49441	-88.15	59.8587	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.62
-468.69	59.9233	578.49	0.00	0.00	0.00	0.00	0.00	0.00	-653.00	52943	501.18	59.8094	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.78
-414.43	60.0354	775.26	0.00	0.00	0.00	0.00	0.00	0.00	-653.00	52048	-231.00	59.8680	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.62
-443.88	60.0077	840.89	0.00	0.00	0.00	0.00	0.00	0.00	-653.00	52733	-50.60	59.8203	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.57
-516.81	60.0224	598.69	0.00	0.00	0.00	0.00	0.00	0.00	-653.00	50685	-146.11	59.9173	17.31	0.00	0.00	0.00	0.00	0.00	0.00	1.93
-358.19	60.0341	769.98	0.00	0.00	0.00	0.00	0.00	0.00	-653.00	31612	-222.84	59.8303	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.32
-324.98	59.9919	569.86	0.00	0.00	0.00	0.00	0.00	0.00	-653.00	31136	53.06	59.8144	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.12
-468.08	59.9666	440.45	0.00	0.00	0.00	0.00	0.00	0.00	-653.00	31497	217.94	59.8687	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.57
-467.61	60.0315	970.67	0.00	0.00	0.00	0.00	0.00	0.00	-653.00	26753	-205.69	59.8263	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.65
-382.72	60.0054	486.97	0.00	0.00	0.00	0.00	0.00	0.00	-653.00	29065	-35.10	59.8783	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.34
-543.82	59.9876	397.56	0.00	0.00	0.00	0.00	0.00	0.00	-653.00	33413	80.81	59.8989	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.57
-996.30	59.9897	621.17	0.00	0.00	0.00	0.00	0.00	0.00	-653.00	38734	66.93	59.9073	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.63
-281.72	59.9981	498.31	0.00	0.00	0.00	0.00	0.00	0.00	-653.00	35354	12.24	59.8123	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.94
-289.62	60.0142	553.38	0.00	0.00	0.00	0.00	0.00	0.00	-653.00	40152	-93.05	59.8277	66.73	0.00	0.00	0.00	0.00	0.00	0.00	0.91
-748.57	59.9635	742.82	0.00	0.00	0.00	0.00	0.00	0.00	-653.00	31094	238.34	59.8406	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.11
-378.95	59.9865	421.05	0.00	0.00	0.00	0.00	0.00	0.00	-653.00	31970	88.15	59.8744	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.31
-580.03	59.9182	518.48	0.00	0.00	0.00	0.00	0.00	0.00	-653.00	30986	533.83	59.8350	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.18
-544.21	60.0246	785.54	0.00	0.00	0.00	0.00	0.00	0.00	-653.00	41620	-160.81	59.8623	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.69
-520.76	60.0075	691.80	0.00	0.00	0.00	0.00	0.00	0.00	-653.00	29943	-48.97	59.8753	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.83
-599.24	60.0087	726.02	0.00	0.00	0.00	0.00	0.00	0.00	-653.00	42266	-56.72	59.8822	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.01
-464.95	59.9986	471.09	0.00	0.00	0.00	0.00	0.00	0.00	-653.00	30203	8.97	59.8883	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.49
-505.24	59.9756	995.08	0.00	0.00	0.00	0.00	0.00	0.00	-653.00	42910	159.27	59.7529	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.56
-583.92	59.9352	533.33	0.00	0.00	0.00	0.00	0.00	0.00	-653.00	50590	423.29	59.8231	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.66
-647.86	59.9060	762.32	0.00	0.00	0.00	0.00	0.00	0.00	-653.00	44770	613.83	59.7731	0.01	0.00	0.00	0.00	0.00	0.00	0.00	2.01
-831.17	60.0336	-258.56	0.00	0.00	0.00	0.00	0.00	0.00	-653.00	44769	-219.57	60.0697	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.50
-504.79	59.9738	661.23	0.00	0.00	0.00	0.00	0.00	0.00	-653.00	56971	171.41	59.8297	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.61
-410.31	59.9576	386.25	0.00	0.00	0.00	0.00	0.00	0.00	-653.00	45315	276.71	59.8619	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.41
-467.01	60.0084	596.15	0.00	0.00	0.00	0.00	0.00	0.00	-653.00	57050	-54.69	59.8751	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.56

Value B	18 to 30 second Average Period Evaluation																		Value B	20 to 40 s
Initial Performance Unadjusted P.U.	Sustained Performance P.U.	BA Bias Setting MW/0.1 Hz	BA Load MW	Bias Setting EPFR MW	Frequency Hz	Net Actual Interchange MW	JOU Dynamic Schedules Imp(-) Exp (+) MW	Non-Conforming Load Load (-) MW	Pumped Hydro ad (-) Gen MW	Ramping Units Gen (+) MW	Transferred Frequency Response Rec (-) Del (+) MW/0.1 Hz	Contingent BA Lost Generation Load (-) Gen (+) MW	Initial Performance Adjusted P.U.	Initial Performance Unadjusted P.U.	Sustained Performance P.U.	BA Bias Setting MW	BA Load MW	Bias Setting EPFR MW	Frequency Hz	Net Actual Interchange MW
2.57	No Evaluation	-653.00	35449	693.12	59.8959	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.62	2.62	No Evaluation	-653.00	35340	680.06	59.8990	0.00
2.36	No Evaluation	-653.00	34067	740.69	59.8933	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.51	2.51	No Evaluation	-653.00	34085	696.85	59.8928	0.00
1.55	No Evaluation	-653.00	29333	1168.87	59.8059	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.43	1.43	No Evaluation	-653.00	29363	1267.75	59.8063	0.00
2.64	No Evaluation	-653.00	31711	708.97	59.8877	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.53	2.53	No Evaluation	-653.00	31747	733.23	59.8905	0.00
2.25	No Evaluation	-653.00	30096	816.25	59.8614	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.01	2.01	No Evaluation	-653.00	30116	904.87	59.8543	0.00
2.90	No Evaluation	-653.00	39157	753.75	59.8903	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.20	3.20	No Evaluation	-653.00	39176	716.44	59.8971	0.00
1.65	No Evaluation	-653.00	40313	873.16	59.8770	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.81	1.81	No Evaluation	-653.00	40208	803.19	59.8806	0.00
1.66	No Evaluation	-653.00	48119	757.48	59.8857	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.69	1.69	No Evaluation	-653.00	48008	746.29	59.8864	0.00
1.45	No Evaluation	-653.00	28707	1194.06	59.8086	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.39	1.39	No Evaluation	-653.00	28784	1250.03	59.8105	0.00
1.44	No Evaluation	-653.00	40291	736.03	59.8806	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.38	1.38	No Evaluation	-653.00	40274	779.87	59.8764	0.00
1.04	No Evaluation	-653.00	31381	888.08	59.8551	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.98	0.98	No Evaluation	-653.00	31467	945.92	59.8532	0.00
1.61	No Evaluation	-653.00	32678	616.62	59.9083	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.67	1.67	No Evaluation	-653.00	32693	598.90	59.9116	0.00
1.51	No Evaluation	-653.00	27565	805.05	59.8753	113.82	0.00	0.00	0.00	0.00	0.00	0.00	1.50	1.50	No Evaluation	-653.00	27600	814.38	59.8786	203.71
1.97	No Evaluation	-653.00	51739	731.36	59.8907	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.04	2.04	No Evaluation	-653.00	51717	713.64	59.8897	0.00
1.62	No Evaluation	-653.00	49254	922.59	59.8597	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.63	1.63	No Evaluation	-653.00	49280	916.06	59.8570	0.00
1.78	No Evaluation	-653.00	52893	1244.43	59.8086	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.76	1.76	No Evaluation	-653.00	52827	1250.03	59.8035	0.00
1.62	No Evaluation	-653.00	51827	861.96	59.8563	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.51	1.51	No Evaluation	-653.00	51915	938.45	59.8502	0.00
1.57	No Evaluation	-653.00	52504	1173.53	59.8227	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.59	1.59	No Evaluation	-653.00	52603	1157.67	59.8202	0.00
1.93	No Evaluation	-653.00	50470	540.13	59.9117	17.27	0.00	0.00	0.00	0.00	0.00	0.00	1.84	1.84	No Evaluation	-653.00	50564	576.51	59.9080	17.25
1.32	No Evaluation	-653.00	31208	1108.23	59.8344	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.35	1.35	No Evaluation	-653.00	31374	1081.18	59.8251	0.00
1.12	No Evaluation	-653.00	30973	1211.78	59.8166	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.14	1.14	No Evaluation	-653.00	30997	1197.79	59.8170	0.00
1.57	No Evaluation	-653.00	31383	857.29	59.8704	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.60	1.60	No Evaluation	-653.00	31421	846.10	59.8714	0.00
1.65	No Evaluation	-653.00	26453	1134.35	59.8259	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.65	1.65	No Evaluation	-653.00	26534	1137.15	59.8248	0.00
1.34	No Evaluation	-653.00	29073	794.79	59.8774	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.33	1.33	No Evaluation	-653.00	29072	800.39	59.8771	0.00
1.57	No Evaluation	-653.00	33249	660.46	59.9086	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.76	1.76	No Evaluation	-653.00	33243	597.02	59.9091	0.00
2.63	No Evaluation	-653.00	38264	605.43	59.9247	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.34	3.34	No Evaluation	-653.00	38266	491.62	59.9253	0.00
0.94	No Evaluation	-653.00	35177	1225.77	59.8224	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.99	0.99	No Evaluation	-653.00	35215	1159.54	59.8236	0.00
0.91	No Evaluation	-653.00	39959	1125.02	59.8344	66.87	0.00	0.00	0.00	0.00	0.00	0.00	0.95	0.95	No Evaluation	-653.00	39985	1081.18	59.8407	67.01
2.11	No Evaluation	-653.00	30934	1041.07	59.8629	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.58	2.58	No Evaluation	-653.00	31019	895.55	59.8625	0.00
1.31	No Evaluation	-653.00	31779	819.98	59.8756	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.33	1.33	No Evaluation	-653.00	31785	812.52	59.8734	0.00
2.18	No Evaluation	-653.00	30798	1077.44	59.8339	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.15	2.15	No Evaluation	-653.00	30837	1084.91	59.8317	0.00
1.69	No Evaluation	-653.00	41378	899.27	59.8759	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.85	1.85	No Evaluation	-653.00	41434	810.65	59.8775	0.00
1.83	No Evaluation	-653.00	29644	814.39	59.8760	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.84	1.84	No Evaluation	-653.00	29685	809.72	59.8750	0.00
2.01	No Evaluation	-653.00	42054	769.19	59.8901	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.14	2.14	No Evaluation	-653.00	42103	717.38	59.8874	0.00
1.49	No Evaluation	-653.00	30091	729.10	59.8920	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.54	1.54	No Evaluation	-653.00	30113	705.56	59.8954	0.00
1.56	No Evaluation	-653.00	42474	1613.70	59.7684	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.68	1.68	No Evaluation	-653.00	42561	1512.44	59.7758	0.00
1.66	No Evaluation	-653.00	50458	1155.02	59.8325	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.82	1.82	No Evaluation	-653.00	50478	1093.50	59.8387	0.00
2.01	No Evaluation	-653.00	44439	1481.38	59.7834	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.17	2.17	No Evaluation	-653.00	44480	1414.22	59.7885	0.00
2.50	No Evaluation	-653.00	44675	-455.24	60.0676	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.66	2.66	No Evaluation	-653.00	44560	-441.25	60.0663	0.00
1.61	No Evaluation	-653.00	56796	1111.96	59.8371	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.69	1.69	No Evaluation	-653.00	56806	1063.46	59.8409	0.00
1.41	No Evaluation	-653.00	45258	902.08	59.8624	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.42	1.42	No Evaluation	-653.00	45274	898.35	59.8649	0.00
1.56	No Evaluation	-653.00	56858	815.32	59.8799	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.62	1.62	No Evaluation	-653.00	56872	784.53	59.8802	0.00

econd Average Period Evaluation

Value B

18 to 52 second Average Period Evaluation

JOU Dynamic Schedules Imp(-) Exp (+) MW	Non-Conforming Load Load (-) MW	Pumped Hydro Load (-) Gen (+) MW	Ramping Units Gen (+) MW	Transferred Frequency Response Rec (-) Del (+) MW/0.1 Hz	Contingent BA Lost Generation Load (-) Gen (+) MW	Initial Performance Adjusted P.U.	Initial Performance Unadjusted P.U.	Sustained Performance P.U.	BA Bias Setting MW	BA Load MW	Bias Setting EPFR MW	Frequency Hz	Net Actual Interchange MW	JOU Dynamic Schedules Imp(-) Exp (+) MW	Non-Conforming Load Load (-) MW	Pumped Hydro Load (-) Gen (+) MW	Ramping Units Gen (+) MW	Transferred Frequency Response Rec (-) Del (+) MW	Contingent BA Lost Generation Load (-) Gen (+) MW
0.00	0.00	0.00	0.00	0.00	0.00	2.71	2.71	No Evaluation	-653.00	35411	659.53	59.9013	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	2.50	2.50	No Evaluation	-653.00	34097	699.90	59.8908	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	1.44	1.44	No Evaluation	-653.00	29392	1265.04	59.8081	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	2.61	2.61	No Evaluation	-653.00	31745	714.74	59.8948	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	1.90	1.90	No Evaluation	-653.00	30120	951.59	59.8554	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	3.67	3.67	No Evaluation	-653.00	39182	672.00	59.9036	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	1.87	1.87	No Evaluation	-653.00	40236	779.44	59.8799	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	1.70	1.70	No Evaluation	-653.00	48021	742.04	59.8888	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	1.40	1.40	No Evaluation	-653.00	28787	1237.73	59.8092	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	1.35	1.35	No Evaluation	-653.00	40282	807.35	59.8743	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.96	0.96	No Evaluation	-653.00	31481	958.72	59.8517	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	1.76	1.76	No Evaluation	-653.00	32701	577.01	59.9167	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	1.28	1.28	No Evaluation	-653.00	27623	792.50	59.9152	338.14	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	2.01	2.01	No Evaluation	-653.00	51712	720.08	59.8914	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	1.60	1.60	No Evaluation	-653.00	49288	933.79	59.8552	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	1.69	1.69	No Evaluation	-653.00	52850	1283.44	59.8000	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	1.46	1.46	No Evaluation	-653.00	51926	978.31	59.8497	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	1.57	1.57	No Evaluation	-653.00	52612	1174.21	59.8186	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	1.78	1.78	No Evaluation	-653.00	50612	600.76	59.9090	11.51	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	1.29	1.29	No Evaluation	-653.00	31368	1142.16	59.8191	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	1.14	1.14	No Evaluation	-653.00	31009	1194.99	59.8164	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	1.62	1.62	No Evaluation	-653.00	31439	840.00	59.8723	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	1.64	1.64	No Evaluation	-653.00	26582	1143.94	59.8237	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	1.33	1.33	No Evaluation	-653.00	29080	802.60	59.8781	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	1.77	1.77	No Evaluation	-653.00	33252	593.63	59.9136	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	3.37	3.37	No Evaluation	-653.00	38254	487.97	59.9268	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	1.00	1.00	No Evaluation	-653.00	35226	1151.65	59.8205	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.98	0.98	No Evaluation	-653.00	39984	1040.05	59.8449	67.03	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	2.57	2.57	No Evaluation	-653.00	31035	897.58	59.8632	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	1.30	1.30	No Evaluation	-653.00	31784	826.94	59.8747	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	2.10	2.10	No Evaluation	-653.00	30850	1098.82	59.8295	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	1.87	1.87	No Evaluation	-653.00	41450	800.22	59.8788	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	1.83	1.83	No Evaluation	-653.00	29706	816.25	59.8749	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	2.09	2.09	No Evaluation	-653.00	42114	735.39	59.8875	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	1.60	1.60	No Evaluation	-653.00	30125	682.81	59.8967	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	1.74	1.74	No Evaluation	-653.00	42599	1464.07	59.7772	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	1.93	1.93	No Evaluation	-653.00	50482	1053.60	59.8420	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	2.27	2.27	No Evaluation	-653.00	44483	1380.80	59.7873	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	2.77	2.77	No Evaluation	-653.00	44477	-432.76	60.0652	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	1.74	1.74	No Evaluation	-653.00	56824	1038.87	59.8419	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	1.46	1.46	No Evaluation	-653.00	45286	882.15	59.8632	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	1.63	1.63	No Evaluation	-653.00	56879	782.41	59.8804	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Value B 20 to 52 second Average Period Evaluation

Initial Performance Adjusted P.U.	Initial Performance Unadjusted P.U.	Sustained Performance P.U.	BA Bias Setting MW/0.1 Hz	BA Load MW	Bias Setting EPFR MW	Frequency Hz	Net Actual Interchange MW	JOU Dynamic Schedules Imp(-) Exp (+) MW	Non-Conforming Load Load (-) MW	Pumped Hydro Load (-) Gen (+) MW	Ramping Units Gen (+) MW	Transferred Frequency Response Rec (-) Del (+) MW	Contingent BA Lost Generation Load (-) Gen (+) MW	Initial Performance Adjusted P.U.	Initial Performance Unadjusted P.U.	Sustained Performance P.U.	BA Bias Setting MW/0.1 Hz	BA Load MW	Bias Setting EPFR MW
2.77	2.77	No Evaluation	-653.00	35459	644.66	59.9019	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.79	2.79	No Evaluation	-653.00	35470	640.71
2.46	2.46	No Evaluation	-653.00	34110	712.86	59.8909	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.46	2.46	No Evaluation	-653.00	34111	712.54
1.45	1.45	No Evaluation	-653.00	29399	1253.04	59.8078	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.45	1.45	No Evaluation	-653.00	29403	1254.91
2.75	2.75	No Evaluation	-653.00	31742	687.10	59.8949	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.76	2.76	No Evaluation	-653.00	31741	686.42
1.91	1.91	No Evaluation	-653.00	30136	944.31	59.8540	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.89	1.89	No Evaluation	-653.00	30135	953.38
4.25	4.25	No Evaluation	-653.00	39184	629.42	59.9048	0.00	0.00	0.00	0.00	0.00	0.00	0.00	4.38	4.38	No Evaluation	-653.00	39186	621.89
1.86	1.86	No Evaluation	-653.00	40276	784.33	59.8805	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.87	1.87	No Evaluation	-653.00	40270	780.53
1.74	1.74	No Evaluation	-653.00	48065	725.92	59.8891	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.75	1.75	No Evaluation	-653.00	48054	724.06
1.39	1.39	No Evaluation	-653.00	28794	1245.78	59.8085	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.39	1.39	No Evaluation	-653.00	28795	1250.69
1.33	1.33	No Evaluation	-653.00	40291	820.96	59.8735	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.33	1.33	No Evaluation	-653.00	40292	825.85
0.95	0.95	No Evaluation	-653.00	31482	968.25	59.8512	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.95	0.95	No Evaluation	-653.00	31484	971.43
1.92	1.92	No Evaluation	-653.00	32711	543.80	59.9174	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.95	1.95	No Evaluation	-653.00	32712	539.30
1.27	1.27	No Evaluation	-653.00	27719	553.96	59.9174	351.29	0.00	0.00	0.00	0.00	0.00	0.00	1.25	1.25	No Evaluation	-653.00	27729	539.30
2.06	2.06	No Evaluation	-653.00	51715	709.23	59.8916	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.06	2.06	No Evaluation	-653.00	51714	707.93
1.58	1.58	No Evaluation	-653.00	49290	945.76	59.8551	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.58	1.58	No Evaluation	-653.00	49291	946.46
1.64	1.64	No Evaluation	-653.00	52861	1306.00	59.7994	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.63	1.63	No Evaluation	-653.00	52865	1310.23
1.46	1.46	No Evaluation	-653.00	51916	981.31	59.8479	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.45	1.45	No Evaluation	-653.00	51918	992.94
1.55	1.55	No Evaluation	-653.00	52601	1184.47	59.8182	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.55	1.55	No Evaluation	-653.00	52605	1186.92
1.81	1.81	No Evaluation	-653.00	50614	594.23	59.9086	11.16	0.00	0.00	0.00	0.00	0.00	0.00	1.81	1.81	No Evaluation	-653.00	50619	596.92
1.25	1.25	No Evaluation	-653.00	31388	1181.57	59.8182	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.25	1.25	No Evaluation	-653.00	31389	1186.92
1.14	1.14	No Evaluation	-653.00	31019	1198.98	59.8165	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.14	1.14	No Evaluation	-653.00	31020	1198.45
1.63	1.63	No Evaluation	-653.00	31441	834.03	59.8724	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.63	1.63	No Evaluation	-653.00	31443	833.15
1.63	1.63	No Evaluation	-653.00	26588	1151.46	59.8239	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.63	1.63	No Evaluation	-653.00	26598	1150.05
1.34	1.34	No Evaluation	-653.00	29087	795.93	59.8781	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.34	1.34	No Evaluation	-653.00	29088	796.28
1.88	1.88	No Evaluation	-653.00	33258	564.48	59.9138	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.88	1.88	No Evaluation	-653.00	33258	563.11
3.45	3.45	No Evaluation	-653.00	38258	477.78	59.9272	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.47	3.47	No Evaluation	-653.00	38256	475.15
0.98	0.98	No Evaluation	-653.00	35238	1172.13	59.8211	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.98	0.98	No Evaluation	-653.00	35241	1168.10
1.00	1.00	No Evaluation	-653.00	39990	1012.51	59.8458	67.05	0.00	0.00	0.00	0.00	0.00	0.00	1.01	1.01	No Evaluation	-653.00	39989	1006.77
2.59	2.59	No Evaluation	-653.00	31031	893.16	59.8641	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.61	2.61	No Evaluation	-653.00	31035	887.69
1.32	1.32	No Evaluation	-653.00	31775	818.06	59.8747	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.32	1.32	No Evaluation	-653.00	31775	818.17
2.04	2.04	No Evaluation	-653.00	30845	1113.36	59.8286	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.02	2.02	No Evaluation	-653.00	30848	1119.32
1.88	1.88	No Evaluation	-653.00	41460	791.22	59.8801	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.90	1.90	No Evaluation	-653.00	41463	783.22
1.82	1.82	No Evaluation	-653.00	29701	816.61	59.8746	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.82	1.82	No Evaluation	-653.00	29704	818.94
2.09	2.09	No Evaluation	-653.00	42112	734.82	59.8874	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.09	2.09	No Evaluation	-653.00	42113	734.98
1.62	1.62	No Evaluation	-653.00	30134	674.32	59.8972	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.62	1.62	No Evaluation	-653.00	30137	671.54
1.75	1.75	No Evaluation	-653.00	42603	1454.64	59.7784	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.76	1.76	No Evaluation	-653.00	42610	1446.88
2.00	2.00	No Evaluation	-653.00	50486	1031.72	59.8431	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.03	2.03	No Evaluation	-653.00	50488	1024.52
2.25	2.25	No Evaluation	-653.00	44476	1389.08	59.7881	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.26	2.26	No Evaluation	-653.00	44478	1383.98
2.87	2.87	No Evaluation	-653.00	44473	-425.54	60.0649	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.89	2.89	No Evaluation	-653.00	44457	-424.07
1.75	1.75	No Evaluation	-653.00	56831	1032.10	59.8426	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.76	1.76	No Evaluation	-653.00	56833	1027.51
1.43	1.43	No Evaluation	-653.00	45295	893.16	59.8634	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.43	1.43	No Evaluation	-653.00	45297	892.31
1.63	1.63	No Evaluation	-653.00	56883	780.70	59.8807	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.63	1.63	No Evaluation	-653.00	56884	778.99

Instructions

Step 1	Enter data in all green cells on the "Data Entry" worksheet.
Step 2	For identified events in column B of the "Data Entry" worksheet, collect data and complete one FRS Form 2 workbook for each event in the list.
Step 3	PasteSpecial/Values data from FRS Form 2 "Form 1 Summary Data" worksheet into "BA Form 2 Event Data" worksheet of this workbook. Do this for each event in the list.
Step 4	Save this workbook using the following file name format:NYISO_yyyy_FRS_Form1.xlsx and send a copy of this workbook and all FRS_Form 2 workbooks to NERC. (where NYISO is replaced with your Balancing Authority abbreviation)
Step 5	"Summary" worksheet contains each event's results for your Balancing Authority.
Note	Balancing Authorities with variable Frequency Bias Settings shall calculate monthly average Frequency Bias Settings. The previous year's monthly averages will be reported annually on FRS Form 1.

Balancing Authority: HQ

NERC FRS FORM 1 20 to 52 second Value B

Enter Addition Data in column R ==>

Event Number	Date/Time (Central Prevailing)	DelFreq	BA Time	BA DelFreq	Value "A" Information MW Lost	Value "A" Information Adjustment	Value "B" Information MW Lost	Value "B" Information Adjustment	SEFRD (MW/0.1Hz)	Exclude for data error *	Event MW Loss	Information Value "A" Load	Information Value "B" Load	Select Reason(s) for adjustment Reason(s)
1	12/6/2010 11:25	-0.101	0:00:00	0.000	0.0	0.0	0.0	0.0	#DIV/0!	N	755.3	0.0	0.0	
2			0:00:00	0.000	0.0	0.0	0.0	0.0	#DIV/0!	N		0.0	0.0	
3			0:00:00	0.000	0.0	0.0	0.0	0.0	#DIV/0!	N		0.0	0.0	
4			0:00:00	0.000	0.0	0.0	0.0	0.0	#DIV/0!	N		0.0	0.0	
5			0:00:00	0.000	0.0	0.0	0.0	0.0	#DIV/0!	N		0.0	0.0	
6			0:00:00	0.000	0.0	0.0	0.0	0.0	#DIV/0!	N		0.0	0.0	
7			0:00:00	0.000	0.0	0.0	0.0	0.0	#DIV/0!	N		0.0	0.0	
8			0:00:00	0.000	0.0	0.0	0.0	0.0	#DIV/0!	N		0.0	0.0	
9			0:00:00	0.000	0.0	0.0	0.0	0.0	#DIV/0!	N		0.0	0.0	
10			0:00:00	0.000	0.0	0.0	0.0	0.0	#DIV/0!	N		0.0	0.0	
11			0:00:00	0.000	0.0	0.0	0.0	0.0	#DIV/0!	N		0.0	0.0	
12			0:00:00	0.000	0.0	0.0	0.0	0.0	#DIV/0!	N		0.0	0.0	
13			0:00:00	0.000	0.0	0.0	0.0	0.0		Y		0.0	0.0	
14			0:00:00	0.000	0.0	0.0	0.0	0.0	#DIV/0!	N		0.0	0.0	
15			0:00:00	0.000	0.0	0.0	0.0	0.0	#DIV/0!	N		0.0	0.0	
16			0:00:00	0.000	0.0	0.0	0.0	0.0	#DIV/0!	N		0.0	0.0	
17			0:00:00	0.000	0.0	0.0	0.0	0.0	#DIV/0!	N		0.0	0.0	
18			0:00:00	0.000	0.0	0.0	0.0	0.0	#DIV/0!	N		0.0	0.0	
19			0:00:00	0.000	0.0	0.0	0.0	0.0	#DIV/0!	N		0.0	0.0	
20			0:00:00	0.000	0.0	0.0	0.0	0.0	#DIV/0!	N		0.0	0.0	
21			0:00:00	0.000	0.0	0.0	0.0	0.0	#DIV/0!	N		0.0	0.0	
22			0:00:00	0.000	0.0	0.0	0.0	0.0	#DIV/0!	N		0.0	0.0	
23			0:00:00	0.000	0.0	0.0	0.0	0.0	#DIV/0!	N		0.0	0.0	
24			0:00:00	0.000	0.0	0.0	0.0	0.0	#DIV/0!	N		0.0	0.0	
25			0:00:00	0.000	0.0	0.0	0.0	0.0	#DIV/0!	N		0.0	0.0	
26			0:00:00	0.000	0.0	0.0	0.0	0.0	#DIV/0!	N		0.0	0.0	
27			0:00:00	0.000	0.0	0.0	0.0	0.0	#DIV/0!	N		0.0	0.0	
28			0:00:00	0.000	0.0	0.0	0.0	0.0	#DIV/0!	N		0.0	0.0	
29			0:00:00	0.000	0.0	0.0	0.0	0.0	#DIV/0!	N		0.0	0.0	
30			0:00:00	0.000	0.0	0.0	0.0	0.0	#DIV/0!	N		0.0	0.0	
31			0:00:00	0.000	0.0	0.0	0.0	0.0	#DIV/0!	N		0.0	0.0	
32			0:00:00	0.000	0.0	0.0	0.0	0.0	#DIV/0!	N		0.0	0.0	
33			0:00:00	0.000	0.0	0.0	0.0	0.0	#DIV/0!	N		0.0	0.0	
34			0:00:00	0.000	0.0	0.0	0.0	0.0	#DIV/0!	N		0.0	0.0	
35			0:00:00	0.000	0.0	0.0	0.0	0.0	#DIV/0!	N		0.0	0.0	
36			0:00:00	0.000	0.0	0.0	0.0	0.0	#DIV/0!	N		0.0	0.0	
37			0:00:00	0.000	0.0	0.0	0.0	0.0	#DIV/0!	N		0.0	0.0	
38			0:00:00	0.000	0.0	0.0	0.0	0.0	#DIV/0!	N		0.0	0.0	
39			0:00:00	0.000	0.0	0.0	0.0	0.0	#DIV/0!	N		0.0	0.0	
40			0:00:00	0.000	0.0	0.0	0.0	0.0	#DIV/0!	N		0.0	0.0	
41			0:00:00	0.000	0.0	0.0	0.0	0.0	#DIV/0!	N		0.0	0.0	
42			0:00:00	0.000	0.0	0.0	0.0	0.0	#DIV/0!	N		0.0	0.0	

Enter Data in Green Highlighted Cells
Send copy to: Chris.Scheetz@nerc.net

1901	Bias Calculation Form Year
Hydro Quebec	Interconnection
HQ	Balancing Authority
	Contact Name
	Contact Phone #
	Contact e-mail
	Current Year's Actual Peak
	Internal Generating Capacity
	Next Year's Projected Peak
1900	Current year
-141.0	**1900 Frequency Response Obligation (FRO)**

Summary Statistics

#DIV/0!	Average Frequency Response (MW/0.1Hz)
-33.8	Regression Estimate of Frequency Response (MW/0.1Hz)
-141.0	Next Year's **1901 Frequency Response Obligation (FRO)**
#DIV/0!	**1901 Frequency Bias Setting - (minimum of FRM, next year's FRO, or 0.8% of Projected Peak [Load + Gen]/2)**
#DIV/0!	**1900 FRM - Median Frequency Response (MW/0.1Hz)**

N	Do you RECEIVE Overlap regulation? If Yes, list the BA name and the associated Bias of that BA

Bias -MW/0.1 Hz	Balancing Authority

N	Do you PROVIDE Overlap regulation? If Yes, list the BA name and the associated Bias of that BA

Bias -MW/0.1 Hz	Balancing Authority

-0.058	23.2	Dynamic schedules for joint-owned units (DS)
-0.066	27.7	Nonconforming load (NL)
-0.040	10.7	Pumped hydro (PH)
-0.05252493	80.66089	Ramping units (RU)
-0.07090523	-26.89761	Xfred Frequency Response (TFR)
-0.05190677	9.955449	Contingent BA adjustment for loss of units (CBA)
-0.0580477	3.367024	DS & NL
-0.07557242	36.33443	DS & PH
-0.0563805	0.488253	DS & RU
-0.0573329	2.758037	DS & TFR
-0.0517609	13.64342	DS & CBA
-0.04999924	11.10075	DS & NL & PH
-0.052	-19.90685	DS & NL & RU
-0.05599976	12.32546	JOU DS & NL & TFR
-0.05849838	0.750192	DS & NL & CBA
-0.04850006	2.230058	DS & NL & PH & RU
-0.04500008	9.477859	DS & NL & PH & TFR
-0.03750229	0.355309	DS & NL & PH & CBA
-0.04750061	2.170702	DS & NL & PH & RU & TFR
-0.05550003	29.38207	DS & NL & PH & RU & CBA
-0.047	4.601381	DS & NL & PH & RU & TFR & CBA
-0.06	1.593515	NL & PH
-0.06	52.37091	NL & RU
-0.051	33.94787	NL & TFR
-0.1	100	NL & CBA
		NL & PH & RU
		NL & PH & TFR
		NL & PH & BAA
		NL & PH & RU & TFR
	N	NL & PH & RU & CBA
	Y	NL & PH & RU & TFR & CBA
		PH & RU
		PH & TFR
		PH & CBA
		PH & RU & TFR
		PH & RU & CBA
		PH & TFR
		PH & CBA
		PH & RU & TFR
		PH & RU & CBA
		PH & TFR
		PH & CBA
		PH & RU & TFR & CBA
		RU & TFR
		RU & CBA
		RU & TFR & CBA
		TFR & CBA

N
Y

Instructions

Step 1 Enter data in all green cells on this "Data Entry" worksheet.

Step 2 For identified events in column B, collect data and complete FRS Form 2 for each event in the list.

Step 3 PasteSpecial/Values data from FRS Form 2 "Form 1 Summary Data" into "BA Form 2 Data" worksheet of this workbook. Do this for each event in the list.

Step 4 Save this workbook using the following file name format:NYISO_yyyy_FRS_Form1.xlsx and send a copy of this workbook and all FRS_Form 2 workbooks to NERC. (where NYISO is replaced with your BA name)

Note: Only one set of average periods of evaluation is displayed. Other worksheets for the additional average periods are hidden.

Event Number	Balancing Authority	HQ	JOU Dynamic Schedules		Non conforming Load		Pumped Hydro		Ramping Units		Transferred Frequency Response		Contingent BA Adjustment		Net Total Adjustments
	Date/Time (Central Prevailing)	DelFreq	Value A Adjustment	Value B Adjustment	Value A Adjustment	Value B Adjustment	Value A Adjustment	Value B Adjustment	Value A Adjustment	Value B Adjustment	Value A Adjustment	Value B Adjustment	Value A Adjustment	Value B Adjustment	Value B 12 to 24 seconds
1	12/6/2010 11:25	-0.101	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2			0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3			0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
4			0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5			0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
6			0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
7			0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
8			0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
9			0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
10			0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
11			0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
12			0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
13			0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
14			0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
15			0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
16			0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
17			0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
18			0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
19			0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
20			0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
21			0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
22			0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
23			0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
24			0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
25			0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
26			0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
27			0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
28			0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
29			0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
30			0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
31			0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
32			0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
33			0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
34			0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
35			0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
36			0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
37			0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
38			0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
39			0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
40			0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
41			0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
42			0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Sign Convention for scan data collected in Form 2	Imports: MWs are - Exports: MWs are +	Loads in MW as -	Load MW as - Generation MW as +	Enter Gen MW as +	The transactional amount in MW Receiver enters - Deliverer enters + on Form 2 Data sheet	Generation MW as + (If load occurs due to gen loss, enter MW as - at value B)

Notes:

1) Balancing Authorities making adjustments must retain evidence to verify:
   - Adjustment values are determined from scan-cycle data using Value A and Value B averaging periods. Scan-cycle data must be available if adjustments are made.
   - Adjustments are necessary to improve accuracy of calculations compared to using Net Actual Interchange (contingency size for single BA interconnections) solely. Said differently, unless an adjustment compensates for significant known error, it should not be made. However, as noted in the next item, once a decision to include an adjustment for one or more of the six types is made for one event, the entity must calculate adjustments for that (those) type(s) for all events.
   - Adjustments are included consistently for all events (e.g. if adjustments for nonconforming load are made for one event, the load must be included for all events, etc.).

2) Dynamic Schedules:
   - Values use schedule sign convention.
   - Adjustments should include only dynamic schedules accounting for joint-owned units. Other dynamic schedules should be ignored.

3) Nonconforming Loads:
   - Values must be entered as negative numbers.

4) Pumped Hydro:
   - Values for pumping must be entered as negative values.
   - Values for generating must be entered as positive values.

5) Rampling Units:
   - Values are entered as positive values.

6) Transferred Frequency Response:
   - This value is the amount agreed upon between the entities expressed in MW/0.1 Hz. Form 2 will adjust this amount for the frequency deviation experienced. (e.g. if an entity agrees to provide 20 MW/0.1 Hz to another entity and a frequency event with a deviation of 50 mHz occurs, the delivering entity should enter +20 in the data column of Form 2 and the receiving entity should enter - 20. The spreadsheet will adjust the SEFRD for each entity by the 10 for this event.)
   - Values for the entity receiving the response must be entered as a negative number.
   - Values for the entity delivering the response must be entered as a positive number.
   - Values between entities must sum to zero.

7) Contingent Balancing Authority Adjustment:
   - Value for Value A is the pre-contingency generation from the contingent unit(s).
   - Value for Value B is usually 0 MW, but may be the load that remains on the system that was "netted" out by the now offline generation.

NERC FRS FORM 1

Balancing Authority: HQ

Event Number	Date/Time (Central Prevailing)	DelFreq	BA Time	BA DelFreq	12 to 24 SEFRD	18 to 30 SEFRD	20 to 40 SEFRD	18 to 52 SEFRD	20 to 52 SEFRD	Exclude for data error *
1	12/6/2010 11:25	-0.101	0:00:00	0.000	0.0	0.0	0.0	0.0	0.0	N
2	1/0/1900 0:00	0.000	0:00:00	0.000	0.0	0.0	0.0	0.0	0.0	N
3	1/0/1900 0:00	0.000	0:00:00	0.000	0.0	0.0	0.0	0.0	0.0	N
4	1/0/1900 0:00	0.000	0:00:00	0.000	0.0	0.0	0.0	0.0	0.0	N
5	1/0/1900 0:00	0.000	0:00:00	0.000	0.0	0.0	0.0	0.0	0.0	N
6	1/0/1900 0:00	0.000	0:00:00	0.000	0.0	0.0	0.0	0.0	0.0	N
7	1/0/1900 0:00	0.000	0:00:00	0.000	0.0	0.0	0.0	0.0	0.0	N
8	1/0/1900 0:00	0.000	0:00:00	0.000	0.0	0.0	0.0	0.0	0.0	N
9	1/0/1900 0:00	0.000	0:00:00	0.000	0.0	0.0	0.0	0.0	0.0	N
10	1/0/1900 0:00	0.000	0:00:00	0.000	0.0	0.0	0.0	0.0	0.0	N
11	1/0/1900 0:00	0.000	0:00:00	0.000	0.0	0.0	0.0	0.0	0.0	N
12	1-0-00 0:00:00	0.000	0:00:00	0.000	0.0	0.0	0.0	0.0	0.0	N
13	1/0/1900 0:00	0.000	0:00:00	0.000						Y
14	1-0-00 0:00:00	0.000	0:00:00	0.000	0.0	0.0	0.0	0.0	0.0	N
15	1-0-00 0:00:00	0.000	0:00:00	0.000	0.0	0.0	0.0	0.0	0.0	N
16	1-0-00 0:00:00	0.000	0:00:00	0.000	0.0	0.0	0.0	0.0	0.0	N
17	1-0-00 0:00:00	0.000	0:00:00	0.000	0.0	0.0	0.0	0.0	0.0	N
18	1-0-00 0:00:00	0.000	0:00:00	0.000	0.0	0.0	0.0	0.0	0.0	N
19	1-0-00 0:00:00	0.000	0:00:00	0.000	0.0	0.0	0.0	0.0	0.0	N
20	1-0-00 0:00:00	0.000	0:00:00	0.000	0.0	0.0	0.0	0.0	0.0	N
21	1-0-00 0:00:00	0.000	0:00:00	0.000	0.0	0.0	0.0	0.0	0.0	N
22	1-0-00 0:00:00	0.000	0:00:00	0.000	0.0	0.0	0.0	0.0	0.0	N
23	1-0-00 0:00:00	0.000	0:00:00	0.000	0.0	0.0	0.0	0.0	0.0	N
24	1-0-00 0:00:00	0.000	0:00:00	0.000	0.0	0.0	0.0	0.0	0.0	N
25	1-0-00 0:00:00	0.000	0:00:00	0.000	0.0	0.0	0.0	0.0	0.0	N
26	1-0-00 0:00:00	0.000	0:00:00	0.000	0.0	0.0	0.0	0.0	0.0	N
27	1-0-00 0:00:00	0.000	0:00:00	0.000	0.0	0.0	0.0	0.0	0.0	N
28	1-0-00 0:00:00	0.000	0:00:00	0.000	0.0	0.0	0.0	0.0	0.0	N
29	1-0-00 0:00:00	0.000	0:00:00	0.000	0.0	0.0	0.0	0.0	0.0	N
30	1-0-00 0:00:00	0.000	0:00:00	0.000	0.0	0.0	0.0	0.0	0.0	N
31	1-0-00 0:00:00	0.000	0:00:00	0.000	0.0	0.0	0.0	0.0	0.0	N
32	1-0-00 0:00:00	0.000	0:00:00	0.000	0.0	0.0	0.0	0.0	0.0	N
33	1-0-00 0:00:00	0.000	0:00:00	0.000	0.0	0.0	0.0	0.0	0.0	N
34	1-0-00 0:00:00	0.000	0:00:00	0.000	0.0	0.0	0.0	0.0	0.0	N
35	1-0-00 0:00:00	0.000	0:00:00	0.000	0.0	0.0	0.0	0.0	0.0	N
36	1-0-00 0:00:00	0.000	0:00:00	0.000	0.0	0.0	0.0	0.0	0.0	N
37	1-0-00 0:00:00	0.000	0:00:00	0.000	0.0	0.0	0.0	0.0	0.0	N
38	1-0-00 0:00:00	0.000	0:00:00	0.000	0.0	0.0	0.0	0.0	0.0	N
39	1-0-00 0:00:00	0.000	0:00:00	0.000	0.0	0.0	0.0	0.0	0.0	N
40	1-0-00 0:00:00	0.000	0:00:00	0.000	0.0	0.0	0.0	0.0	0.0	N
41	1-0-00 0:00:00	0.000	0:00:00	0.000	0.0	0.0	0.0	0.0	0.0	N
42	1-0-00 0:00:00	0.000	0:00:00	0.000	0.0	0.0	0.0	0.0	0.0	N
	Average Frequency Response (MW/0.1Hz)				#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	
	1901 FRM - Median Frequency Response (MW/0.1Hz)				#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	
	Regression Estimate of Frequency Response (MW/0.1Hz)				-33.77	-33.77	-33.77	-33.77	-33.77	
	1901 Frequency Response Obligation (FRO)				-141	-141	-141	-141	-141	

Event Number	12 to 24 P.U. Performance			18 to 30 P.U. Performance			20 to 40 P.U. Performance			18 to 52 P.U. Performance			20 to 52 P.U. Performance		
	Initial Adjusted	Initial Unadjusted	Sustained	Initial Adjusted	Initial Unadjusted	Sustained	Initial Adjusted	Initial Unadjusted	Sustained	Initial Adjusted	Initial Unadjusted	Sustained	Initial Adjusted	Initial Unadjusted	Sustained
1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
3	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
4	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
6	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
7	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
8	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
9	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
11	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
12	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
13	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
14	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
16	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
17	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
18	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
19	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
20	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
21	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
22	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
23	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
24	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
25	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
26	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
27	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
28	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
29	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
30	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
31	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
32	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
33	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
34	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
35	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
36	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
37	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
38	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
39	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
40	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
41	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
42	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Average Frequency Response (MW/0.1Hz)	0.00	0.00		0.00	0.00		0.00	0.00		0.00	0.00		0.00	0.00	

Month	Minimum FBS* for month	Maximum FBS* for month	Time weighted ** average FBS* for month	
January			-10.0	
Feburary			-7.0	
March			-12.0	
April			-8.0	
May			-27.0	
June			-8.7	
July			-8.0	
August			-8.0	
September			-8.2	
October			-8.0	
November			-8.0	
December			-12.0	
			-10.4	Average Annual Bias

*** Frequency Bias Setting (FBS)**
**** Based on the one minute values used in BAL 001**

PasteSpecial/Values the data copied from FRS Form 2 for each event.

Interconnection Performance

Event Number	Date/Time Central Prevailing	DelFreq	Date	A Point Time	FPointA Hz	A Value Hz	t(0) Time	C Value Hz				Value B 12 to 24 sec Average Frequency	FR B 12 to 24 sec Average MW	Value B 18 to 30 sec Average Frequency	FR B 18 to 30 sec Average MW	Value B 20 to 40 sec Average Frequency	FR B 20 to 40 sec Average MW	Value B 18 to 52 sec Average Frequency	FR B 18 to 52 sec Average MW	Value B 20 to 52 sec Average Frequency
1	12/6/2010 11:25	-0.101																		
2	1/0/1900 0:00	0																		
3	1/0/1900 0:00	0																		
4	1/0/1900 0:00	0																		
5	1/0/1900 0:00	0																		
6	1/0/1900 0:00	0																		
7	1/0/1900 0:00	0																		
8	1/0/1900 0:00	0																		
9	1/0/1900 0:00	0																		
10	1/0/1900 0:00	0																		
11	1/0/1900 0:00	0																		
12	1/0/1900 0:00	0																		
13	1/0/1900 0:00	0																		
14	1/0/1900 0:00	0																		
15	1/0/1900 0:00	0																		
16	1/0/1900 0:00	0																		
17	1/0/1900 0:00	0																		
18	1/0/1900 0:00	0																		
19	1/0/1900 0:00	0																		
20	1/0/1900 0:00	0																		
21	1/0/1900 0:00	0																		
22	1/0/1900 0:00	0																		
23	1/0/1900 0:00	0																		
24	1/0/1900 0:00	0																		
25	1/0/1900 0:00	0																		
26	1/0/1900 0:00	0																		
27	1/0/1900 0:00	0																		
28	1/0/1900 0:00	0																		
29	1/0/1900 0:00	0																		
30	1/0/1900 0:00	0																		
31	1/0/1900 0:00	0																		
32	1/0/1900 0:00	0																		
33	1/0/1900 0:00	0																		
34	1/0/1900 0:00	0																		
35	1/0/1900 0:00	0																		
36	1/0/1900 0:00	0																		
37	1/0/1900 0:00	0																		
38	1/0/1900 0:00	0																		
39	1/0/1900 0:00	0																		
40	1/0/1900 0:00	0																		
41	1/0/1900 0:00	0																		
42	1/0/1900 0:00	0																		

	Value A Data	BA Performance											Value B	12 to 24 second Average Period Evaluation								
FR B 20 to 52 sec Average MW	Frequency Hz	Net Actual Interchange MW	JOU Dynamic Schedules Imp(-) Exp (+) MW	Non-Conforming Load Load (-) MW	Pumped Hydro Load (-) Gen (+) MW	Ramping Units Gen (+) MW	Transferred Frequency Response Rec (-) Del (+) MW	Contingent BA Lost Generation Load (-) Gen (+) MW	BA Bias Setting MW/0.1 Hz	BA Load MW	Bias Setting EPFR MW		Frequency Hz	Net Actual Interchange MW	JOU Dynamic Schedules Imp(-) Exp (+) MW	Non-Conforming Load Load (-) MW	Pumped Hydro Load (-) Gen (+) MW	Ramping Units Gen (+) MW	Transferred Frequency Response Rec (-) Del (+) MW	Contingent BA Lost Generation Load (-) Gen (+) MW	Initial Performance Adjusted P.U.

Initial Performance Unadjusted P.U.	Sustained Performance P.U.	BA Bias Setting MW/0.1 Hz	BA Load MW	Bias Setting EPFR MW	Value B	18 to 30 second Average Period Evaluation												Value B	20 to 40 s	
					Frequency Hz	Net Actual Interchange MW	JOU Dynamic Schedules Imp(-) Exp (+) MW	Non-Conforming Load Load (-) MW	Pumped Hydro ad (-) Gen MW	Ramping Units Gen (+) MW	Transferred Frequency Response Rec (-) Del (+) MW/0.1 Hz	Contingent BA Lost Generation Load (-) Gen (+) MW	Initial Performance Adjusted P.U.	Initial Performance Unadjusted P.U.	Sustained Performance P.U.	BA Bias Setting MW	BA Load MW	Bias Setting EPFR MW	Frequency Hz	Net Actual Interchange MW

econd Average Period Evaluation

Value B

18 to 52 second Average Period Evaluation

JOU Dynamic Schedules Imp(-) Exp (+) MW	Non-Conforming Load Load (-) MW	Pumped Hydro Load (-) Gen (+) MW	Ramping Units Gen (+) MW	Transferred Frequency Response Rec (-) Del (+) MW/0.1 Hz	Contingent BA Lost Generation Load (-) Gen (+) MW	Initial Performance Adjusted P.U.	Initial Performance Unadjusted P.U.	Sustained Performance P.U.	BA Bias Setting MW	BA Load MW	Bias Setting EPFR MW	Frequency Hz	Net Actual Interchange MW	JOU Dynamic Schedules Imp(-) Exp (+) MW	Non-Conforming Load Load (-) MW	Pumped Hydro Load (-) Gen (+) MW	Ramping Units Gen (+) MW	Transferred Frequency Response Rec (-) Del (+) MW	Contingent BA Lost Generation Load (-) Gen (+) MW

Value B 20 to 52 second Average Period Evaluation

Initial Performance Adjusted P.U.	Initial Performance Unadjusted P.U.	Sustained Performance P.U.	BA Bias Setting MW/0.1 Hz	BA Load MW	Bias Setting EPFR MW	Frequency Hz	Net Actual Interchange MW	JOU Dynamic Schedules Imp(-) Exp (+) MW	Non-Conforming Load Load (-) MW	Pumped Hydro Load (-) Gen (+) MW	Ramping Units Gen (+) MW	Transferred Frequency Response Rec (-) Del (+) MW	Contingent BA Lost Generation Load (-) Gen (+) MW	Initial Performance Adjusted P.U.	Initial Performance Unadjusted P.U.	Sustained Performance P.U.	BA Bias Setting MW/0.1 Hz	BA Load MW	Bias Setting EPFR MW

Instructions

Step 1	Enter data in all green cells on the "Data Entry" worksheet.
Step 2	For identified events in column B of the "Data Entry" worksheet, collect data and complete one FRS Form 2 workbook for each event in the list.
Step 3	PasteSpecial/Values data from FRS Form 2 "Form 1 Summary Data" worksheet into "BA Form 2 Event Data" worksheet of this workbook. Do this for each event in the list.
Step 4	Save this workbook using the following file name format:NYISO_yyyy_FRS_Form1.xlsx and send a copy of this workbook and all FRS_Form 2 workbooks to NERC. (where NYISO is replaced with your Balancing Authority abbreviation)
Step 5	"Summary" worksheet contains each event's results for your Balancing Authority.
Note	Balancing Authorities with variable Frequency Bias Settings shall calculate monthly average Frequency Bias Settings. The previous year's monthly averages will be reported annually on FRS Form 1.

Balancing Authority: MyBA

NERC FRS FORM 1 20 to 52 second Value B

Enter Addition Data in column R ==>

Select Reason(s) for adjustment

Event Number	Date/Time (Central Prevailing)	DelFreq	BA Time	BA DelFreq	Value "A" Information NAI	Value "A" Information Adjustment	Value "B" Information NAI	Value "B" Information Adjustment	SEFRD (MW/0.1Hz)	Exclude for data error *	Event MW Loss	Value "A" Load	Value "B" Load	Reason(s)
1	3/7/2011 11:48	-0.111	0:00:00	0.000	0.0	0.0	0.0	0.0	#DIV/0!	N		0.0	0.0	
2	3/14/2011 9:01	-0.055	0:00:00	0.000	0.0	0.0	0.0	0.0	#DIV/0!	N		0.0	0.0	
3	3/16/2011 16:54	-0.070	0:00:00	0.000	0.0	0.0	0.0	0.0	#DIV/0!	N	710	0.0	0.0	
4	3/22/2011 10:47	-0.079	0:00:00	0.000	0.0	0.0	0.0	0.0	#DIV/0!	N		0.0	0.0	
5	3/22/2011 10:50	-0.120	0:00:00	0.000	0.0	0.0	0.0	0.0	#DIV/0!	N		0.0	0.0	
6	3/26/2011 15:49	-0.113	0:00:00	0.000	0.0	0.0	0.0	0.0	#DIV/0!	N		0.0	0.0	
7	4/1/2011 17:57	-0.088	0:00:00	0.000	0.0	0.0	0.0	0.0	#DIV/0!	N		0.0	0.0	
8	4/28/2011 17:09	-0.116	0:00:00	0.000	0.0	0.0	0.0	0.0	#DIV/0!	N	810	0.0	0.0	
9	5/11/2011 14:04	-0.070	0:00:00	0.000	0.0	0.0	0.0	0.0	#DIV/0!	N		0.0	0.0	
10	5/24/2011 23:34	-0.074	0:00:00	0.000	0.0	0.0	0.0	0.0	#DIV/0!	N	810	0.0	0.0	
11	5-31-11 1:58:00	-0.076	0:00:00	0.000	0.0	0.0	0.0	0.0	#DIV/0!	N		0.0	0.0	
12	6-1-11 12:04:00	-0.096	0:00:00	0.000	0.0	0.0	0.0	0.0	#DIV/0!	N	750	0.0	0.0	
13	6-24-11 22:10:00	-0.090	0:00:00	0.000	0.0	0.0	0.0	0.0	#DIV/0!	N		0.0	0.0	
14	6-25-11 19:52:00	-0.085	0:00:00	0.000	0.0	0.0	0.0	0.0	#DIV/0!	N		0.0	0.0	
15	7-3-11 18:51:00	-0.061	0:00:00	0.000	0.0	0.0	0.0	0.0	#DIV/0!	N		0.0	0.0	
16	7-10-11 22:17:00	-0.091	0:00:00	0.000	0.0	0.0	0.0	0.0	#DIV/0!	N		0.0	0.0	
17			0:00:00	0.000	0.0	0.0	0.0	0.0		Y		0.0	0.0	
18			0:00:00	0.000	0.0	0.0	0.0	0.0		Y		0.0	0.0	
19			0:00:00	0.000	0.0	0.0	0.0	0.0		Y		0.0	0.0	
20			0:00:00	0.000	0.0	0.0	0.0	0.0		Y		0.0	0.0	
21			0:00:00	0.000	0.0	0.0	0.0	0.0		Y		0.0	0.0	
22			0:00:00	0.000	0.0	0.0	0.0	0.0		Y		0.0	0.0	
23			0:00:00	0.000	0.0	0.0	0.0	0.0		Y		0.0	0.0	
24			0:00:00	0.000	0.0	0.0	0.0	0.0		Y		0.0	0.0	
25			0:00:00	0.000	0.0	0.0	0.0	0.0		Y		0.0	0.0	
26			0:00:00	0.000	0.0	0.0	0.0	0.0		Y		0.0	0.0	
27			0:00:00	0.000	0.0	0.0	0.0	0.0		Y		0.0	0.0	
28			0:00:00	0.000	0.0	0.0	0.0	0.0		Y		0.0	0.0	
29			0:00:00	0.000	0.0	0.0	0.0	0.0		Y		0.0	0.0	
30			0:00:00	0.000	0.0	0.0	0.0	0.0		Y		0.0	0.0	
31			0:00:00	0.000	0.0	0.0	0.0	0.0		Y		0.0	0.0	
32			0:00:00	0.000	0.0	0.0	0.0	0.0		Y		0.0	0.0	
33			0:00:00	0.000	0.0	0.0	0.0	0.0		Y		0.0	0.0	
34			0:00:00	0.000	0.0	0.0	0.0	0.0		Y		0.0	0.0	
35			0:00:00	0.000	0.0	0.0	0.0	0.0		Y		0.0	0.0	
36			0:00:00	0.000	0.0	0.0	0.0	0.0		Y		0.0	0.0	
37			0:00:00	0.000	0.0	0.0	0.0	0.0		Y		0.0	0.0	
38			0:00:00	0.000	0.0	0.0	0.0	0.0		Y		0.0	0.0	
39			0:00:00	0.000	0.0	0.0	0.0	0.0		Y		0.0	0.0	
40			0:00:00	0.000	0.0	0.0	0.0	0.0		Y		0.0	0.0	
41			0:00:00	0.000	0.0	0.0	0.0	0.0		Y		0.0	0.0	
42			0:00:00	0.000	0.0	0.0	0.0	0.0		Y		0.0	0.0	

Enter Data in Green Highlighted Cells
Send copy to: Chris.Scheetz@nerc.net

2012	Bias Calculation Form Year
Western	Interconnection
MyBA	Balancing Authority
	Contact Name
	Contact Phone #
	Contact e-mail
	Current Year's Actual Peak
	Internal Generating Capacity
	Next Year's Projected Peak
2011	Current year
-50.0	**2011 Frequency Response Obligation (FRO)**

Summary Statistics

#DIV/0!	Average Frequency Response (MW/0.1Hz)
-33.8	Regression Estimate of Frequency Response (MW/0.1Hz)
-50.0	Next Year's **2012 Frequency Response Obligation (FRO)**
#DIV/0!	**2012 Frequency Bias Setting - (minimum of FRM, next year's FRO, or 0.8% of Projected Peak [Load + Gen]/2)**
#DIV/0!	**2011 FRM - Median Frequency Response (MW/0.1Hz)**

N — Do you RECEIVE Overlap regulation?
If Yes, list the BA name and the associated Bias of that BA

Bias -MW/0.1 Hz	Balancing Authority

N — Do you PROVIDE Overlap regulation?
If Yes, list the BA name and the associated Bias of that BA

Bias -MW/0.1 Hz	Balancing Authority

-0.058	23.2	Dynamic schedules for joint-owned units (
-0.066	27.7	Nonconforming load (NL)
-0.040	10.7	Pumped hydro (PH)
-0.05252493	80.66089	Ramping units (RU)
-0.07090523	-26.89761	Xfred Frequency Response (TFR)
-0.05190677	9.955449	Contingent BA adjustment for loss of units
-0.0580477	3.367024	DS & NL
-0.07557242	36.33443	DS & PH
-0.0563805	0.488253	DS & RU
-0.0573329	2.758037	DS & TFR
-0.0517609	13.64342	DS & CBA
-0.04999924	11.10075	DS & NL & PH
-0.052	-19.90685	DS & NL & RU
-0.05599976	12.32546	JOU DS & NL & TFR
-0.05849838	0.750192	DS & NL & CBA
-0.04850006	2.230058	DS & NL & PH & RU
-0.04500008	9.477859	DS & NL & PH & TFR
-0.03750229	0.355309	DS & NL & PH & CBA
-0.04750061	2.170702	DS & NL & PH & RU & TFR
-0.05550003	29.38207	DS & NL & PH & RU & CBA
-0.047	4.601381	DS & NL & PH & RU & TFR & CBA
-0.06	1.593515	NL & PH
-0.06	52.37091	NL & RU
-0.051	33.94787	NL & TFR
-0.1	100	NL & CBA
		NL & PH & RU
		NL & PH & TFR
		NL & PH & BAA
		NL & PH & RU & TFR
	N	NL & PH & RU & CBA
	Y	NL & PH & RU & TFR & CBA
		PH & RU
		PH & TFR
		PH & CBA
		PH & RU & TFR
		PH & RU & CBA
		PH & TFR
		PH & CBA
		PH & RU & TFR
		PH & RU & CBA
		PH & TFR
		PH & CBA
		PH & RU & TFR & CBA
		RU & TFR
		RU & CBA
		RU & TFR & CBA
		TFR & CBA

N
Y

Instructions

Step 1 Enter data in all green cells on this "Data Entry" worksheet.

Step 2 For identified events in column B, collect data and complete FRS Form 2 for each event in the list.

Step 3 PasteSpecial/Values data from FRS Form 2 "Form 1 Summary Data" into "BA Form 2 Data" worksheet of this workbook. Do this for each event in the list.

Step 4 Save this workbook using the following file name format:NYISO_yyyy_FRS_Form1.xlsx and send a copy of this workbook and all FRS_Form 2 workbooks to NERC. (where NYISO is replaced with your BA name)

Note: Only one set of average periods of evaluation is displayed. Other worksheets for the additional average periods are hidden.

DS)

s (CBA)

Event Number	Balancing Authority	MyBA	JOU Dynamic Schedules		Non conforming Load		Pumped Hydro		Ramping Units		Transferred Frequency Response		Contingent BA Adjustment		Net Total Adjustments
	Date/Time (Central Prevailing)	DelFreq	Value A Adjustment	Value B Adjustment	Value A Adjustment	Value B Adjustment	Value A Adjustment	Value B Adjustment	Value A Adjustment	Value B Adjustment	Value A Adjustment	Value B Adjustment	Value A Adjustment	Value B Adjustment	Value B 12 to 24 seconds
1	3/7/2011 11:48	-0.111	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2	3/14/2011 9:01	-0.055	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3	3/16/2011 16:54	-0.070	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
4	3/22/2011 10:47	-0.079	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5	3/22/2011 10:50	-0.120	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
6	3/26/2011 15:49	-0.113	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
7	4/1/2011 17:57	-0.088	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
8	4/28/2011 17:09	-0.116	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
9	5/11/2011 14:04	-0.070	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
10	5/24/2011 23:34	-0.074	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
11	5/31/2011 1:58	-0.076	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
12	6-1-11 12:04:00	-0.096	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
13	6/24/2011 22:10	-0.090	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
14	6-25-11 19:52:00	-0.085	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
15	7-3-11 18:51:00	-0.061	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
16	7-10-11 22:17:00	-0.091	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
17			0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
18			0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
19			0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
20			0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
21			0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
22			0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
23			0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
24			0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
25			0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
26			0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
27			0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
28			0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
29			0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
30			0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
31			0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
32			0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
33			0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
34			0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
35			0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
36			0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
37			0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
38			0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
39			0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
40			0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
41			0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
42			0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Sign Convention for scan data collected in Form 2	Imports: MWs are - Exports: MWs are +	Loads in MW as -	Load MW as - Generation MW as +	Enter Gen MW as +	The transactional amount in MW Receiver enters - Deliverer enters + on Form 2 Data sheet	Generation MW as + (If load occurs due to gen loss, enter MW as - at value B)

Notes:

1) Balancing Authorities making adjustments must retain evidence to verify:
   - Adjustment values are determined from scan-cycle data using Value A and Value B averaging periods. Scan-cycle data must be available if adjustments are made.
   - Adjustments are necessary to improve accuracy of calculations compared to using Net Actual Interchange (contingency size for single BA interconnections) solely. Said differently, unless an adjustment compensates for significant known error, it should not be made. However, as noted in the next item, once a decision to include an adjustment for one or more of the six types is made for one event, the entity must calculate adjustments for that (those) type(s) for all events.
   - Adjustments are included consistently for all events (e.g. if adjustments for nonconforming load are made for one event, the load must be included for all events, etc.).

2) Dynamic Schedules:
   - Values use schedule sign convention.
   - Adjustments should include only dynamic schedules accounting for joint-owned units. Other dynamic schedules should be ignored.

3) Nonconforming Loads:
   - Values must be entered as negative numbers.

4) Pumped Hydro:
   - Values for pumping must be entered as negative values.
   - Values for generating must be entered as positive values.

5) Rampling Units:
   - Values are entered as positive values.

6) Transferred Frequency Response:
   - This value is the amount agreed upon between the entities expressed in MW/0.1 Hz. Form 2 will adjust this amount for the frequency deviation experienced. (e.g. if an entity agrees to provide 20 MW/0.1 Hz to another entity and a frequency event with a deviation of 50 mHz occurs, the delivering entity should enter +20 in the data column of Form 2 and the receiving entity should enter - 20. The spreadsheet will adjust the SEFRD for each entity by the 10 for this event.)
   - Values for the entity receiving the response must be entered as a negative number.
   - Values for the entity delivering the response must be entered as a positive number.
   - Values between entities must sum to zero.

7) Contingent Balancing Authority Adjustment:
   - Value for Value A is the pre-contingency generation from the contingent unit(s).
   - Value for Value B is usually 0 MW, but may be the load that remains on the system that was "netted" out by the now offline generation.

NERC FRS FORM 1

Balancing Authority	MyBA

Event Number	Date/Time (Central Prevailing)	DelFreq	BA Time	BA DelFreq	12 to 24 SEFRD	18 to 30 SEFRD	20 to 40 SEFRD	18 to 52 SEFRD	20 to 52 SEFRD	Exclude for data error *	12 to 24 P.U. Performance			18 to 30 P.U. Performance			20 to 40 P.U. Performance			18 to 52 P.U. Performance			20 to 52 P.U. Performance		
											Initial Adjusted	Initial Unadjusted	Sustained	Initial Adjusted	Initial Unadjusted	Sustained	Initial Adjusted	Initial Unadjusted	Sustained	Initial Adjusted	Initial Unadjusted	Sustained	Initial Adjusted	Initial Unadjusted	Sustained
1	3/7/2011 11:48	-0.111	0:00:00	0.000	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	N	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2	3/14/2011 9:01	-0.055	0:00:00	0.000	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	N	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
3	3/16/2011 16:54	-0.070	0:00:00	0.000	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	N	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
4	3/22/2011 10:47	-0.079	0:00:00	0.000	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	N	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5	3/22/2011 10:50	-0.120	0:00:00	0.000	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	N	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
6	3/26/2011 15:49	-0.113	0:00:00	0.000	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	N	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
7	4/1/2011 17:57	-0.088	0:00:00	0.000	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	N	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
8	4/28/2011 17:09	-0.116	0:00:00	0.000	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	N	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
9	5/11/2011 14:04	-0.070	0:00:00	0.000	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	N	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
10	5/24/2011 23:34	-0.074	0:00:00	0.000	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	N	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
11	5-31-11 1:58:00	-0.076	0:00:00	0.000	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	N	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
12	6-1-11 12:04:00	-0.096	0:00:00	0.000	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	N	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
13	6-24-11 22:10:00	-0.090	0:00:00	0.000	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	N	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
14	6-25-11 19:52:00	-0.085	0:00:00	0.000	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	N	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
15	7-3-11 18:51:00	-0.061	0:00:00	0.000	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	N	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
16	7-10-11 22:17:00	-0.091	0:00:00	0.000	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	N	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
17	1-0-00 0:00:00	0.000	0:00:00	0.000						Y	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
18	1-0-00 0:00:00	0.000	0:00:00	0.000						Y	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
19	1-0-00 0:00:00	0.000	0:00:00	0.000						Y	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
20	1-0-00 0:00:00	0.000	0:00:00	0.000						Y	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
21	1-0-00 0:00:00	0.000	0:00:00	0.000						Y	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
22	1-0-00 0:00:00	0.000	0:00:00	0.000						Y	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
23	1-0-00 0:00:00	0.000	0:00:00	0.000						Y	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
24	1-0-00 0:00:00	0.000	0:00:00	0.000						Y	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
25	1-0-00 0:00:00	0.000	0:00:00	0.000						Y	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
26	1-0-00 0:00:00	0.000	0:00:00	0.000						Y	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
27	1-0-00 0:00:00	0.000	0:00:00	0.000						Y	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
28	1-0-00 0:00:00	0.000	0:00:00	0.000						Y	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
29	1-0-00 0:00:00	0.000	0:00:00	0.000						Y	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
30	1-0-00 0:00:00	0.000	0:00:00	0.000						Y	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
31	1-0-00 0:00:00	0.000	0:00:00	0.000						Y	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
32	1-0-00 0:00:00	0.000	0:00:00	0.000						Y	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
33	1-0-00 0:00:00	0.000	0:00:00	0.000						Y	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
34	1-0-00 0:00:00	0.000	0:00:00	0.000						Y	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
35	1-0-00 0:00:00	0.000	0:00:00	0.000						Y	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
36	1-0-00 0:00:00	0.000	0:00:00	0.000						Y	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
37	1-0-00 0:00:00	0.000	0:00:00	0.000						Y	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
38	1-0-00 0:00:00	0.000	0:00:00	0.000						Y	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
39	1-0-00 0:00:00	0.000	0:00:00	0.000						Y	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
40	1-0-00 0:00:00	0.000	0:00:00	0.000						Y	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
41	1-0-00 0:00:00	0.000	0:00:00	0.000						Y	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
42	1-0-00 0:00:00	0.000	0:00:00	0.000						Y	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Average Frequency Response (MW/0.1Hz)	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	
2012 FRM - Median Frequency Response (MW/0.1Hz)	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	
Regression Estimate of Frequency Response (MW/0.1Hz)	-33.77	-33.77	-33.77	-33.77	-33.77	
2012 Frequency Response Obligation (FRO)	-50	-50	-50	-50	-50	

Month	Minimum FBS* for month	Maximum FBS* for month	Time weighted ** average FBS* for month	
January			-10.0	
Feburary			-7.0	
March			-12.0	
April			-8.0	
May			-27.0	
June			-8.7	
July			-8.0	
August			-8.0	
September			-8.2	
October			-8.0	
November			-8.0	
December			-12.0	
			-10.4	Average Annual Bias

*** Frequency Bias Setting (FBS)**
**** Based on the one minute values used in BAL 001**

PasteSpecial/Values the data copied from FRS Form 2 for each event.

Interconnection Performance

Value A Data

Event Number	Date/Time Central Prevailing	DelFreq	Date	A Point Time	FPointA Hz	A Value Hz	t(0) Time	C Value Hz			Value B 12 to 24 sec Average Frequency	FR B 12 to 24 sec Average MW	Value B 18 to 30 sec Average Frequency	FR B 18 to 30 sec Average MW	Value B 20 to 40 sec Average Frequency	FR B 20 to 40 sec Average MW	Value B 18 to 52 sec Average Frequency	FR B 18 to 52 sec Average MW	Value B 20 to 52 sec Average Frequency	FR B 20 to 52 sec Average MW	Frequency Hz	Net Actual Interchange MW
1	3/7/2011 11:48	-0.111																				
2	3/14/2011 9:01	-0.055																				
3	3/16/2011 16:54	-0.07																				
4	3/22/2011 10:47	-0.079																				
5	3/22/2011 10:50	-0.12																				
6	3/26/2011 15:49	-0.113																				
7	4/1/2011 17:57	-0.088																				
8	4/28/2011 17:09	-0.116																				
9	5/11/2011 14:04	-0.07																				
10	5/24/2011 23:34	-0.074																				
11	5/31/2011 1:58	-0.076																				
12	6/1/2011 12:04	-0.096																				
13	6/24/2011 22:10	-0.09																				
14	6/25/2011 19:52	-0.085																				
15	7/3/2011 18:51	-0.061																				
16	7/10/2011 22:17	-0.091																				
17	1/0/1900 0:00	0																				
18	1/0/1900 0:00	0																				
19	1/0/1900 0:00	0																				
20	1/0/1900 0:00	0																				
21	1/0/1900 0:00	0																				
22	1/0/1900 0:00	0																				
23	1/0/1900 0:00	0																				
24	1/0/1900 0:00	0																				
25	1/0/1900 0:00	0																				
26	1/0/1900 0:00	0																				
27	1/0/1900 0:00	0																				
28	1/0/1900 0:00	0																				
29	1/0/1900 0:00	0																				
30	1/0/1900 0:00	0																				
31	1/0/1900 0:00	0																				
32	1/0/1900 0:00	0																				
33	1/0/1900 0:00	0																				
34	1/0/1900 0:00	0																				
35	1/0/1900 0:00	0																				
36	1/0/1900 0:00	0																				
37	1/0/1900 0:00	0																				
38	1/0/1900 0:00	0																				
39	1/0/1900 0:00	0																				
40	1/0/1900 0:00	0																				
41	1/0/1900 0:00	0																				
42	1/0/1900 0:00	0																				

BA Performance

JOU Dynamic Schedules Imp(-) Exp (+) MW	Non-Conforming Load Load (-) MW	Pumped Hydro Load (-) Gen (+) MW	Ramping Units Gen (+) MW	Transferred Frequency Response Rec (-) Del (+) MW	Contingent BA Lost Generation Load (-) Gen (+) MW	BA Bias Setting MW/0.1 Hz	BA Load MW	Bias Setting EPFR MW

Value B 12 to 24 second Average Period Evaluation

Frequency Hz	Net Actual Interchange MW	JOU Dynamic Schedules Imp(-) Exp (+) MW	Non-Conforming Load Load (-) MW	Pumped Hydro Load (-) Gen (+) MW	Ramping Units Gen (+) MW	Transferred Frequency Response Rec (-) Del (+) MW	Contingent BA Lost Generation Load (-) Gen (+) MW	Initial Performance Adjusted P.U.	Initial Performance Unadjusted P.U.	Sustained Performance P.U.	BA Bias Setting MW/0.1 Hz	BA Load MW	Bias Setting EPFR MW

Value B **18 to 30 second Average Period Evaluation**

Frequency Hz	Net Actual Interchange MW	JOU Dynamic Schedules Imp(-) Exp (+) MW	Non-Conforming Load Load (-) MW	Pumped Hydro ad (-) Gen MW	Ramping Units Gen (+) MW	Transferred Frequency Response Rec (-) Del (+) MW/0.1 Hz	Contingent BA Lost Generation Load (-) Gen (+) MW	Initial Performance Adjusted P.U.	Initial Performance Unadjusted P.U.	Sustained Performance P.U.	BA Bias Setting MW	BA Load MW	Bias Setting EPFR MW

Value B **20 to 40 second Average Period Evaluation**

Frequency Hz	Net Actual Interchange MW	JOU Dynamic Schedules Imp(-) Exp (+) MW	Non-Conforming Load Load (-) MW	Pumped Hydro Load (-) Gen (+) MW	Ramping Units Gen (+) MW	Transferred Frequency Response Rec (-) Del (+) MW/0.1 Hz	Contingent BA Lost Generation Load (-) Gen (+) MW	Initial Performance Adjusted P.U.

Value B 18 to 52 second Average Period Evaluation

Initial Performance Unadjusted P.U.	Sustained Performance P.U.	BA Bias Setting MW	BA Load MW	Bias Setting EPFR MW	Frequency Hz	Net Actual Interchange MW	JOU Dynamic Schedules Imp(-) Exp (+) MW	Non-Conforming Load Load (-) MW	Pumped Hydro Load (-) Gen (+) MW	Ramping Units Gen (+) MW	Transferred Frequency Response Rec (-) Del (+) MW	Contingent BA Lost Generation Load (-) Gen (+) MW

Value B 20 to 52 second Average Per

Initial Performance Adjusted P.U.	Initial Performance Unadjusted P.U.	Sustained Performance P.U.	BA Bias Setting MW/0.1 Hz	BA Load MW	Bias Setting EPFR MW	Frequency Hz	Net Actual Interchange MW	JOU Dynamic Schedules Imp(-) Exp (+) MW	Non-Conforming Load Load (-) MW

iod Evaluation

Pumped Hydro Load (-) Gen (+) MW	Ramping Units Gen (+) MW	Transferred Frequency Response Rec (-) Del (+) MW	Contingent BA Lost Generation Load (-) Gen (+) MW	Initial Performance Adjusted P.U.	Initial Performance Unadjusted P.U.	Sustained Performance P.U.	BA Bias Setting MW/0.1 Hz	BA Load MW	Bias Setting EPFR MW

Steps **To be completed for each event evaluated.**

1 Set-up Data collection in exact same order as the "Data" sheet of this work book. Data should be in this order:
Column A: Date and Time in this format, mm/dd/yy HH:MM:SS
Column B: Frequency Hz
Column C: Net Actual Interchange
Column D: Joint Owned Unit dynamic schedule
Column E: Non Conforming Load
Column F: Pumped Hydro
Column G: Ramping units
Column H: Transferred Frequency Response
Column I: Contingent BA Lost load or generation
Column J: BA Bias Setting
Column K: BA Load

2 Note: Columns D, E, F, G and H are optional data. If you choose not to use these, leave the columns blank. Do not delete the columns. Use the sign (+/-) convention defined in FRS Form 1.

3 Data compression must be turned off for each data point. Quality data will give you quality results in the evaluation.

4 Data must be at 2 second sample rate for the full 25 minute minimum collection period that starts a minimum of two (2) minutes before the event begins and includes a minimum of 15 minutes after the beginning of the event.
The spreadsheet will work with up to 60 minutes of data. Be sure "Data" worksheet is clear of any old data.
If using PI historian as your data source, use "PasteSpecial/Values" to enter data into the spreadsheet. Do not include historian data collection formulas in the data.

5 Once data is in place in the "Data" worksheet, determine when the beginning of the event occurred. This is accomplished by knowing the UTC event time from the master event list.
Convert the UTC event time to your PI data time and then scroll through the Data worksheet column B data of frequency and observe when frequency moves from the normal, pre-event frequency.
This will usually be a single change in frequency of 0.008 to 0.010 Hz more or less. Note the row number in the worksheet that this change occurs. In this sample data spreadsheet this occurs in row 313 of the data.

6 Edit cell "C8" of the "Entry Data" worksheet, change the formula in the cell "C8" to reference the row number identified in step 5 above. In the sample data of this workbook this formula is: "=Data!A313"
If the correct row is selected, the "Graph 20 to 52s" worksheet will indicate the first change in frequency of the event on the center vertical grid line of the graph (Red Trend).

7 Determine the end of the event to be evaluated. Use the same rules that are used for DCS only look at frequency instead of ACE. Scroll down the frequency data in column B of the "Data" worksheet until frequency reaches 60 Hz or the pre-disturbance value. Note the row number in the worksheet that this occurs. In this sample data spreadsheet this occurs in row 427.

8 Edit cell "C11" of the "Evaluation" worksheet, change the formula in the cell "C11" to reference the row number identified in step 7 above. In the sample data of this workbook this formula is: "=Data!A427"

9 In cell "R41" of the "Evaluation" spreadsheet, enter the MW value of the unit(s) that tripped (from the Master Event List). This is only necessary for the "Interconnection" evaluation if you're interested.
It is not necessary to do this for the BA evaluation but it will provide a comparison of the BA frequency response as compared to the Interconnection frequency response.

10 Use the "copy" button provided to copy the evaluation and event specific data for the "FRS Form 1" of this field trial. This data is summarized in the correct order on worksheet "Form 1 Summary Data" of this workbook.
Use PasteSpecial/Values when pasting the data into FRS Form 1 on the appropriate event row.

Steps **To be completed once at the initial setup of the evaluation spreadsheet for your BA.**

A Enter the Balancing Authority name as you want it to appear on the graphs in cell "B1" of the "Entry Data" worksheet. For example: "NYISO".

B Enter your Balancing Authorities Frequency Response Obligation in cell "B2" of the "Entry Data" worksheet. For example: -80 MW/0.1 Hz (This value could change annually)

C For informational and educational purposes, a "Sustained" performance evaluation is provided in the "Evaluation" worksheet and in the "Sustained" Graph. This evaluation uses a Time Constant (TC) to model the frequency response of your BA.
The time constant is located in cell "L13" of the "Evaluation" spreadsheet and should be edited for the types of generators in your BA. Presently this time constant is set at 0.35.
The higher the value of the time constant, the faster the delivery of frequency response is expected. Setting the TC to 1.0 effectively turns off the delay and instantaneous frequency response will be modeled. Do not set higher than 1.0.
This time constant is only used in the "Sustained" evaluation and is not used for the Field Trial evaluation of performance to the FRO.
A typical setting for this time constant is 0.08 to 0.15 for hydro units, 0.10 to 0.20 for large steam turbines and 0.20 to 0.40 for combustion turbines.
By observing the slope of your "Interchange Actual" on the "Sustained" Graph, adjust the time constant until the initial slope of the "Target" is similar.
When set appropriately, the "Target" trend on the "Sustained" graph will model what Interchange Actual should have done during the event recovery period based on your minimum FRO.

Note: For ease of use, only the necessary worksheets are displayed. If you are interested in viewing graphs and other hidden worksheets, select the "tab" at the bottom, right click, select unhide and select the worksheet you wish to unhide.

Time (T)	Hz	Net Actual Interchange MW	JOU Dynamic Schedules Imp(-) Exp (+) MW	Non-Conforming Load Load (-) MW	Pumped Hydro Load (-) Gen (+) MW	Ramping Units Gen (+) MW	Transferred Frequency Response Rec (-) Del (+) MW/0.1 Hz	Contingent BA Lost Generation Load (-) Gen (+) MW	BA Bias Setting MW/0.1 Hz	BA Load MW
10/12/09 02:12:00	59.98	3669.878	350	-351.361511	0	0	10	15	-103	7500
10/12/09 02:12:02	59.981	3672.385	350	-351.361511	0	0.5	10	15	-103	7500.33
10/12/09 02:12:04	59.98	3669.878	350	-351.361511	0	1	10	15	-103	7500.66
10/12/09 02:12:06	59.981	3672.385	350	-357.94751	0	1.5	10	15	-103	7500.99
10/12/09 02:12:08	59.98	3671.7	350	-357.94751	0	2	10	15	-103	7501.32
10/12/09 02:12:10	59.98	3670.949	350	-357.94751	0	2.5	10	15	-103	7501.65
10/12/09 02:12:12	59.982	3671.698	350	-357.94751	0	3	10	15	-103	7501.98
10/12/09 02:12:14	59.981	3671.548	350	-357.94751	0	3.5	10	15	-103	7502.31
10/12/09 02:12:16	59.979	3672.31	350	-360.234741	0	4	10	15	-103	7502.64
10/12/09 02:12:18	59.981	3672.775	350	-360.234741	0	4.5	10	15	-103	7502.97
10/12/09 02:12:20	59.982	3672.174	350	-360.234741	0	5	10	15	-103	7503.3
10/12/09 02:12:22	59.979	3672.276	350	-360.234741	0	5.5	10	15	-103	7503.63
10/12/09 02:12:24	59.979	3674.263	350	-360.234741	0	6	10	15	-103	7503.96
10/12/09 02:12:26	59.98	3674.508	350	-346.525879	0	6.5	10	15	-103	7504.29
10/12/09 02:12:28	59.98	3673.844	350	-346.525879	0	7	10	15	-103	7504.62
10/12/09 02:12:30	59.983	3675.092	350	-346.525879	0	7.5	10	15	-103	7504.95
10/12/09 02:12:32	59.986	3672.106	350	-346.525879	0	8	10	15	-103	7505.28
10/12/09 02:12:34	59.986	3669.33	350	-346.525879	0	8.5	10	15	-103	7505.61
10/12/09 02:12:36	59.98	3669.168	350	-296.443359	0	9	10	15	-103	7505.94
10/12/09 02:12:38	59.976	3671.5	350	-296.443359	0	9.5	10	15	-103	7506.27
10/12/09 02:12:40	59.975	3673.56	350	-296.443359	0	10	10	15	-103	7506.6
10/12/09 02:12:42	59.979	3673.897	350	-296.443359	0	10.5	10	15	-103	7506.93
10/12/09 02:12:44	59.981	3673.834	350	-296.443359	0	11	10	15	-103	7507.26
10/12/09 02:12:46	59.982	3671.887	350	-341.061157	0	11.5	10	15	-103	7507.59
10/12/09 02:12:48	59.987	3671.635	350	-341.061157	0	12	10	15	-103	7507.92
10/12/09 02:12:50	59.99	3671.22	350	-341.061157	0	12.5	10	15	-103	7508.25
10/12/09 02:12:52	59.993	3671.56	350	-341.061157	0	13	10	15	-103	7508.58
10/12/09 02:12:54	59.994	3671.283	350	-341.061157	0	13.5	10	15	-103	7508.91
10/12/09 02:12:56	59.995	3670.772	350	-322.826294	0	14	10	15	-103	7509.24
10/12/09 02:12:58	59.995	3668.362	350	-322.826294	0	14.5	10	15	-103	7509.57
10/12/09 02:13:00	59.995	3668.129	350	-322.826294	0	15	10	15	-103	7509.9
10/12/09 02:13:02	59.995	3668.245	350	-322.826294	0	15.5	10	15	-103	7510.23
10/12/09 02:13:04	59.995	3669.291	350	-322.826294	0	16	10	15	-103	7510.56
10/12/09 02:13:06	59.994	3670.494	350	-321.544403	0	16.5	10	15	-103	7510.89
10/12/09 02:13:08	59.994	3671.254	350	-321.544403	0	17	10	15	-103	7511.22
10/12/09 02:13:10	59.995	3670.683	350	-321.544403	0	17.5	10	15	-103	7511.55
10/12/09 02:13:12	59.997	3670.156	350	-321.544403	0	18	10	15	-103	7511.88
10/12/09 02:13:14	60.001	3670.212	350	-321.544403	0	18.5	10	15	-103	7512.21
10/12/09 02:13:16	60.002	3670.712	350	-362.136261	0	19	10	15	-103	7512.54
10/12/09 02:13:18	60.001	3670.329	350	-362.136261	0	19.5	10	15	-103	7512.87
10/12/09 02:13:20	60.003	3671.184	350	-362.136261	0	20	10	15	-103	7513.2
10/12/09 02:13:22	60.003	3671.227	350	-362.136261	0	20.5	10	15	-103	7513.53
10/12/09 02:13:24	60.005	3670.267	350	-362.136261	0	21	10	15	-103	7513.86
10/12/09 02:13:26	60.003	3670.19	350	-336.311798	0	21.5	10	15	-103	7514.19

10/12/09 02:13:28	60	3671.092	350	-336.311798	0	22	10	15	-103	7514.52
10/12/09 02:13:30	60.001	3670.249	350	-336.311798	0	22.5	10	15	-103	7514.85
10/12/09 02:13:32	60.003	3670.67	350	-336.311798	0	23	10	15	-103	7515.18
10/12/09 02:13:34	60.004	3669.899	350	-336.311798	0	23.5	10	15	-103	7515.51
10/12/09 02:13:36	60.005	3669.534	350	-316.443054	0	24	10	15	-103	7515.84
10/12/09 02:13:38	60.001	3670.199	350	-316.443054	0	24.5	10	15	-103	7516.17
10/12/09 02:13:40	59.999	3671.628	350	-316.443054	0	25	10	15	-103	7516.5
10/12/09 02:13:42	60.001	3671.123	350	-316.443054	0	25.5	10	15	-103	7516.83
10/12/09 02:13:44	60.004	3671.968	350	-316.443054	0	26	10	15	-103	7517.16
10/12/09 02:13:46	60.004	3671.444	350	-325.464294	0	26.5	10	15	-103	7517.49
10/12/09 02:13:48	60.004	3671.872	350	-325.464294	0	27	10	15	-103	7517.82
10/12/09 02:13:50	60.004	3671.875	350	-325.464294	0	27.5	10	15	-103	7518.15
10/12/09 02:13:52	60.005	3671.066	350	-325.464294	0	28	10	15	-103	7518.48
10/12/09 02:13:54	60.003	3672.873	350	-325.464294	0	28.5	10	15	-103	7518.81
10/12/09 02:13:56	60.002	3673.235	350	-336.614166	0	29	10	15	-103	7519.14
10/12/09 02:13:58	60.003	3673.498	350	-336.614166	0	29.5	10	15	-103	7519.47
10/12/09 02:14:00	60.001	3673.531	350	-336.614166	0	30	10	15	-103	7519.8
10/12/09 02:14:02	59.999	3672.75	350	-336.614166	0	30.5	10	15	-103	7520.13
10/12/09 02:14:04	59.999	3673.186	350	-336.614166	0	31	10	15	-103	7520.46
10/12/09 02:14:06	59.997	3674.322	350	-316.726166	0	31.5	10	15	-103	7520.79
10/12/09 02:14:08	59.998	3673.576	350	-316.726166	0	32	10	15	-103	7521.12
10/12/09 02:14:10	59.996	3673.365	350	-316.726166	0	32.5	10	15	-103	7521.45
10/12/09 02:14:12	59.995	3671.821	350	-316.726166	0	33	10	15	-103	7521.78
10/12/09 02:14:14	59.993	3672.093	350	-316.726166	0	33.5	10	15	-103	7522.11
10/12/09 02:14:16	59.993	3671.998	350	-320.195526	0	34	10	15	-103	7522.44
10/12/09 02:14:18	59.996	3671.568	350	-320.195526	0	34.5	10	15	-103	7522.77
10/12/09 02:14:20	59.999	3671.073	350	-320.195526	0	35	10	15	-103	7523.1
10/12/09 02:14:22	60.001	3670.957	350	-320.195526	0	35.5	10	15	-103	7523.43
10/12/09 02:14:24	60.005	3671.441	350	-320.195526	0	36	10	15	-103	7523.76
10/12/09 02:14:26	60.007	3670.893	350	-341.86615	0	36.5	10	15	-103	7524.09
10/12/09 02:14:28	60.007	3670.162	350	-341.86615	0	37	10	15	-103	7524.42
10/12/09 02:14:30	60.005	3670.513	350	-341.86615	0	37.5	10	15	-103	7524.75
10/12/09 02:14:32	60.002	3670.62	350	-341.86615	0	38	10	15	-103	7525.08
10/12/09 02:14:34	59.999	3672.713	350	-341.86615	0	38.5	10	15	-103	7525.41
10/12/09 02:14:36	59.997	3672.086	350	-348.597839	0	39	10	15	-103	7525.74
10/12/09 02:14:38	59.999	3671.07	350	-348.597839	0	39.5	10	15	-103	7526.07
10/12/09 02:14:40	60.002	3670.826	350	-348.597839	0	40	10	15	-103	7526.4
10/12/09 02:14:42	60.007	3670.823	350	-348.597839	0	40.5	10	15	-103	7526.73
10/12/09 02:14:44	60.01	3671.809	350	-348.597839	0	41	10	15	-103	7527.06
10/12/09 02:14:46	60.011	3673.363	350	-329.085022	0	41.5	10	15	-103	7527.39
10/12/09 02:14:48	60.009	3672.736	350	-329.085022	0	42	10	15	-103	7527.72
10/12/09 02:14:50	60.003	3673.255	350	-329.085022	0	42.5	10	15	-103	7528.05
10/12/09 02:14:52	59.997	3674.415	350	-329.085022	0	43	10	15	-103	7528.38
10/12/09 02:14:54	59.995	3675.426	350	-329.085022	0	43.5	10	15	-103	7528.71
10/12/09 02:14:56	59.994	3674.755	350	-342.418243	0	44	10	15	-103	7529.04
10/12/09 02:14:58	59.994	3674.29	350	-342.418243	0	44.5	10	15	-103	7529.37
10/12/09 02:15:00	60	3675.311	350	-342.418243	0	45	10	15	-103	7529.7
10/12/09 02:15:02	60.001	3675.157	350	-342.418243	0	45.5	10	15	-103	7530.03
10/12/09 02:15:04	59.998	3675.166	350	-342.418243	0	46	10	15	-103	7530.36

10/12/09 02:15:06	59.998	3674.442	350	-338.794647	0	46.5	10	15	-103	7530.69
10/12/09 02:15:08	59.995	3674.319	350	-338.794647	0	47	10	15	-103	7531.02
10/12/09 02:15:10	59.992	3674.906	350	-338.794647	0	47.5	10	15	-103	7531.35
10/12/09 02:15:12	59.986	3676.329	350	-338.794647	0	48	10	15	-103	7531.68
10/12/09 02:15:14	59.986	3676.714	350	-338.794647	0	48.5	10	15	-103	7532.01
10/12/09 02:15:16	59.986	3677.791	350	-335.931	0	49	10	15	-103	7532.34
10/12/09 02:15:18	59.988	3675.972	350	-335.931	0	49.5	10	15	-103	7532.67
10/12/09 02:15:20	59.989	3675.543	350	-335.931	0	50	10	15	-103	7533
10/12/09 02:15:22	59.988	3676.593	350	-335.931	0	50.5	10	15	-103	7533.33
10/12/09 02:15:24	59.987	3676.931	350	-335.931	0	51	10	15	-103	7533.66
10/12/09 02:15:26	59.985	3677.223	350	-339.712402	0	51.5	10	15	-103	7533.99
10/12/09 02:15:28	59.984	3677.067	350	-339.712402	0	52	10	15	-103	7534.32
10/12/09 02:15:30	59.983	3677.361	350	-339.712402	0	52.5	10	15	-103	7534.65
10/12/09 02:15:32	59.982	3678.455	350	-339.712402	0	53	10	15	-103	7534.98
10/12/09 02:15:34	59.984	3679.228	350	-339.712402	0	53.5	10	15	-103	7535.31
10/12/09 02:15:36	59.984	3679.731	350	-332.024658	0	54	10	15	-103	7535.64
10/12/09 02:15:38	59.985	3679.059	350	-332.024658	0	54.5	10	15	-103	7535.97
10/12/09 02:15:40	59.986	3677.627	350	-332.024658	0	55	10	15	-103	7536.3
10/12/09 02:15:42	59.987	3677.482	350	-332.024658	0	55.5	10	15	-103	7536.63
10/12/09 02:15:44	59.99	3676.409	350	-332.024658	0	56	10	15	-103	7536.96
10/12/09 02:15:46	59.99	3677.528	350	-330.759033	0	56.5	10	15	-103	7537.29
10/12/09 02:15:48	59.987	3677.371	350	-330.759033	0	57	10	15	-103	7537.62
10/12/09 02:15:50	59.983	3676.915	350	-330.759033	0	57.5	10	15	-103	7537.95
10/12/09 02:15:52	59.98	3678.086	350	-330.759033	0	58	10	15	-103	7538.28
10/12/09 02:15:54	59.979	3679.233	350	-330.759033	0	58.5	10	15	-103	7538.61
10/12/09 02:15:56	59.983	3680.163	350	-323.419952	0	59	10	15	-103	7538.94
10/12/09 02:15:58	59.987	3679.213	350	-323.419952	0	59.5	10	15	-103	7539.27
10/12/09 02:16:00	59.986	3678.344	350	-323.419952	0	60	10	15	-103	7539.6
10/12/09 02:16:02	59.988	3677.653	350	-323.419952	0	60.5	10	15	-103	7539.93
10/12/09 02:16:04	59.987	3677.678	350	-323.419952	0	61	10	15	-103	7540.26
10/12/09 02:16:06	59.983	3678.951	350	-342.350922	0	61.5	10	15	-103	7540.59
10/12/09 02:16:08	59.978	3679.279	350	-342.350922	0	62	10	15	-103	7540.92
10/12/09 02:16:10	59.979	3678.729	350	-342.350922	0	62.5	10	15	-103	7541.25
10/12/09 02:16:12	59.979	3679.606	350	-342.350922	0	63	10	15	-103	7541.58
10/12/09 02:16:14	59.989	3680.287	350	-342.350922	0	63.5	10	15	-103	7541.91
10/12/09 02:16:16	59.991	3679.026	350	-345.081818	0	64	10	15	-103	7542.24
10/12/09 02:16:18	59.988	3678.813	350	-345.081818	0	64.5	10	15	-103	7542.57
10/12/09 02:16:20	59.983	3678.489	350	-345.081818	0	65	10	15	-103	7542.9
10/12/09 02:16:22	59.989	3678.72	350	-345.081818	0	65.5	10	15	-103	7543.23
10/12/09 02:16:24	59.991	3678.74	350	-345.081818	0	66	10	15	-103	7543.56
10/12/09 02:16:26	59.989	3678.971	350	-346.537384	0	66.5	10	15	-103	7543.89
10/12/09 02:16:28	59.992	3679.39	350	-346.537384	0	67	10	15	-103	7544.22
10/12/09 02:16:30	59.993	3677.063	350	-346.537384	0	67.5	10	15	-103	7544.55
10/12/09 02:16:32	59.995	3678.33	350	-346.537384	0	68	10	15	-103	7544.88
10/12/09 02:16:34	59.996	3678.49	350	-346.537384	0	68.5	10	15	-103	7545.21
10/12/09 02:16:36	59.998	3677.944	350	-342.905762	0	69	10	15	-103	7545.54
10/12/09 02:16:38	59.998	3676.763	350	-342.905762	0	69.5	10	15	-103	7545.87
10/12/09 02:16:40	60	3678.951	350	-342.905762	0	70	10	15	-103	7546.2
10/12/09 02:16:42	59.999	3678.456	350	-342.905762	0	70.5	10	15	-103	7546.53

10/12/09 02:16:44	59.995	3679.148	350	-342.905762	0	71	10	15	-103	7546.86
10/12/09 02:16:46	59.991	3679.903	350	-340.094391	0	71.5	10	15	-103	7547.19
10/12/09 02:16:48	59.992	3680.041	350	-340.094391	0	72	10	15	-103	7547.52
10/12/09 02:16:50	59.995	3678.997	350	-340.094391	0	72.5	10	15	-103	7547.85
10/12/09 02:16:52	59.998	3677.86	350	-340.094391	0	73	10	15	-103	7548.18
10/12/09 02:16:54	60.001	3678.493	350	-340.094391	0	73.5	10	15	-103	7548.51
10/12/09 02:16:56	60.003	3678.267	350	-342.771179	0	74	10	15	-103	7548.84
10/12/09 02:16:58	60.006	3677.686	350	-342.771179	0	74.5	10	15	-103	7549.17
10/12/09 02:17:00	60.009	3677.899	350	-342.771179	0	75	10	15	-103	7549.5
10/12/09 02:17:02	60.009	3678.364	350	-342.771179	0	75.5	10	15	-103	7549.83
10/12/09 02:17:04	60.011	3679.209	350	-342.771179	0	76	10	15	-103	7550.16
10/12/09 02:17:06	60.012	3678.659	350	-342.909912	0	76.5	10	15	-103	7550.49
10/12/09 02:17:08	60.011	3678.653	350	-342.909912	0	77	10	15	-103	7550.82
10/12/09 02:17:10	60.01	3679.057	350	-342.909912	0	77.5	10	15	-103	7551.15
10/12/09 02:17:12	60.008	3679.703	350	-342.909912	0	78	10	15	-103	7551.48
10/12/09 02:17:14	60.007	3680.604	350	-342.909912	0	78.5	10	15	-103	7551.81
10/12/09 02:17:16	60.011	3679.806	350	-343.286011	0	79	10	15	-103	7552.14
10/12/09 02:17:18	60.012	3680.625	350	-343.286011	0	79.5	10	15	-103	7552.47
10/12/09 02:17:20	60.013	3680.263	350	-343.286011	0	80	10	15	-103	7552.8
10/12/09 02:17:22	60.01	3679.851	350	-343.286011	0	80.5	10	15	-103	7553.13
10/12/09 02:17:24	60.01	3679.561	350	-343.286011	0	81	10	15	-103	7553.46
10/12/09 02:17:26	60.007	3679.946	350	-331.852966	0	81.5	10	15	-103	7553.79
10/12/09 02:17:28	60.009	3679.44	350	-331.852966	0	82	10	15	-103	7554.12
10/12/09 02:17:30	60.009	3679.912	350	-331.852966	0	82.5	10	15	-103	7554.45
10/12/09 02:17:32	60.006	3679.517	350	-331.852966	0	83	10	15	-103	7554.78
10/12/09 02:17:34	60.006	3679.888	350	-331.852966	0	83.5	10	15	-103	7555.11
10/12/09 02:17:36	60.009	3679.608	350	-329.98822	0	84	10	15	-103	7555.44
10/12/09 02:17:38	60.009	3679.06	350	-329.98822	0	84.5	10	15	-103	7555.77
10/12/09 02:17:40	60.008	3679.261	350	-329.98822	0	85	10	15	-103	7556.1
10/12/09 02:17:42	60.009	3679.164	350	-329.98822	0	85.5	10	15	-103	7556.43
10/12/09 02:17:44	60.009	3679.025	350	-329.98822	0	86	10	15	-103	7556.76
10/12/09 02:17:46	60.005	3679.152	350	-255.444168	0	86.5	10	15	-103	7557.09
10/12/09 02:17:48	60.004	3678.572	350	-255.444168	0	87	10	15	-103	7557.42
10/12/09 02:17:50	60.001	3678.295	350	-255.444168	0	87.5	10	15	-103	7557.75
10/12/09 02:17:52	59.999	3678.249	350	-255.444168	0	88	10	15	-103	7558.08
10/12/09 02:17:54	59.993	3678.236	350	-255.444168	0	88.5	10	15	-103	7558.41
10/12/09 02:17:56	59.991	3677.83	350	-254.838303	0	89	10	15	-103	7558.74
10/12/09 02:17:58	59.994	3677.955	350	-254.838303	0	89.5	10	15	-103	7559.07
10/12/09 02:18:00	59.992	3677.772	350	-254.838303	0	90	10	15	-103	7559.4
10/12/09 02:18:02	59.994	3676.666	350	-254.838303	0	90.5	10	15	-103	7559.73
10/12/09 02:18:04	59.992	3677.093	350	-254.838303	0	91	10	15	-103	7560.06
10/12/09 02:18:06	59.994	3677.141	350	-257.146973	0	91.5	10	15	-103	7560.39
10/12/09 02:18:08	59.995	3676.401	350	-257.146973	0	92	10	15	-103	7560.72
10/12/09 02:18:10	59.993	3678.516	350	-257.146973	0	92.5	10	15	-103	7561.05
10/12/09 02:18:12	59.99	3679.872	350	-257.146973	0	93	10	15	-103	7561.38
10/12/09 02:18:14	59.99	3680.197	350	-257.146973	0	93.5	10	15	-103	7561.71
10/12/09 02:18:16	59.987	3678.743	350	-262.289368	0	94	10	15	-103	7562.04
10/12/09 02:18:18	59.983	3678.428	350	-262.289368	0	94.5	10	15	-103	7562.37
10/12/09 02:18:20	59.977	3677.921	350	-262.289368	0	95	10	15	-103	7562.7

10/12/09 02:18:22	59.977	3680.254	350	-262.289368	0	95.5	10	15	-103	7563.03
10/12/09 02:18:24	59.989	3682.07	350	-262.289368	0	96	10	15	-103	7563.36
10/12/09 02:18:26	59.995	3681.329	350	-256.647949	0	96.5	10	15	-103	7563.69
10/12/09 02:18:28	59.999	3678.656	350	-256.647949	0	97	10	15	-103	7564.02
10/12/09 02:18:30	59.994	3678.077	350	-256.647949	0	97.5	10	15	-103	7564.35
10/12/09 02:18:32	59.989	3677.78	350	-256.647949	0	98	10	15	-103	7564.68
10/12/09 02:18:34	59.987	3678.427	350	-256.647949	0	98.5	10	15	-103	7565.01
10/12/09 02:18:36	59.986	3678.473	350	-256.307251	0	99	10	15	-103	7565.34
10/12/09 02:18:38	59.984	3678.278	350	-256.307251	0	99.5	10	15	-103	7565.67
10/12/09 02:18:40	59.983	3677.822	350	-256.307251	0	100	10	15	-103	7566
10/12/09 02:18:42	59.985	3676.615	350	-256.307251	0	100.5	10	15	-103	7566.33
10/12/09 02:18:44	59.986	3677.397	350	-256.307251	0	101	10	15	-103	7566.66
10/12/09 02:18:46	59.985	3677.917	350	-249.086395	0	101.5	10	15	-103	7566.99
10/12/09 02:18:48	59.986	3677.95	350	-249.086395	0	102	10	15	-103	7567.32
10/12/09 02:18:50	59.98	3678.617	350	-249.086395	0	102.5	10	15	-103	7567.65
10/12/09 02:18:52	59.981	3678.963	350	-249.086395	0	103	10	15	-103	7567.98
10/12/09 02:18:54	59.981	3681.252	350	-249.086395	0	103.5	10	15	-103	7568.31
10/12/09 02:18:56	59.989	3680.737	350	-253.742477	0	104	10	15	-103	7568.64
10/12/09 02:18:58	59.998	3680.045	350	-253.742477	0	104.5	10	15	-103	7568.97
10/12/09 02:19:00	60.007	3678.161	350	-253.742477	0	105	10	15	-103	7569.3
10/12/09 02:19:02	60.007	3674.076	350	-253.742477	0	105.5	10	15	-103	7569.63
10/12/09 02:19:04	59.997	3676.222	350	-253.742477	0	106	10	15	-103	7569.96
10/12/09 02:19:06	59.986	3676.669	350	-257.421204	0	106.5	10	15	-103	7570.29
10/12/09 02:19:08	59.981	3677.497	350	-257.421204	0	107	10	15	-103	7570.62
10/12/09 02:19:10	59.977	3677.49	350	-257.421204	0	107.5	10	15	-103	7570.95
10/12/09 02:19:12	59.974	3675.186	350	-257.421204	0	108	10	15	-103	7571.28
10/12/09 02:19:14	59.976	3675.437	350	-257.421204	0	108.5	10	15	-103	7571.61
10/12/09 02:19:16	59.974	3680.451	350	-261.73822	0	109	10	15	-103	7571.94
10/12/09 02:19:18	59.974	3682.032	350	-261.73822	0	109.5	10	15	-103	7572.27
10/12/09 02:19:20	59.977	3683.829	350	-261.73822	0	110	10	15	-103	7572.6
10/12/09 02:19:22	59.979	3682.843	350	-261.73822	0	110.5	10	15	-103	7572.93
10/12/09 02:19:24	59.979	3681.108	350	-261.73822	0	111	10	15	-103	7573.26
10/12/09 02:19:26	59.982	3680.566	350	-271.875977	0	111.5	10	15	-103	7573.59
10/12/09 02:19:28	59.984	3678.229	350	-271.875977	0	112	10	15	-103	7573.92
10/12/09 02:19:30	59.987	3676.752	350	-271.875977	0	112.5	10	15	-103	7574.25
10/12/09 02:19:32	59.988	3675.759	350	-271.875977	0	113	10	15	-103	7574.58
10/12/09 02:19:34	59.988	3671.942	350	-271.875977	0	113.5	10	15	-103	7574.91
10/12/09 02:19:36	59.987	3671.166	350	-262.073486	0	114	10	15	-103	7575.24
10/12/09 02:19:38	59.987	3670.476	350	-262.073486	0	114.5	10	15	-103	7575.57
10/12/09 02:19:40	59.987	3670.129	350	-262.073486	0	115	10	15	-103	7575.9
10/12/09 02:19:42	59.985	3671.542	350	-262.073486	0	115.5	10	15	-103	7576.23
10/12/09 02:19:44	59.984	3672.048	350	-262.073486	0	116	10	15	-103	7576.56
10/12/09 02:19:46	59.982	3671.576	350	-260.36441	0	116.5	10	15	-103	7576.89
10/12/09 02:19:48	59.983	3672.104	350	-260.36441	0	117	10	15	-103	7577.22
10/12/09 02:19:50	59.989	3672.414	350	-260.36441	0	117.5	10	15	-103	7577.55
10/12/09 02:19:52	59.989	3671.882	350	-260.36441	0	118	10	15	-103	7577.88
10/12/09 02:19:54	59.988	3671.837	350	-260.36441	0	118.5	10	15	-103	7578.21
10/12/09 02:19:56	59.984	3671.336	350	-352.644379	0	119	10	15	-103	7578.54
10/12/09 02:19:58	59.982	3670.726	350	-352.644379	0	119.5	10	15	-103	7578.87

10/12/09 02:20:00	59.983	3670.372	350	-352.644379	0	120	10	15	-103	7579.2
10/12/09 02:20:02	59.981	3671.364	350	-352.644379	0	120.5	10	15	-103	7579.53
10/12/09 02:20:04	59.982	3671.401	350	-352.644379	0	121	10	15	-103	7579.86
10/12/09 02:20:06	59.983	3672.156	350	-354.89566	0	121.5	10	15	-103	7580.19
10/12/09 02:20:08	59.986	3672.181	350	-354.89566	0	122	10	15	-103	7580.52
10/12/09 02:20:10	59.989	3670.296	350	-354.89566	0	122.5	10	15	-103	7580.85
10/12/09 02:20:12	59.987	3668.071	350	-354.89566	0	123	10	15	-103	7581.18
10/12/09 02:20:14	59.985	3668.59	350	-354.89566	0	123.5	10	15	-103	7581.51
10/12/09 02:20:16	59.98	3669.908	350	-340.46936	0	124	10	15	-103	7581.84
10/12/09 02:20:18	59.98	3670.399	350	-340.46936	0	124.5	10	15	-103	7582.17
10/12/09 02:20:20	59.983	3670.263	350	-340.46936	0	125	10	15	-103	7582.5
10/12/09 02:20:22	59.98	3669.382	350	-340.46936	0	125.5	10	15	-103	7582.83
10/12/09 02:20:24	59.979	3670.102	350	-340.46936	0	126	10	15	-103	7583.16
10/12/09 02:20:26	59.979	3670.438	350	-337.642914	0	126.5	10	15	-103	7583.49
10/12/09 02:20:28	59.981	3671.403	350	-337.642914	0	127	10	15	-103	7583.82
10/12/09 02:20:30	59.981	3672.442	350	-337.642914	0	127.5	10	15	-103	7584.15
10/12/09 02:20:32	59.98	3672.372	350	-337.642914	0	128	10	15	-103	7584.48
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10/12/09 02:20:36	59.981	3670.938	350	-284.36084	0	129	10	15	-103	7585.14
10/12/09 02:20:38	59.98	3670.705	350	-284.36084	0	129.5	10	15	-103	7585.47
10/12/09 02:20:40	59.98	3670.137	350	-284.36084	0	130	10	15	-103	7585.8
10/12/09 02:20:42	59.977	3669.279	350	-284.36084	0	130.5	10	15	-103	7586.13
10/12/09 02:20:44	59.979	3672.391	350	-284.36084	0	131	10	15	-103	7586.46
10/12/09 02:20:46	59.981	3672.558	350	-260.467987	0	131.5	10	15	-103	7586.79
10/12/09 02:20:48	59.979	3674.052	350	-260.467987	0	132	10	15	-103	7587.12
10/12/09 02:20:50	59.976	3672.626	350	-260.467987	0	132.5	10	15	-103	7587.45
10/12/09 02:20:52	59.977	3671.8	350	-260.467987	0	133	10	15	-103	7587.78
10/12/09 02:20:54	59.972	3673.183	350	-260.467987	0	133.5	10	15	-103	7588.11
10/12/09 02:20:56	59.971	3673.874	350	-253.141541	0	134	10	15	-103	7588.44
10/12/09 02:20:58	59.973	3676.263	350	-253.141541	0	134.5	10	15	-103	7588.77
10/12/09 02:21:00	59.973	3676.623	350	-253.141541	0	135	10	15	-103	7589.1
10/12/09 02:21:02	59.973	3676.87	350	-253.141541	0	135.5	10	15	-103	7589.43
10/12/09 02:21:04	59.974	3676.543	350	-253.141541	0	136	10	15	-103	7589.76
10/12/09 02:21:06	59.971	3675.464	350	-251.929871	0	136.5	10	15	-103	7590.09
10/12/09 02:21:08	59.975	3675.752	350	-251.929871	0	137	10	15	-103	7590.42
10/12/09 02:21:10	59.977	3675.256	350	-251.929871	0	137.5	10	15	-103	7590.75
10/12/09 02:21:12	59.977	3674.87	350	-251.929871	0	138	10	15	-103	7591.08
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10/12/09 02:21:16	59.976	3671.593	350	-250.674194	0	139	10	15	-103	7591.74
10/12/09 02:21:18	59.98	3670.587	350	-250.674194	0	139.5	10	15	-103	7592.07
10/12/09 02:21:20	59.979	3669.963	350	-250.674194	0	140	10	15	-103	7592.4
10/12/09 02:21:22	59.981	3669.54	350	-250.674194	0	140.5	10	15	-103	7592.73
10/12/09 02:21:24	59.982	3669.497	350	-250.674194	0	141	10	15	-103	7593.06
10/12/09 02:21:26	59.982	3668.706	350	-253.631866	0	141.5	10	15	-103	7593.39
10/12/09 02:21:28	59.982	3667.677	350	-253.631866	0	142	10	15	-103	7593.72
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10/12/09 02:21:34	59.982	3666.911	350	-253.631866	0	143.5	10	15	-103	7594.71
10/12/09 02:21:36	59.984	3666.442	350	-246.957306	0	144	10	15	-103	7595.04

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10/12/09 02:21:48	59.998	3663.825	350	-254.541779	0	147	10	15	-103	7597.02
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10/12/09 02:22:00	60.014	3662.959	350	-256.571594	0	150	10	15	-103	7599
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10/12/09 02:22:04	60.008	3664.139	350	-256.571594	0	151	10	15	-103	7599.66
10/12/09 02:22:06	60.008	3665.278	350	-258.37262	0	151.5	10	15	-103	7599.99
10/12/09 02:22:08	60.01	3664.159	350	-258.37262	0	152	10	15	-103	7600.32
10/12/09 02:22:10	60.019	3663.265	350	-258.37262	0	152.5	10	15	-103	7600.65
10/12/09 02:22:12	60.019	3663.184	350	-258.37262	0	153	10	15	-103	7600.98
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10/12/09 02:22:16	60.021	3661.512	350	-263.047363	0	154	10	15	-103	7601.64
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10/12/09 02:22:20	60.021	3658.661	350	-263.047363	0	155	10	15	-103	7602.3
10/12/09 02:22:22	60.021	3656.785	350	-263.047363	0	155.5	10	15	-103	7602.63
10/12/09 02:22:24	60.02	3657.571	350	-263.047363	0	156	10	15	-103	7602.96
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10/12/09 02:22:48	60.019	3662.531	350	-262.1026	0	162	10	15	-103	7606.92
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10/12/09 02:23:28	60.008	3666.726	350	-264.5979	0	172	10	15	-103	7613.52
10/12/09 02:23:30	60.011	3667.677	350	-264.5979	0	172.5	10	15	-103	7613.85
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10/12/09 02:23:36	60.012	3666.449	350	-262.415924	0	174	10	15	-103	7614.84
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10/12/09 02:23:40	60.009	3667.696	350	-262.415924	0	175	10	15	-103	7615.5
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10/12/09 02:24:04	59.998	3666.133	350	-255.911011	0	181	10	15	-103	7619.46
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10/12/09 02:24:08	59.995	3666.735	350	-258.148193	0	182	10	15	-103	7620.12
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10/12/09 02:24:12	59.993	3667.557	350	-258.148193	0	183	10	15	-103	7620.78
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10/12/09 02:24:16	59.988	3667.853	350	-258.873596	0	184	10	15	-103	7621.44
10/12/09 02:24:18	59.982	3668.116	350	-258.873596	0	184.5	10	15	-103	7621.77
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10/12/09 02:24:24	59.982	3669.606	350	-258.873596	0	186	10	15	-103	7622.76
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10/12/09 02:24:28	59.982	3670.25	350	-249.33757	0	187	10	15	-103	7623.42
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10/12/09 02:24:32	59.978	3671.549	350	-249.33757	0	188	10	15	-103	7624.08
10/12/09 02:24:34	59.976	3673.243	350	-249.33757	0	188.5	10	15	-103	7624.41
10/12/09 02:24:36	59.975	3674.263	350	-258.278168	0	189	10	15	-103	7624.74
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10/12/09 02:24:40	59.974	3676.418	350	-258.278168	0	190	10	15	-103	7625.4
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10/12/09 02:24:44	59.98	3674.637	350	-258.278168	0	191	10	15	-103	7626.06
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10/12/09 02:24:52	59.987	3674.399	350	-258.406372	0	193	10	15	-103	7627.38

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10/12/09 02:24:56	59.988	3673.04	350	-260.538879	0	194	10	15	-103	7628.04
10/12/09 02:24:58	59.99	3672.442	350	-260.538879	0	194.5	10	15	-103	7628.37
10/12/09 02:25:00	59.992	3673.056	350	-260.538879	0	195	10	15	-103	7628.7
10/12/09 02:25:02	59.991	3671.68	350	-260.538879	0	195.5	10	15	-103	7629.03
10/12/09 02:25:04	59.991	3671.493	350	-260.538879	0	196	10	15	-103	7629.36
10/12/09 02:25:06	59.991	3669.53	350	-257.88208	0	196.5	10	15	-103	7629.69
10/12/09 02:25:08	59.993	3670.066	350	-257.88208	0	197	10	15	-103	7630.02
10/12/09 02:25:10	59.993	3670.028	350	-257.88208	0	197.5	10	15	-103	7630.35
10/12/09 02:25:12	59.996	3671.744	350	-257.88208	0	198	10	15	-103	7630.68
10/12/09 02:25:14	60.002	3671.578	350	-257.88208	0	198.5	10	15	-103	7631.01
10/12/09 02:25:16	60.002	3672.625	350	-258.588654	0	199	10	15	-103	7631.34
10/12/09 02:25:18	60.003	3672.674	350	-258.588654	0	199.5	10	15	-103	7631.67
10/12/09 02:25:20	60.004	3673.819	350	-258.588654	0	200	10	15	-103	7632
10/12/09 02:25:22	60.005	3673.25	350	-258.588654	0	200.5	10	15	-103	7632.33
10/12/09 02:25:24	60.004	3673.182	350	-258.588654	0	201	10	15	-103	7632.66
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10/12/09 02:25:36	60.01	3673.182	350	-256.747803	0	204	10	15	-103	7634.64
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10/12/09 02:25:44	60.013	3674.537	350	-256.747803	0	206	10	15	-103	7635.96
10/12/09 02:25:46	60.012	3673.813	350	-167.431976	0	206.5	10	15	-103	7636.29
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10/12/09 02:25:52	60.017	3673.068	350	-167.431976	0	208	10	15	-103	7637.28
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10/12/09 02:25:56	60.017	3672.52	350	-164.973404	0	209	10	15	-103	7637.94
10/12/09 02:25:58	60.014	3671.25	350	-164.973404	0	209.5	10	15	-103	7638.27
10/12/09 02:26:00	60.013	3671.288	350	-164.973404	0	210	10	15	-103	7638.6
10/12/09 02:26:02	60.014	3672.989	350	-164.973404	0	210.5	10	15	-103	7638.93
10/12/09 02:26:04	60.017	3672.982	350	-164.973404	0	211	10	15	-103	7639.26
10/12/09 02:26:06	60.017	3672.915	350	-157.628082	0	211.5	10	15	-103	7639.59
10/12/09 02:26:08	60.019	3671.952	350	-157.628082	0	212	10	15	-103	7639.92
10/12/09 02:26:10	60.019	3671.193	350	-157.628082	0	212.5	10	15	-103	7640.25
10/12/09 02:26:12	60.019	3671.627	350	-157.628082	0	213	10	15	-103	7640.58
10/12/09 02:26:14	60.027	3671.189	350	-157.628082	0	213.5	10	15	-103	7640.91
10/12/09 02:26:16	60.026	3668.611	350	-155.531708	0	214	10	15	-103	7641.24
10/12/09 02:26:18	60.026	3665.232	350	-155.531708	0	214.5	10	15	-103	7641.57
10/12/09 02:26:20	60.022	3664.495	350	-155.531708	0	215	10	15	-103	7641.9
10/12/09 02:26:22	60.019	3666.062	350	-155.531708	0	215.5	10	15	-103	7642.23
10/12/09 02:26:24	60.017	3666.821	350	-155.531708	0	216	10	15	-103	7642.56
10/12/09 02:26:26	60.019	3666.787	350	-160.447235	0	216.5	10	15	-103	7642.89
10/12/09 02:26:28	60.02	3670.454	350	-160.447235	0	217	10	15	-103	7643.22
10/12/09 02:26:30	60.019	3670.267	350	-160.447235	0	217.5	10	15	-103	7643.55

10/12/09 02:26:32	60.021	3671.668	350	-160.447235	0	218	10	15	-103	7643.88
10/12/09 02:26:34	60.021	3672.493	350	-160.447235	0	218.5	10	15	-103	7644.21
10/12/09 02:26:36	60.021	3672.685	350	-163.958603	0	219	10	15	-103	7644.54
10/12/09 02:26:38	60.019	3672.857	350	-163.958603	0	219.5	10	15	-103	7644.87
10/12/09 02:26:40	60.018	3672.164	350	-163.958603	0	220	10	15	-103	7645.2
10/12/09 02:26:42	60.022	3671.413	350	-163.958603	0	220.5	10	15	-103	7645.53
10/12/09 02:26:44	60.031	3669.983	350	-163.958603	0	221	10	15	-103	7645.86
10/12/09 02:26:46	60.037	3666.467	350	-166.072449	0	221.5	10	15	-103	7646.19
10/12/09 02:26:48	60.037	3663.758	350	-166.072449	0	222	10	15	-103	7646.52
10/12/09 02:26:50	60.036	3661.599	350	-166.072449	0	222.5	10	15	-103	7646.85
10/12/09 02:26:52	60.037	3660.672	350	-166.072449	0	223	10	15	-103	7647.18
10/12/09 02:26:54	60.046	3651.492	350	-166.072449	0	223.5	10	15	-103	7647.51
10/12/09 02:26:56	60.048	3649.19	350	-163.766586	0	224	10	15	-103	7647.84
10/12/09 02:26:58	60.048	3650.025	350	-163.766586	0	224.5	10	15	-103	7648.17
10/12/09 02:27:00	60.043	3648.246	350	-163.766586	0	225	10	15	-103	7648.5
10/12/09 02:27:02	60.041	3649.512	350	-163.766586	0	225.5	10	15	-103	7648.83
10/12/09 02:27:04	60.041	3654.294	350	-163.766586	0	226	10	15	-103	7649.16
10/12/09 02:27:06	60.041	3655.007	350	-165.101685	0	226.5	10	15	-103	7649.49
10/12/09 02:27:08	60.039	3651.874	350	-165.101685	0	227	10	15	-103	7649.82
10/12/09 02:27:10	60.041	3651.059	350	-165.101685	0	227.5	10	15	-103	7650.15
10/12/09 02:27:12	60.043	3649.187	350	-165.101685	0	228	10	15	-103	7650.48
10/12/09 02:27:14	60.045	3648.236	350	-165.101685	0	228.5	10	15	-103	7650.81
10/12/09 02:27:16	60.046	3645.387	350	-165.476395	0	229	10	15	-103	7651.14
10/12/09 02:27:18	60.041	3644.628	350	-165.476395	0	229.5	10	15	-103	7651.47
10/12/09 02:27:20	60.041	3645.446	350	-165.476395	0	230	10	15	-103	7651.8
10/12/09 02:27:22	60.041	3640.682	350	-165.476395	0	230.5	10	15	-103	7652.13
10/12/09 02:27:24	60.039	3641.191	350	-165.476395	0	231	10	15	-103	7652.46
10/12/09 02:27:26	59.978	3659.465	350	-206.459106	0	231.5	10	15	-103	7652.79
10/12/09 02:27:28	59.852	3696.362	350	-206.459106	0	232	10	0	-103	7616
10/12/09 02:27:30	59.836	3734.904	335	-206.459106	0	232.5	10	0	-103	7626
10/12/09 02:27:32	59.869	3734.673	335	-206.459106	0	233	10	0	-103	7632
10/12/09 02:27:34	59.892	3737.157	335	-206.459106	0	233.5	10	0	-103	7632
10/12/09 02:27:36	59.891	3761.25	335	-211.256042	0	234	10	0	-103	7632
10/12/09 02:27:38	59.88	3766.113	335	-211.256042	1	234.5	10	0	-103	7632
10/12/09 02:27:40	59.876	3766.194	335	-211.256042	1	235	10	0	-103	7632
10/12/09 02:27:42	59.875	3768.877	335	-211.256042	1	235.5	10	0	-103	7632
10/12/09 02:27:44	59.883	3769.925	335	-211.256042	1	236	10	0	-103	7632
10/12/09 02:27:46	59.887	3780.621	335	-214.346695	1	236.5	10	0	-103	7632
10/12/09 02:27:48	59.886	3781.592	335	-214.346695	1	237	10	0	-103	7632
10/12/09 02:27:50	59.885	3782.5	335	-214.346695	1	237.5	10	0	-103	7632
10/12/09 02:27:52	59.887	3784.962	335	-214.346695	2	238	10	0	-103	7632
10/12/09 02:27:54	59.888	3784.73	335	-214.346695	3	238.5	10	0	-103	7632
10/12/09 02:27:56	59.89	3784.419	335	-212.172699	4	239	10	0	-103	7632
10/12/09 02:27:58	59.895	3788.072	335	-212.172699	5	239.5	10	0	-103	7632
10/12/09 02:28:00	59.894	3788.328	335	-212.172699	6	240	10	0	-103	7632
10/12/09 02:28:02	59.893	3788.868	335	-212.172699	7	240.5	10	0	-103	7632
10/12/09 02:28:04	59.894	3788.472	335	-212.172699	8	241	10	0	-103	7632
10/12/09 02:28:06	59.894	3792.276	335	-215.598175	9	241.5	10	0	-103	7632
10/12/09 02:28:08	59.891	3793.074	335	-215.598175	10	242	10	0	-103	7632

10/12/09 02:28:10	59.89	3794.374	335	-215.598175	11	242.5	10	0	-103	7632
10/12/09 02:28:12	59.885	3799.428	335	-215.598175	12	243	10	0	-103	7632
10/12/09 02:28:14	59.885	3800.427	335	-215.598175	13	243.5	10	0	-103	7632
10/12/09 02:28:16	59.888	3799.959	335	-218.327255	14	244	10	0	-103	7632
10/12/09 02:28:18	59.887	3803.625	335	-218.327255	15	244.5	10	0	-103	7632
10/12/09 02:28:20	59.888	3802.925	335	-218.327255	16	245	10	0	-103	7632
10/12/09 02:28:22	59.888	3802.951	335	-218.327255	16	245.5	10	0	-103	7632
10/12/09 02:28:24	59.89	3804.388	335	-218.327255	16	246	10	0	-103	7632
10/12/09 02:28:26	59.889	3805.496	335	-217.379425	16	246.5	10	0	-103	7632
10/12/09 02:28:28	59.882	3805.617	335	-217.379425	16	247	10	0	-103	7632
10/12/09 02:28:30	59.873	3809.237	335	-217.379425	16	247.5	10	0	-103	7631
10/12/09 02:28:32	59.857	3811.503	335	-217.379425	16	248	10	0	-103	7625
10/12/09 02:28:34	59.849	3814.862	335	-217.379425	16	248.5	10	0	-103	7623
10/12/09 02:28:36	59.852	3815.889	335	-214.830353	16	249	10	0	-103	7621
10/12/09 02:28:38	59.858	3825.643	335	-214.830353	16	249.5	10	0	-103	7623
10/12/09 02:28:40	59.863	3826.053	335	-214.830353	16	250	10	0	-103	7625
10/12/09 02:28:42	59.866	3826.002	335	-214.830353	16	250.5	10	0	-103	7627
10/12/09 02:28:44	59.865	3827.524	335	-214.830353	16	251	10	0	-103	7628
10/12/09 02:28:46	59.867	3826.753	335	-227.655914	16	251.5	10	0	-103	7628
10/12/09 02:28:48	59.866	3826.783	335	-227.655914	16	252	10	0	-103	7629
10/12/09 02:28:50	59.871	3826.454	335	-227.655914	16	252.5	10	0	-103	7630
10/12/09 02:28:52	59.874	3825.713	335	-227.655914	16	253	10	0	-103	7631
10/12/09 02:28:54	59.879	3823.826	335	-227.655914	16	253.5	10	0	-103	7635
10/12/09 02:28:56	59.88	3822.505	335	-225.018082	16	254	10	0	-103	7638
10/12/09 02:28:58	59.883	3819.081	335	-225.018082	16	254.5	10	0	-103	7639
10/12/09 02:29:00	59.886	3818.055	335	-225.018082	16	255	10	0	-103	7642
10/12/09 02:29:02	59.89	3816.815	335	-225.018082	16	255.5	10	0	-103	7644
10/12/09 02:29:04	59.892	3815.01	335	-225.018082	16	256	10	0	-103	7645
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10/12/09 02:29:08	59.893	3811.838	335	-228.365158	16	257	10	0	-103	7648
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10/12/09 02:29:12	59.903	3806.972	335	-228.365158	16	258	10	0	-103	7650
10/12/09 02:29:14	59.902	3805.593	335	-228.365158	16	258.5	10	0	-103	7651
10/12/09 02:29:16	59.902	3804.188	335	-234.075333	16	259	10	0	-103	7652
10/12/09 02:29:18	59.904	3796.078	335	-234.075333	16	259.5	10	0	-103	7653
10/12/09 02:29:20	59.907	3793.975	335	-234.075333	16	260	10	0	-103	7654
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10/12/09 02:29:24	59.916	3791.502	335	-234.075333	16	261	10	0	-103	7655
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10/12/09 02:29:28	59.917	3788.132	335	-228.798157	16	262	10	0	-103	7656
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10/12/09 02:29:32	59.92	3783.028	335	-228.798157	16	263	10	0	-103	7657
10/12/09 02:29:34	59.921	3781.701	335	-228.798157	16	263.5	10	0	-103	7658
10/12/09 02:29:36	59.92	3776.358	335	-229.466965	16	264	10	0	-103	7658
10/12/09 02:29:38	59.917	3775.635	335	-229.466965	16	264.5	10	0	-103	7659
10/12/09 02:29:40	59.92	3774.604	335	-229.466965	16	265	10	0	-103	7659
10/12/09 02:29:42	59.921	3773.334	335	-229.466965	16	265.5	10	0	-103	7659
10/12/09 02:29:44	59.923	3773.958	335	-229.466965	16	266	10	0	-103	7660
10/12/09 02:29:46	59.926	3772.722	335	-228.980164	16	266.5	10	0	-103	7660

10/12/09 02:29:48	59.925	3771.67	335	-228.980164	16	267	10	0	-103	7661
10/12/09 02:29:50	59.928	3769.63	335	-228.980164	16	267.5	10	0	-103	7661
10/12/09 02:29:52	59.927	3768.707	335	-228.980164	16	268	10	0	-103	7662
10/12/09 02:29:54	59.932	3767.643	335	-228.980164	16	268.5	10	0	-103	7662
10/12/09 02:29:56	59.927	3767.021	335	-219.975555	16	269	10	0	-103	7663
10/12/09 02:29:58	59.928	3767.408	335	-219.975555	16	269.5	10	0	-103	7663
10/12/09 02:30:00	59.931	3766.788	335	-219.975555	16	270	10	0	-103	7664
10/12/09 02:30:02	59.929	3766.259	335	-219.975555	16	270.5	10	0	-103	7664
10/12/09 02:30:04	59.931	3765.672	335	-219.975555	16	271	10	0	-103	7665
10/12/09 02:30:06	59.933	3766.123	335	-229.089249	16	271.5	10	0	-103	7666
10/12/09 02:30:08	59.937	3764.243	335	-229.089249	16	272	10	0	-103	7666
10/12/09 02:30:10	59.937	3765.105	335	-229.089249	16	272.5	10	0	-103	7667
10/12/09 02:30:12	59.945	3762.935	335	-229.089249	16	273	10	0	-103	7668
10/12/09 02:30:14	59.949	3758.387	335	-229.089249	16	273.5	10	0	-103	7668
10/12/09 02:30:16	59.947	3753.922	335	-229.663269	16	274	10	0	-103	7669
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10/12/09 02:30:20	59.941	3746.889	335	-229.663269	16	275	10	0	-103	7670
10/12/09 02:30:22	59.942	3747.875	335	-229.663269	16	275.5	10	0	-103	7670
10/12/09 02:30:24	59.945	3749.593	335	-229.663269	16	276	10	0	-103	7671
10/12/09 02:30:26	59.948	3748.661	335	-229.233856	16	276.5	10	0	-103	7671
10/12/09 02:30:28	59.947	3746.706	335	-229.233856	16	277	10	0	-103	7672
10/12/09 02:30:30	59.949	3749.077	335	-229.233856	16	277.5	10	0	-103	7673
10/12/09 02:30:32	59.951	3742.741	335	-229.233856	16	278	10	0	-103	7673
10/12/09 02:30:34	59.952	3740.259	350	-229.233856	16	278.5	10	0	-103	7673
10/12/09 02:30:36	59.953	3736.139	350	-231.409882	16	279	10	0	-103	7673
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10/12/09 02:30:44	59.952	3722.649	350	-231.409882	16	281	10	0	-103	7673
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10/12/09 02:30:48	59.952	3717.996	350	-218.622284	16	282	10	0	-103	7673
10/12/09 02:30:50	59.954	3718.142	350	-218.622284	16	282.5	10	0	-103	7673
10/12/09 02:30:52	59.952	3715.753	350	-218.622284	16	283	10	0	-103	7673
10/12/09 02:30:54	59.953	3713.694	350	-218.622284	16	283.5	10	0	-103	7673
10/12/09 02:30:56	59.953	3713.484	350	-213.535858	16	284	10	0	-103	7673
10/12/09 02:30:58	59.952	3710.848	350	-213.535858	16	284.5	10	0	-103	7673
10/12/09 02:31:00	59.954	3710.81	350	-213.535858	16	285	10	0	-103	7673
10/12/09 02:31:02	59.954	3712.092	350	-213.535858	16	285.5	10	0	-103	7674
10/12/09 02:31:04	59.959	3714.623	350	-213.535858	16	286	10	0	-103	7675
10/12/09 02:31:06	59.957	3715.13	350	-225.651855	16	286.5	10	0	-103	7676
10/12/09 02:31:08	59.956	3716.168	350	-225.651855	16	287	10	0	-103	7677
10/12/09 02:31:10	59.954	3716.461	350	-225.651855	16	287.5	10	0	-103	7678
10/12/09 02:31:12	59.956	3716.98	350	-225.651855	16	288	10	0	-103	7679
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10/12/09 02:31:16	59.958	3722.361	350	-212.573639	16	289	10	0	-103	7681
10/12/09 02:31:18	59.961	3721.973	350	-212.573639	16	289.5	10	0	-103	7682
10/12/09 02:31:20	59.962	3722.658	350	-212.573639	16	290	10	0	-103	7684
10/12/09 02:31:22	59.962	3722.267	350	-212.573639	16	290.5	10	0	-103	7685
10/12/09 02:31:24	59.968	3722.278	350	-212.573639	16	291	10	0	-103	7687

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10/12/09 02:31:28	59.966	3723.091	350	-219.897293	16	292	10	0	-103	7690
10/12/09 02:31:30	59.968	3723.984	350	-219.897293	16	292.5	10	0	-103	7692
10/12/09 02:31:32	59.97	3723.435	350	-219.897293	16	293	10	0	-103	7692
10/12/09 02:31:34	59.974	3723.893	350	-219.897293	16	293.5	10	0	-103	7693
10/12/09 02:31:36	59.97	3725.403	350	-231.1754	16	294	10	0	-103	7693
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10/12/09 02:31:40	59.969	3728.053	350	-231.1754	16	295	10	0	-103	7694
10/12/09 02:31:42	59.97	3731.13	350	-231.1754	16	295.5	10	0	-103	7695
10/12/09 02:31:44	59.971	3732.53	350	-231.1754	16	296	10	0	-103	7695
10/12/09 02:31:46	59.973	3733.327	350	-226.634125	16	296.5	10	0	-103	7695
10/12/09 02:31:48	59.973	3736.535	350	-226.634125	16	297	10	0	-103	7696
10/12/09 02:31:50	59.976	3736.907	350	-226.634125	16	297.5	10	0	-103	7696
10/12/09 02:31:52	59.978	3736.822	350	-226.634125	16	298	10	0	-103	7697
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10/12/09 02:32:02	59.978	3745.234	350	-227.255066	16	300.5	10	0	-103	7698.33
10/12/09 02:32:04	59.977	3746.608	350	-227.255066	16	301	10	0	-103	7698.66
10/12/09 02:32:06	59.98	3748.3	350	-229.290222	16	301.5	10	0	-103	7698.99
10/12/09 02:32:08	59.982	3750.716	350	-229.290222	16	302	10	0	-103	7699.32
10/12/09 02:32:10	59.981	3751.558	350	-229.290222	16	302.5	10	0	-103	7699.65
10/12/09 02:32:12	59.98	3752.748	350	-229.290222	16	303	10	0	-103	7699.98
10/12/09 02:32:14	59.979	3755.599	350	-229.290222	16	303.5	10	0	-103	7700.31
10/12/09 02:32:16	59.98	3756.407	350	-221.461365	16	304	10	0	-103	7700.64
10/12/09 02:32:18	59.979	3756.975	350	-221.461365	16	304.5	10	0	-103	7700.97
10/12/09 02:32:20	59.983	3760.405	350	-221.461365	16	305	10	0	-103	7701.3
10/12/09 02:32:22	59.983	3760.982	350	-221.461365	16	305.5	10	0	-103	7701.63
10/12/09 02:32:24	59.984	3761.407	350	-221.461365	16	306	10	0	-103	7701.96
10/12/09 02:32:26	59.988	3762.737	350	-241.274368	16	306.5	10	0	-103	7702.29
10/12/09 02:32:28	59.989	3763.212	350	-241.274368	16	307	10	0	-103	7702.62
10/12/09 02:32:30	59.987	3764.958	350	-241.274368	16	307.5	10	0	-103	7702.95
10/12/09 02:32:32	59.987	3766.085	350	-241.274368	16	308	10	0	-103	7703.28
10/12/09 02:32:34	59.991	3766.433	350	-241.274368	16	308.5	10	0	-103	7703.61
10/12/09 02:32:36	59.993	3767.251	350	-243.071854	16	309	10	0	-103	7703.94
10/12/09 02:32:38	59.992	3767.792	350	-243.071854	16	309.5	10	0	-103	7704.27
10/12/09 02:32:40	59.991	3768.634	350	-243.071854	16	310	10	0	-103	7704.6
10/12/09 02:32:42	59.989	3771.146	350	-243.071854	16	310.5	10	0	-103	7704.93
10/12/09 02:32:44	59.986	3772.445	350	-243.071854	16	311	10	0	-103	7705.26
10/12/09 02:32:46	59.983	3773.695	350	-241.670212	16	311.5	10	0	-103	7705.59
10/12/09 02:32:48	59.983	3774.668	350	-241.670212	16	312	10	0	-103	7705.92
10/12/09 02:32:50	59.988	3775.841	350	-241.670212	16	312.5	10	0	-103	7706.25
10/12/09 02:32:52	59.993	3775.363	350	-241.670212	16	313	10	0	-103	7706.58
10/12/09 02:32:54	59.996	3774.866	350	-241.670212	16	313.5	10	0	-103	7706.91
10/12/09 02:32:56	59.998	3775.492	350	-228.149307	16	314	10	0	-103	7707.24
10/12/09 02:32:58	59.999	3776.42	350	-228.149307	16	314.5	10	0	-103	7707.57
10/12/09 02:33:00	60.001	3778.554	350	-228.149307	16	315	10	0	-103	7707.9
10/12/09 02:33:02	59.999	3779.692	350	-228.149307	16	315.5	10	0	-103	7708.23

10/12/09 02:33:04	59.999	3781.256	350	-228.149307	16	316	10	0	-103	7708.56
10/12/09 02:33:06	59.999	3780.595	350	-235.128983	16	316.5	10	0	-103	7708.89
10/12/09 02:33:08	60.002	3783.092	350	-235.128983	16	317	10	0	-103	7709.22
10/12/09 02:33:10	60.005	3783.896	350	-235.128983	16	317.5	10	0	-103	7709.55
10/12/09 02:33:12	60.007	3784.421	350	-235.128983	16	318	10	0	-103	7709.88
10/12/09 02:33:14	60.008	3785.768	350	-235.128983	16	318.5	10	0	-103	7710.21
10/12/09 02:33:16	60.011	3785.463	350	-246.433136	16	319	10	0	-103	7710.54
10/12/09 02:33:18	60.014	3786.85	350	-246.433136	16	319.5	10	0	-103	7710.87
10/12/09 02:33:20	60.017	3786.304	350	-246.433136	16	320	10	0	-103	7711.2
10/12/09 02:33:22	60.019	3787.259	350	-246.433136	16	320.5	10	0	-103	7711.53
10/12/09 02:33:24	60.021	3787.516	350	-246.433136	16	321	10	0	-103	7711.86
10/12/09 02:33:26	60.017	3787.955	350	-236.553543	16	321.5	10	0	-103	7712.19
10/12/09 02:33:28	60.017	3788.03	350	-236.553543	16	322	10	0	-103	7712.52
10/12/09 02:33:30	60.019	3788.607	350	-236.553543	16	322.5	10	0	-103	7712.85
10/12/09 02:33:32	60.023	3789.216	350	-236.553543	16	323	10	0	-103	7713.18
10/12/09 02:33:34	60.024	3787.537	350	-236.553543	16	323.5	10	0	-103	7713.51
10/12/09 02:33:36	60.025	3785.842	350	-230.297562	16	324	10	0	-103	7713.84
10/12/09 02:33:38	60.021	3786.077	350	-230.297562	16	324.5	10	0	-103	7714.17
10/12/09 02:33:40	60.019	3787.93	350	-230.297562	16	325	10	0	-103	7714.5
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10/12/09 02:33:44	60.024	3786.875	350	-230.297562	16	326	10	0	-103	7715.16
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10/12/09 02:33:48	60.02	3787.358	350	-231.175537	16	327	10	0	-103	7715.82
10/12/09 02:33:50	60.025	3785.018	350	-231.175537	16	327.5	10	0	-103	7716.15
10/12/09 02:33:52	60.024	3785.614	350	-231.175537	16	328	10	0	-103	7716.48
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10/12/09 02:33:56	60.02	3785.804	350	-225.61763	16	329	10	0	-103	7717.14
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10/12/09 02:34:04	60.021	3785.726	350	-225.61763	16	331	10	0	-103	7718.46
10/12/09 02:34:06	60.021	3786.347	350	-230.734421	16	331.5	10	0	-103	7718.79
10/12/09 02:34:08	60.023	3785.821	350	-230.734421	16	332	10	0	-103	7719.12
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10/12/09 02:34:12	60.022	3786.284	350	-230.734421	16	333	10	0	-103	7719.78
10/12/09 02:34:14	60.019	3786.939	350	-230.734421	16	333.5	10	0	-103	7720.11
10/12/09 02:34:16	60.016	3787.627	350	-234.847107	16	334	10	0	-103	7720.44
10/12/09 02:34:18	60.018	3789.444	350	-234.847107	16	334.5	10	0	-103	7720.77
10/12/09 02:34:20	60.018	3789.673	350	-234.847107	16	335	10	0	-103	7721.1
10/12/09 02:34:22	60.018	3789.404	350	-234.847107	16	335.5	10	0	-103	7721.43
10/12/09 02:34:24	60.019	3788.479	350	-234.847107	16	336	10	0	-103	7721.76
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10/12/09 02:34:32	60.016	3788.665	350	-228.960922	16	338	10	0	-103	7723.08
10/12/09 02:34:34	60.014	3788.933	350	-228.960922	16	338.5	10	0	-103	7723.41
10/12/09 02:34:36	60.013	3790.667	350	-231.177917	16	339	10	0	-103	7723.74
10/12/09 02:34:38	60.012	3790.805	350	-231.177917	16	339.5	10	0	-103	7724.07
10/12/09 02:34:40	60.012	3790.411	350	-231.177917	16	340	10	0	-103	7724.4

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10/12/09 02:34:44	60.007	3791.54	350	-231.177917	16	341	10	0	-103	7725.06
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10/12/09 02:34:56	59.999	3790.457	350	-245.038925	16	344	10	0	-103	7727.04
10/12/09 02:34:58	59.995	3790.216	350	-245.038925	16	344.5	10	0	-103	7727.37
10/12/09 02:35:00	59.992	3789.585	350	-245.038925	16	345	10	0	-103	7727.7
10/12/09 02:35:02	59.991	3788.457	350	-245.038925	16	345.5	10	0	-103	7728.03
10/12/09 02:35:04	59.992	3788.105	350	-245.038925	16	346	10	0	-103	7728.36
10/12/09 02:35:06	59.992	3788.057	350	-223.605682	16	346.5	10	0	-103	7728.69
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10/12/09 02:35:12	59.985	3788.54	350	-223.605682	16	348	10	0	-103	7729.68
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10/12/09 02:35:20	59.982	3786.453	350	-231.119354	16	350	10	0	-103	7731
10/12/09 02:35:22	59.981	3787.732	350	-231.119354	16	350.5	10	0	-103	7731.33
10/12/09 02:35:24	59.982	3788.813	350	-231.119354	16	351	10	0	-103	7731.66
10/12/09 02:35:26	59.979	3789.285	350	-237.20665	16	351.5	10	0	-103	7731.99
10/12/09 02:35:28	59.977	3788.256	350	-237.20665	16	352	10	0	-103	7732.32
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10/12/09 02:35:32	59.976	3790.467	350	-237.20665	16	353	10	0	-103	7732.98
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10/12/09 02:35:40	59.976	3789.267	350	-240.516373	16	355	10	0	-103	7734.3
10/12/09 02:35:42	59.974	3789.148	350	-240.516373	16	355.5	10	0	-103	7734.63
10/12/09 02:35:44	59.976	3790.43	350	-240.516373	16	356	10	0	-103	7734.96
10/12/09 02:35:46	59.977	3789.914	350	-237.566055	16	356.5	10	0	-103	7735.29
10/12/09 02:35:48	59.977	3786.243	350	-237.566055	16	357	10	0	-103	7735.62
10/12/09 02:35:50	59.975	3787.442	350	-237.566055	16	357.5	10	0	-103	7735.95
10/12/09 02:35:52	59.973	3788.963	350	-237.566055	16	358	10	0	-103	7736.28
10/12/09 02:35:54	59.969	3790.602	350	-237.566055	16	358.5	10	0	-103	7736.61
10/12/09 02:35:56	59.97	3791.877	350	-231.581421	16	359	10	0	-103	7736.94
10/12/09 02:35:58	59.971	3792.911	350	-231.581421	16	359.5	10	0	-103	7737.27
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10/12/09 02:36:02	59.978	3789.125	350	-231.581421	16	360.5	10	0	-103	7737.93
10/12/09 02:36:04	59.981	3788.08	350	-231.581421	16	361	10	0	-103	7738.26
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10/12/09 02:36:08	59.975	3787.135	350	-235.850845	16	362	10	0	-103	7738.92
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10/12/09 02:36:12	59.976	3786.996	350	-235.850845	16	363	10	0	-103	7739.58
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10/12/09 02:36:16	59.973	3786.487	350	-233.559982	16	364	10	0	-103	7740.24
10/12/09 02:36:18	59.969	3787.079	350	-233.559982	16	364.5	10	0	-103	7740.57

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10/12/09 02:36:22	59.965	3790.512	350	-233.559982	16	365.5	10	0	-103	7741.23
10/12/09 02:36:24	59.966	3791.221	350	-233.559982	16	366	10	0	-103	7741.56
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10/12/09 02:36:38	59.972	3785.69	350	-205.338913	16	369.5	10	0	-103	7743.87
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10/12/09 02:36:54	59.966	3778.633	350	-236.285355	16	373.5	10	0	-103	7746.51
10/12/09 02:36:56	59.965	3779.212	350	-223.015732	16	374	10	0	-103	7746.84
10/12/09 02:36:58	59.971	3779.335	350	-223.015732	16	374.5	10	0	-103	7747.17
10/12/09 02:37:00	59.967	3776.429	350	-223.015732	16	375	10	0	-103	7747.5
10/12/09 02:37:02	59.965	3775.647	350	-223.015732	16	375.5	10	0	-103	7747.83
10/12/09 02:37:04	59.962	3776.597	350	-223.015732	16	376	10	0	-103	7748.16
10/12/09 02:37:06	59.964	3776.559	350	-223.015732	16	376.5	10	0	-103	7748.49
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10/12/09 02:37:24	59.968	3760.295	350	-223.015732	16	381	10	0	-103	7751.46
10/12/09 02:37:26	59.965	3759.592	350	-223.015732	16	381.5	10	0	-103	7751.79
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10/12/09 02:37:34	59.964	3760.157	350	-223.015732	16	383.5	10	0	-103	7753.11
10/12/09 02:37:36	59.966	3759.781	350	-223.015732	16	384	10	0	-103	7753.44
10/12/09 02:37:38	59.979	3759.495	350	-223.015732	16	384.5	10	0	-103	7753.77
10/12/09 02:37:40	59.99	3757.773	350	-223.015732	16	385	10	0	-103	7754.1
10/12/09 02:37:42	59.983	3753.277	350	-223.015732	16	385.5	10	0	-103	7754.43
10/12/09 02:37:44	59.974	3753.087	350	-223.015732	16	386	10	0	-103	7754.76
10/12/09 02:37:46	59.967	3751.637	350	-223.015732	16	386.5	10	0	-103	7755.09
10/12/09 02:37:48	59.965	3753.751	350	-223.015732	16	387	10	0	-103	7755.42
10/12/09 02:37:50	59.962	3758.225	350	-223.015732	16	387.5	10	0	-103	7755.75
10/12/09 02:37:52	59.962	3759.25	350	-223.015732	16	388	10	0	-103	7756.08
10/12/09 02:37:54	59.961	3758.041	350	-223.015732	16	388.5	10	0	-103	7756.41
10/12/09 02:37:56	59.961	3760.965	350	-223.015732	16	389	10	0	-103	7756.74

10/12/09 02:37:58	59.96	3762.022	350	-223.015732	16	389.5	10	0	-103	7757.07
10/12/09 02:38:00	59.963	3763.822	350	-223.015732	16	390	10	0	-103	7757.4
10/12/09 02:38:02	59.959	3763.1	350	-223.015732	16	390.5	10	0	-103	7757.73
10/12/09 02:38:04	59.956	3763.858	350	-223.015732	16	391	10	0	-103	7758.06
10/12/09 02:38:06	59.951	3764.158	350	-223.015732	16	391.5	10	0	-103	7758.39
10/12/09 02:38:08	59.953	3766.127	350	-223.015732	16	392	10	0	-103	7758.72
10/12/09 02:38:10	59.954	3768.339	350	-223.015732	16	392.5	10	0	-103	7759.05
10/12/09 02:38:12	59.957	3767.972	350	-223.015732	16	393	10	0	-103	7759.38
10/12/09 02:38:14	59.956	3767.438	350	-223.015732	16	393.5	10	0	-103	7759.71
10/12/09 02:38:16	59.961	3765.606	350	-223.015732	16	394	10	0	-103	7760.04
10/12/09 02:38:18	59.963	3762.688	350	-223.015732	16	394.5	10	0	-103	7760.37
10/12/09 02:38:20	59.961	3761.57	350	-223.015732	16	395	10	0	-103	7760.7
10/12/09 02:38:22	59.959	3761.92	350	-223.015732	16	395.5	10	0	-103	7761.03
10/12/09 02:38:24	59.963	3759.627	350	-223.015732	16	396	10	0	-103	7761.36
10/12/09 02:38:26	59.963	3758.522	350	-223.015732	16	396.5	10	0	-103	7761.69
10/12/09 02:38:28	59.965	3752.429	350	-223.015732	16	397	10	0	-103	7762.02
10/12/09 02:38:30	59.968	3750.102	350	-223.015732	16	397.5	10	0	-103	7762.35
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10/12/09 02:38:38	59.973	3752.741	350	-223.015732	16	399.5	10	0	-103	7763.67
10/12/09 02:38:40	59.971	3753.178	350	-223.015732	16	400	10	0	-103	7764
10/12/09 02:38:42	59.965	3752.729	350	-223.015732	16	400.5	10	0	-103	7764.33
10/12/09 02:38:44	59.967	3753.291	350	-223.015732	16	401	10	0	-103	7764.66
10/12/09 02:38:46	59.967	3752.872	350	-223.015732	16	401.5	10	0	-103	7764.99
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10/12/09 02:38:52	59.975	3747.476	350	-223.015732	16	403	10	0	-103	7765.98
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10/12/09 02:38:56	59.973	3741.285	350	-223.015732	16	404	10	0	-103	7766.64
10/12/09 02:38:58	59.974	3746.651	350	-223.015732	16	404.5	10	0	-103	7766.97
10/12/09 02:39:00	59.978	3745.738	350	-223.015732	16	405	10	0	-103	7767.3
10/12/09 02:39:02	59.981	3743.351	350	-223.015732	16	405.5	10	0	-103	7767.63
10/12/09 02:39:04	59.981	3741.618	350	-223.015732	16	406	10	0	-103	7767.96
10/12/09 02:39:06	59.981	3740.306	350	-223.015732	16	406.5	10	0	-103	7768.29
10/12/09 02:39:08	59.982	3738.484	350	-223.015732	16	407	10	0	-103	7768.62
10/12/09 02:39:10	59.982	3738.901	350	-223.015732	16	407.5	10	0	-103	7768.95
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10/12/09 02:39:28	59.981	3736.748	350	-223.015732	16	412	10	0	-103	7771.92
10/12/09 02:39:30	59.98	3736.693	350	-223.015732	16	412.5	10	0	-103	7772.25
10/12/09 02:39:32	59.978	3736.067	350	-223.015732	16	413	10	0	-103	7772.58
10/12/09 02:39:34	59.976	3736.094	350	-223.015732	16	413.5	10	0	-103	7772.91

10/12/09 02:39:36	59.972	3736.575	350	-223.015732	16	414	10	0	-103	7773.24
10/12/09 02:39:38	59.971	3738.571	350	-223.015732	16	414.5	10	0	-103	7773.57
10/12/09 02:39:40	59.969	3738.875	350	-223.015732	16	415	10	0	-103	7773.9
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10/12/09 02:39:56	59.972	3742.053	350	-223.015732	16	419	10	0	-103	7776.54
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10/12/09 02:40:10	59.973	3739.964	350	-223.015732	16	422.5	10	0	-103	7778.85
10/12/09 02:40:12	59.974	3740.775	350	-223.015732	16	423	10	0	-103	7779.18
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10/12/09 02:40:18	59.978	3739.776	350	-223.015732	16	424.5	10	0	-103	7780.17
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10/12/09 02:40:42	59.971	3750.7	350	-223.015732	16	430.5	10	0	-103	7784.13
10/12/09 02:40:44	59.973	3749.75	350	-223.015732	16	431	10	0	-103	7784.46
10/12/09 02:40:46	59.972	3746.217	350	-223.015732	16	431.5	10	0	-103	7784.79
10/12/09 02:40:48	59.969	3744.683	350	-223.015732	16	432	10	0	-103	7785.12
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10/12/09 02:40:56	59.97	3739.453	350	-223.015732	16	434	10	0	-103	7786.44
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10/12/09 02:41:08	59.985	3733.434	350	-223.015732	16	437	10	0	-103	7788.42
10/12/09 02:41:10	59.987	3733.115	350	-223.015732	16	437.5	10	0	-103	7788.75
10/12/09 02:41:12	59.989	3730.51	350	-223.015732	16	438	10	0	-103	7789.08

10/12/09 02:41:14	59.989	3729.18	350	-223.015732	16	438.5	10	0	-103	7789.41
10/12/09 02:41:16	59.986	3725.459	350	-223.015732	16	439	10	0	-103	7789.74
10/12/09 02:41:18	59.987	3724.785	350	-223.015732	16	439.5	10	0	-103	7790.07
10/12/09 02:41:20	59.99	3720.108	350	-223.015732	16	440	10	0	-103	7790.4
10/12/09 02:41:22	59.994	3720.938	350	-223.015732	16	440.5	10	0	-103	7790.73
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10/12/09 02:41:36	60.014	3725.012	350	-223.015732	16	444	10	0	-103	7793.04
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10/12/09 02:41:44	60.026	3716.375	350	-223.015732	16	446	10	0	-103	7794.36
10/12/09 02:41:46	60.027	3717.333	350	-223.015732	16	446.5	10	0	-103	7794.69
10/12/09 02:41:48	60.029	3717.56	350	-223.015732	16	447	10	0	-103	7795.02
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10/12/09 02:41:54	60.036	3713.632	350	-223.015732	16	448.5	10	0	-103	7796.01
10/12/09 02:41:56	60.037	3710.283	350	-223.015732	16	449	10	0	-103	7796.34
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10/12/09 02:42:36	60.039	3698.787	350	-223.015732	16	459	10	0	-103	7802.94
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10/12/09 02:42:42	60.033	3699.968	350	-223.015732	16	460.5	10	0	-103	7803.93
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10/12/09 02:42:48	60.037	3701.614	350	-223.015732	16	462	10	0	-103	7804.92
10/12/09 02:42:50	60.035	3701.998	350	-223.015732	16	462.5	10	0	-103	7805.25

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10/12/09 02:42:54	60.033	3703.909	350	-223.015732	16	463.5	10	0	-103	7805.91
10/12/09 02:42:56	60.036	3705.522	350	-223.015732	16	464	10	0	-103	7806.24
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10/12/09 02:43:24	60.036	3702.525	350	-223.015732	16	471	10	0	-103	7810.86
10/12/09 02:43:26	60.034	3703.269	350	-223.015732	16	471.5	10	0	-103	7811.19
10/12/09 02:43:28	60.038	3703.844	350	-223.015732	16	472	10	0	-103	7811.52
10/12/09 02:43:30	60.037	3702.865	350	-223.015732	16	472.5	10	0	-103	7811.85
10/12/09 02:43:32	60.037	3702.518	350	-223.015732	16	473	10	0	-103	7812.18
10/12/09 02:43:34	60.037	3702.28	350	-223.015732	16	473.5	10	0	-103	7812.51
10/12/09 02:43:36	60.038	3692.427	350	-223.015732	16	474	10	0	-103	7812.84
10/12/09 02:43:38	60.04	3692.178	350	-223.015732	16	474.5	10	0	-103	7813.17
10/12/09 02:43:40	60.043	3700.276	350	-223.015732	16	475	10	0	-103	7813.5
10/12/09 02:43:42	60.045	3698.755	350	-223.015732	16	475.5	10	0	-103	7813.83
10/12/09 02:43:44	60.045	3697.729	350	-223.015732	16	476	10	0	-103	7814.16
10/12/09 02:43:46	60.042	3696.916	350	-223.015732	16	476.5	10	0	-103	7814.49
10/12/09 02:43:48	60.043	3697.368	350	-223.015732	16	477	10	0	-103	7814.82
10/12/09 02:43:50	60.04	3697.346	350	-223.015732	16	477.5	10	0	-103	7815.15
10/12/09 02:43:52	60.044	3698.429	350	-223.015732	16	478	10	0	-103	7815.48
10/12/09 02:43:54	60.046	3694.763	350	-223.015732	16	478.5	10	0	-103	7815.81
10/12/09 02:43:56	60.042	3693.584	350	-223.015732	16	479	10	0	-103	7816.14
10/12/09 02:43:58	60.034	3693.241	350	-223.015732	16	479.5	10	0	-103	7816.47
10/12/09 02:44:00	60.039	3696.798	350	-223.015732	16	480	10	0	-103	7816.8
10/12/09 02:44:02	60.039	3699.364	350	-223.015732	16	480.5	10	0	-103	7817.13
10/12/09 02:44:04	60.036	3701.791	350	-223.015732	16	481	10	0	-103	7817.46
10/12/09 02:44:06	60.037	3700.708	350	-223.015732	16	481.5	10	0	-103	7817.79
10/12/09 02:44:08	60.034	3700.753	350	-223.015732	16	482	10	0	-103	7818.12
10/12/09 02:44:10	60.033	3702.148	350	-223.015732	16	482.5	10	0	-103	7818.45
10/12/09 02:44:12	60.032	3705.213	350	-223.015732	16	483	10	0	-103	7818.78
10/12/09 02:44:14	60.031	3707.521	350	-223.015732	16	483.5	10	0	-103	7819.11
10/12/09 02:44:16	60.033	3707.287	350	-223.015732	16	484	10	0	-103	7819.44
10/12/09 02:44:18	60.027	3706.988	350	-223.015732	16	484.5	10	0	-103	7819.77
10/12/09 02:44:20	60.031	3707.34	350	-223.015732	16	485	10	0	-103	7820.1
10/12/09 02:44:22	60.032	3707.917	350	-223.015732	16	485.5	10	0	-103	7820.43
10/12/09 02:44:24	60.031	3707.384	350	-223.015732	16	486	10	0	-103	7820.76
10/12/09 02:44:26	60.031	3706.857	350	-223.015732	16	486.5	10	0	-103	7821.09
10/12/09 02:44:28	60.033	3707.615	350	-223.015732	16	487	10	0	-103	7821.42

10/12/09 02:44:30	60.039	3706.823	350	-223.015732	16	487.5	10	0	-103	7821.75
10/12/09 02:44:32	60.039	3703.746	350	-223.015732	16	488	10	0	-103	7822.08
10/12/09 02:44:34	60.038	3701.582	350	-223.015732	16	488.5	10	0	-103	7822.41
10/12/09 02:44:36	60.037	3700.847	350	-223.015732	16	489	10	0	-103	7822.74
10/12/09 02:44:38	60.035	3701.208	350	-223.015732	16	489.5	10	0	-103	7823.07
10/12/09 02:44:40	60.037	3702.212	350	-223.015732	16	490	10	0	-103	7823.4
10/12/09 02:44:42	60.04	3701.686	350	-223.015732	16	490.5	10	0	-103	7823.73
10/12/09 02:44:44	60.042	3700.397	350	-223.015732	16	491	10	0	-103	7824.06
10/12/09 02:44:46	60.035	3699.69	350	-223.015732	16	491.5	10	0	-103	7824.39
10/12/09 02:44:48	60.036	3700.366	350	-223.015732	16	492	10	0	-103	7824.72
10/12/09 02:44:50	60.04	3700.827	350	-223.015732	16	492.5	10	0	-103	7825.05
10/12/09 02:44:52	60.045	3700.662	350	-223.015732	16	493	10	0	-103	7825.38
10/12/09 02:44:54	60.045	3696.935	350	-223.015732	16	493.5	10	0	-103	7825.71
10/12/09 02:44:56	60.048	3695.688	350	-223.015732	16	494	10	0	-103	7826.04
10/12/09 02:44:58	60.042	3695.819	350	-223.015732	16	494.5	10	0	-103	7826.37
10/12/09 02:45:00	60.044	3693.824	350	-223.015732	16	495	10	0	-103	7826.7
10/12/09 02:45:02	60.044	3694.799	350	-223.015732	16	495.5	10	0	-103	7827.03
10/12/09 02:45:04	60.044	3696.897	350	-223.015732	16	496	10	0	-103	7827.36
10/12/09 02:45:06	60.041	3696.023	350	-223.015732	16	496.5	10	0	-103	7827.69
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10/12/09 02:45:12	60.045	3699.427	350	-223.015732	16	498	10	0	-103	7828.68
10/12/09 02:45:14	60.044	3700.177	350	-223.015732	16	498.5	10	0	-103	7829.01
10/12/09 02:45:16	60.042	3699.806	350	-223.015732	16	499	10	0	-103	7829.34
10/12/09 02:45:18	60.039	3697.577	350	-223.015732	16	499.5	10	0	-103	7829.67
10/12/09 02:45:20	60.042	3697.681	350	-223.015732	16	500	10	0	-103	7830
10/12/09 02:45:22	60.042	3698.507	350	-223.015732	16	500.5	10	0	-103	7830.33
10/12/09 02:45:24	60.041	3698.359	350	-223.015732	16	501	10	0	-103	7830.66
10/12/09 02:45:26	60.038	3698.466	350	-223.015732	16	501.5	10	0	-103	7830.99
10/12/09 02:45:28	60.036	3699.077	350	-223.015732	16	502	10	0	-103	7831.32
10/12/09 02:45:30	60.037	3700.262	350	-223.015732	16	502.5	10	0	-103	7831.65
10/12/09 02:45:32	60.039	3701.592	350	-223.015732	16	503	10	0	-103	7831.98
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10/12/09 02:45:40	60.037	3701.139	350	-223.015732	16	505	10	0	-103	7833.3
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10/12/09 02:45:44	60.039	3700.264	350	-223.015732	16	506	10	0	-103	7833.96
10/12/09 02:45:46	60.04	3699.458	350	-223.015732	16	506.5	10	0	-103	7834.29
10/12/09 02:45:48	60.037	3699.721	350	-223.015732	16	507	10	0	-103	7834.62
10/12/09 02:45:50	60.037	3700.458	350	-223.015732	16	507.5	10	0	-103	7834.95
10/12/09 02:45:52	60.037	3699.505	350	-223.015732	16	508	10	0	-103	7835.28
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10/12/09 02:45:56	60.038	3699.216	350	-223.015732	16	509	10	0	-103	7835.94
10/12/09 02:45:58	60.036	3699.4	350	-223.015732	16	509.5	10	0	-103	7836.27
10/12/09 02:46:00	60.035	3700.661	350	-223.015732	16	510	10	0	-103	7836.6
10/12/09 02:46:02	60.033	3702.173	350	-223.015732	16	510.5	10	0	-103	7836.93
10/12/09 02:46:04	60.031	3702.968	350	-223.015732	16	511	10	0	-103	7837.26
10/12/09 02:46:06	60.03	3705.195	350	-223.015732	16	511.5	10	0	-103	7837.59

10/12/09 02:46:08	60.032	3704.952	350	-223.015732	16	512	10	0	-103	7837.92
10/12/09 02:46:10	60.032	3705.775	350	-223.015732	16	512.5	10	0	-103	7838.25
10/12/09 02:46:12	60.037	3705.621	350	-223.015732	16	513	10	0	-103	7838.58
10/12/09 02:46:14	60.042	3703.744	350	-223.015732	16	513.5	10	0	-103	7838.91
10/12/09 02:46:16	60.041	3701.981	350	-223.015732	16	514	10	0	-103	7839.24
10/12/09 02:46:18	60.036	3700.756	350	-223.015732	16	514.5	10	0	-103	7839.57
10/12/09 02:46:20	60.031	3700.747	350	-223.015732	16	515	10	0	-103	7839.9
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10/12/09 02:46:30	60.032	3703.831	350	-223.015732	16	517.5	10	0	-103	7841.55
10/12/09 02:46:32	60.038	3703.62	350	-223.015732	16	518	10	0	-103	7841.88
10/12/09 02:46:34	60.043	3702.795	350	-223.015732	16	518.5	10	0	-103	7842.21
10/12/09 02:46:36	60.044	3701.432	350	-223.015732	16	519	10	0	-103	7842.54
10/12/09 02:46:38	60.042	3697.38	350	-223.015732	16	519.5	10	0	-103	7842.87
10/12/09 02:46:40	60.045	3696.25	350	-223.015732	16	520	10	0	-103	7843.2
10/12/09 02:46:42	60.04	3696.302	350	-223.015732	16	520.5	10	0	-103	7843.53
10/12/09 02:46:44	60.04	3693.518	350	-223.015732	16	521	10	0	-103	7843.86
10/12/09 02:46:46	60.043	3693.577	350	-223.015732	16	521.5	10	0	-103	7844.19
10/12/09 02:46:48	60.043	3695.197	350	-223.015732	16	522	10	0	-103	7844.52
10/12/09 02:46:50	60.041	3695.186	350	-223.015732	16	522.5	10	0	-103	7844.85
10/12/09 02:46:52	60.04	3693.786	350	-223.015732	16	523	10	0	-103	7845.18
10/12/09 02:46:54	60.038	3694.753	350	-223.015732	16	523.5	10	0	-103	7845.51
10/12/09 02:46:56	60.043	3694.926	350	-223.015732	16	524	10	0	-103	7845.84
10/12/09 02:46:58	60.044	3694.938	350	-223.015732	16	524.5	10	0	-103	7846.17
10/12/09 02:47:00	60.042	3694.159	350	-223.015732	16	525	10	0	-103	7846.5
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10/12/09 02:47:08	60.042	3693.39	350	-223.015732	16	527	10	0	-103	7847.82
10/12/09 02:47:10	60.043	3692.357	350	-223.015732	16	527.5	10	0	-103	7848.15
10/12/09 02:47:12	60.043	3690.951	350	-223.015732	16	528	10	0	-103	7848.48
10/12/09 02:47:14	60.036	3690.836	350	-223.015732	16	528.5	10	0	-103	7848.81
10/12/09 02:47:16	60.039	3692.042	350	-223.015732	16	529	10	0	-103	7849.14
10/12/09 02:47:18	60.039	3693.114	350	-223.015732	16	529.5	10	0	-103	7849.47
10/12/09 02:47:20	60.037	3694.117	350	-223.015732	16	530	10	0	-103	7849.8
10/12/09 02:47:22	60.034	3695.258	350	-223.015732	16	530.5	10	0	-103	7850.13
10/12/09 02:47:24	60.035	3695.581	350	-223.015732	16	531	10	0	-103	7850.46
10/12/09 02:47:26	60.035	3695.949	350	-223.015732	16	531.5	10	0	-103	7850.79
10/12/09 02:47:28	60.035	3695.491	350	-223.015732	16	532	10	0	-103	7851.12
10/12/09 02:47:30	60.036	3696.305	350	-223.015732	16	532.5	10	0	-103	7851.45
10/12/09 02:47:32	60.03	3696.486	350	-223.015732	16	533	10	0	-103	7851.78
10/12/09 02:47:34	60.03	3697.336	350	-223.015732	16	533.5	10	0	-103	7852.11
10/12/09 02:47:36	60.03	3699.171	350	-223.015732	16	534	10	0	-103	7852.44
10/12/09 02:47:38	60.031	3699.357	350	-223.015732	16	534.5	10	0	-103	7852.77
10/12/09 02:47:40	60.031	3699.251	350	-223.015732	16	535	10	0	-103	7853.1
10/12/09 02:47:42	60.032	3699.117	350	-223.015732	16	535.5	10	0	-103	7853.43
10/12/09 02:47:44	60.031	3699.105	350	-223.015732	16	536	10	0	-103	7853.76

10/12/09 02:47:46	60.032	3699.126	350	-223.015732	16	536.5	10	0	-103	7854.09
10/12/09 02:47:48	60.032	3698.954	350	-223.015732	16	537	10	0	-103	7854.42
10/12/09 02:47:50	60.032	3698.136	350	-223.015732	16	537.5	10	0	-103	7854.75
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10/12/09 02:47:54	60.037	3697.412	350	-223.015732	16	538.5	10	0	-103	7855.41
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10/12/09 02:48:04	60.039	3691.919	350	-223.015732	16	541	10	0	-103	7857.06
10/12/09 02:48:06	60.041	3692.798	350	-223.015732	16	541.5	10	0	-103	7857.39
10/12/09 02:48:08	60.04	3691.582	350	-223.015732	16	542	10	0	-103	7857.72
10/12/09 02:48:10	60.035	3692.374	350	-223.015732	16	542.5	10	0	-103	7858.05
10/12/09 02:48:12	60.036	3693.302	350	-223.015732	16	543	10	0	-103	7858.38
10/12/09 02:48:14	60.038	3694.71	350	-223.015732	16	543.5	10	0	-103	7858.71
10/12/09 02:48:16	60.037	3694.331	350	-223.015732	16	544	10	0	-103	7859.04
10/12/09 02:48:18	60.041	3693.815	350	-223.015732	16	544.5	10	0	-103	7859.37
10/12/09 02:48:20	60.04	3693.617	350	-223.015732	16	545	10	0	-103	7859.7
10/12/09 02:48:22	60.036	3694.324	350	-223.015732	16	545.5	10	0	-103	7860.03
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10/12/09 02:48:26	60.034	3694.66	350	-223.015732	16	546.5	10	0	-103	7860.69
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10/12/09 02:48:30	60.04	3692.532	350	-223.015732	16	547.5	10	0	-103	7861.35
10/12/09 02:48:32	60.041	3691.445	350	-223.015732	16	548	10	0	-103	7861.68
10/12/09 02:48:34	60.037	3691.012	350	-223.015732	16	548.5	10	0	-103	7862.01
10/12/09 02:48:36	60.037	3691.799	350	-223.015732	16	549	10	0	-103	7862.34
10/12/09 02:48:38	60.036	3693.077	350	-223.015732	16	549.5	10	0	-103	7862.67
10/12/09 02:48:40	60.037	3693.727	350	-223.015732	16	550	10	0	-103	7863
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10/12/09 02:48:52	60.031	3690.092	350	-223.015732	16	553	10	0	-103	7864.98
10/12/09 02:48:54	60.034	3693.172	350	-223.015732	16	553.5	10	0	-103	7865.31
10/12/09 02:48:56	60.029	3693.321	350	-223.015732	16	554	10	0	-103	7865.64
10/12/09 02:48:58	60.029	3694.593	350	-223.015732	16	554.5	10	0	-103	7865.97
10/12/09 02:49:00	60.031	3695.225	350	-223.015732	16	555	10	0	-103	7866.3
10/12/09 02:49:02	60.03	3694.609	350	-223.015732	16	555.5	10	0	-103	7866.63
10/12/09 02:49:04	60.03	3693.412	350	-223.015732	16	556	10	0	-103	7866.96
10/12/09 02:49:06	60.026	3693.509	350	-223.015732	16	556.5	10	0	-103	7867.29
10/12/09 02:49:08	60.022	3696.026	350	-223.015732	16	557	10	0	-103	7867.62
10/12/09 02:49:10	60.021	3698.012	350	-223.015732	16	557.5	10	0	-103	7867.95
10/12/09 02:49:12	60.024	3699.062	350	-223.015732	16	558	10	0	-103	7868.28
10/12/09 02:49:14	60.023	3699.414	350	-223.015732	16	558.5	10	0	-103	7868.61
10/12/09 02:49:16	60.02	3698.935	350	-223.015732	16	559	10	0	-103	7868.94
10/12/09 02:49:18	60.021	3700.084	350	-223.015732	16	559.5	10	0	-103	7869.27
10/12/09 02:49:20	60.023	3700.544	350	-223.015732	16	560	10	0	-103	7869.6
10/12/09 02:49:22	60.025	3700.486	350	-223.015732	16	560.5	10	0	-103	7869.93

10/12/09 02:49:24	60.026	3698.596	350	-223.015732	16	561	10	0	-103	7870.26
10/12/09 02:49:26	60.026	3697.961	350	-223.015732	16	561.5	10	0	-103	7870.59
10/12/09 02:49:28	60.025	3699.914	350	-223.015732	16	562	10	0	-103	7870.92
10/12/09 02:49:30	60.024	3700.802	350	-223.015732	16	562.5	10	0	-103	7871.25
10/12/09 02:49:32	60.024	3701.301	350	-223.015732	16	563	10	0	-103	7871.58
10/12/09 02:49:34	60.025	3701.45	350	-223.015732	16	563.5	10	0	-103	7871.91
10/12/09 02:49:36	60.023	3701.349	350	-223.015732	16	564	10	0	-103	7872.24
10/12/09 02:49:38	60.023	3701.094	350	-223.015732	16	564.5	10	0	-103	7872.57
10/12/09 02:49:40	60.022	3701.702	350	-223.015732	16	565	10	0	-103	7872.9
10/12/09 02:49:42	60.026	3702.07	350	-223.015732	16	565.5	10	0	-103	7873.23
10/12/09 02:49:44	60.029	3701.965	350	-223.015732	16	566	10	0	-103	7873.56
10/12/09 02:49:46	60.026	3700.269	350	-223.015732	16	566.5	10	0	-103	7873.89
10/12/09 02:49:48	60.024	3700.241	350	-223.015732	16	567	10	0	-103	7874.22
10/12/09 02:49:50	60.021	3701.09	350	-223.015732	16	567.5	10	0	-103	7874.55
10/12/09 02:49:52	60.025	3701.268	350	-223.015732	16	568	10	0	-103	7874.88
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10/12/09 02:50:16	60.019	3700.965	350	-223.015732	16	574	10	0	-103	7878.84
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10/12/09 02:50:30	60.017	3702.921	350	-223.015732	16	577.5	10	0	-103	7881.15
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10/12/09 02:50:54	59.993	3701.737	350	-223.015732	16	583.5	10	0	-103	7885.11
10/12/09 02:50:56	59.992	3700.671	350	-223.015732	16	584	10	0	-103	7885.44
10/12/09 02:50:58	59.989	3700.826	350	-223.015732	16	584.5	10	0	-103	7885.77
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10/12/09 02:51:02	59.985	3700.7	350	-223.015732	16	585.5	10	0	-103	7886.43
10/12/09 02:51:04	59.985	3699.854	350	-223.015732	16	586	10	0	-103	7886.76
10/12/09 02:51:06	59.986	3700.237	350	-223.015732	16	586.5	10	0	-103	7887.09
10/12/09 02:51:08	59.984	3700.342	350	-223.015732	16	587	10	0	-103	7887.42
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10/12/09 02:51:32	59.971	3707.027	350	-223.015732	16	593	10	0	-103	7891.38
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10/12/09 02:51:36	59.979	3710.531	350	-223.015732	16	594	10	0	-103	7892.04
10/12/09 02:51:38	59.98	3708.701	350	-223.015732	16	594.5	10	0	-103	7892.37
10/12/09 02:51:40	59.979	3708.018	350	-223.015732	16	595	10	0	-103	7892.7
10/12/09 02:51:42	59.982	3706.942	350	-223.015732	16	595.5	10	0	-103	7893.03
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10/12/09 02:51:52	59.978	3706.19	350	-223.015732	16	598	10	0	-103	7894.68
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10/12/09 02:51:58	59.977	3708.971	350	-223.015732	16	599.5	10	0	-103	7895.67
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10/12/09 02:52:06	59.971	3709.213	350	-223.015732	16	601.5	10	0	-103	7896.99
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10/12/09 02:52:40	60.024	3697.868	350	-223.015732	16	610	10	0	-103	7902.6
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10/12/09 02:52:44	60.025	3693.912	350	-223.015732	16	611	10	0	-103	7903.26
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10/12/09 02:54:42	59.975	3685.491	350	-223.015732	16	640.5	10	0	-103	7922.73
10/12/09 02:54:44	59.973	3685.196	350	-223.015732	16	641	10	0	-103	7923.06
10/12/09 02:54:46	59.975	3687.412	350	-223.015732	16	641.5	10	0	-103	7923.39
10/12/09 02:54:48	59.976	3688.417	350	-223.015732	16	642	10	0	-103	7923.72
10/12/09 02:54:50	59.976	3688.599	350	-223.015732	16	642.5	10	0	-103	7924.05
10/12/09 02:54:52	59.979	3687.848	350	-223.015732	16	643	10	0	-103	7924.38
10/12/09 02:54:54	59.982	3686.678	350	-223.015732	16	643.5	10	0	-103	7924.71
10/12/09 02:54:56	59.979	3685.782	350	-223.015732	16	644	10	0	-103	7925.04
10/12/09 02:54:58	59.979	3684.89	350	-223.015732	16	644.5	10	0	-103	7925.37
10/12/09 02:55:00	59.977	3685.143	350	-223.015732	16	645	10	0	-103	7925.7
10/12/09 02:55:02	59.977	3684.549	350	-223.015732	16	645.5	10	0	-103	7926.03
10/12/09 02:55:04	59.978	3684.093	350	-223.015732	16	646	10	0	-103	7926.36
10/12/09 02:55:06	59.978	3684.555	350	-223.015732	16	646.5	10	0	-103	7926.69
10/12/09 02:55:08	59.978	3682.814	350	-223.015732	16	647	10	0	-103	7927.02
10/12/09 02:55:10	59.979	3682.318	350	-223.015732	16	647.5	10	0	-103	7927.35
10/12/09 02:55:12	59.983	3682.366	350	-223.015732	16	648	10	0	-103	7927.68
10/12/09 02:55:14	59.981	3682.647	350	-223.015732	16	648.5	10	0	-103	7928.01
10/12/09 02:55:16	59.98	3682.855	350	-223.015732	16	649	10	0	-103	7928.34
10/12/09 02:55:18	59.978	3683.557	350	-223.015732	16	649.5	10	0	-103	7928.67
10/12/09 02:55:20	59.979	3684.052	350	-223.015732	16	650	10	0	-103	7929
10/12/09 02:55:22	59.978	3684.318	350	-223.015732	16	650.5	10	0	-103	7929.33
10/12/09 02:55:24	59.979	3686.049	350	-223.015732	16	651	10	0	-103	7929.66
10/12/09 02:55:26	59.983	3686.629	350	-223.015732	16	651.5	10	0	-103	7929.99
10/12/09 02:55:28	59.987	3685.286	350	-223.015732	16	652	10	0	-103	7930.32
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10/12/09 02:55:36	59.99	3679.012	350	-223.015732	16	654	10	0	-103	7931.64
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10/12/09 02:55:56	59.989	3685.03	350	-223.015732	16	659	10	0	-103	7934.94
10/12/09 02:55:58	59.984	3684.878	350	-223.015732	16	659.5	10	0	-103	7935.27
10/12/09 02:56:00	59.986	3684.165	350	-223.015732	16	660	10	0	-103	7935.6
10/12/09 02:56:02	59.985	3684.478	350	-223.015732	16	660.5	10	0	-103	7935.93
10/12/09 02:56:04	59.988	3685.584	350	-223.015732	16	661	10	0	-103	7936.26
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10/12/09 02:56:16	59.981	3684.245	350	-223.015732	16	664	10	0	-103	7938.24
10/12/09 02:56:18	59.982	3684.711	350	-223.015732	16	664.5	10	0	-103	7938.57
10/12/09 02:56:20	59.987	3685.589	350	-223.015732	16	665	10	0	-103	7938.9
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10/12/09 02:56:36	60.003	3681.65	350	-223.015732	16	669	10	0	-103	7941.54
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10/12/09 02:57:08	60.02	3675.865	350	-223.015732	16	677	10	0	-103	7946.82
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10/12/09 02:58:48	60.02	3674.645	350	-223.015732	16	702	10	0	-103	7963.32
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10/12/09 02:59:08	60.012	3680.11	350	-223.015732	16	707	10	0	-103	7966.62
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10/12/09 02:59:16	60.012	3679.637	350	-223.015732	16	709	10	0	-103	7967.94
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10/12/09 03:00:28	59.968	3692.966	350	-223.015732	16	727	10	0	-103	7979.82
10/12/09 03:00:30	59.968	3693.793	350	-223.015732	16	727.5	10	0	-103	7980.15
10/12/09 03:00:32	59.972	3694.397	350	-223.015732	16	728	10	0	-103	7980.48
10/12/09 03:00:34	59.967	3694.974	350	-223.015732	16	728.5	10	0	-103	7980.81
10/12/09 03:00:36	59.966	3697.407	350	-223.015732	16	729	10	0	-103	7981.14
10/12/09 03:00:38	59.964	3698.502	350	-223.015732	16	729.5	10	0	-103	7981.47
10/12/09 03:00:40	59.965	3698.617	350	-223.015732	16	730	10	0	-103	7981.8
10/12/09 03:00:42	59.966	3698.992	350	-223.015732	16	730.5	10	0	-103	7982.13
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10/12/09 03:00:46	59.963	3702.645	350	-223.015732	16	731.5	10	0	-103	7982.79
10/12/09 03:00:48	59.965	3701.989	350	-223.015732	16	732	10	0	-103	7983.12

10/12/09 03:00:50	59.968	3702.218	350	-223.015732	16	732.5	10	0	-103	7983.45
10/12/09 03:00:52	59.97	3704.023	350	-223.015732	16	733	10	0	-103	7983.78
10/12/09 03:00:54	59.97	3703.365	350	-223.015732	16	733.5	10	0	-103	7984.11
10/12/09 03:00:56	59.97	3702.988	350	-223.015732	16	734	10	0	-103	7984.44
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10/12/09 03:01:00	59.972	3704.899	350	-223.015732	16	735	10	0	-103	7985.1
10/12/09 03:01:02	59.976	3705.625	350	-223.015732	16	735.5	10	0	-103	7985.43
10/12/09 03:01:04	59.975	3704.293	350	-223.015732	16	736	10	0	-103	7985.76
10/12/09 03:01:06	59.975	3702.094	350	-223.015732	16	736.5	10	0	-103	7986.09
10/12/09 03:01:08	59.977	3701.944	350	-223.015732	16	737	10	0	-103	7986.42
10/12/09 03:01:10	59.976	3703.142	350	-223.015732	16	737.5	10	0	-103	7986.75
10/12/09 03:01:12	59.976	3704.669	350	-223.015732	16	738	10	0	-103	7987.08
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10/12/09 03:01:22	59.976	3707.514	350	-223.015732	16	740.5	10	0	-103	7988.73
10/12/09 03:01:24	59.977	3706.928	350	-223.015732	16	741	10	0	-103	7989.06
10/12/09 03:01:26	59.979	3706.446	350	-223.015732	16	741.5	10	0	-103	7989.39
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10/12/09 03:01:38	59.979	3705.974	350	-223.015732	16	744.5	10	0	-103	7991.37
10/12/09 03:01:40	59.983	3705.968	350	-223.015732	16	745	10	0	-103	7991.7
10/12/09 03:01:42	59.987	3705.356	350	-223.015732	16	745.5	10	0	-103	7992.03
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10/12/09 03:02:04	59.999	3701.308	350	-223.015732	16	751	10	0	-103	7995.66
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10/12/09 03:02:24	60.009	3698.032	350	-223.015732	16	756	10	0	-103	7998.96
10/12/09 03:02:26	60.01	3697.96	350	-223.015732	16	756.5	10	0	-103	7999.29

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10/12/09 03:02:30	60.005	3699.241	350	-223.015732	16	757.5	10	0	-103	7999.95
10/12/09 03:02:32	60.004	3700.738	350	-223.015732	16	758	10	0	-103	8000.28
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10/12/09 03:04:02	60.018	3703.895	350	-223.015732	16	780.5	10	0	-103	8015.13
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10/12/09 03:04:10	60.021	3704.795	350	-223.015732	16	782.5	10	0	-103	8016.45
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10/12/09 03:05:40	60.022	3704.406	350	-223.015732	16	805	10	0	-103	8031.3
10/12/09 03:05:42	60.02	3704.963	350	-223.015732	16	805.5	10	0	-103	8031.63

10/12/09 03:05:44	60.019	3706.567	350	-223.015732	16	806	10	0	-103	8031.96
10/12/09 03:05:46	60.022	3705.516	350	-223.015732	16	806.5	10	0	-103	8032.29
10/12/09 03:05:48	60.025	3704.869	350	-223.015732	16	807	10	0	-103	8032.62
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10/12/09 03:06:08	60.03	3698.222	350	-223.015732	16	812	10	0	-103	8035.92
10/12/09 03:06:10	60.022	3698.009	350	-223.015732	16	812.5	10	0	-103	8036.25
10/12/09 03:06:12	60.016	3700.28	350	-223.015732	16	813	10	0	-103	8036.58
10/12/09 03:06:14	60.019	3703.192	350	-223.015732	16	813.5	10	0	-103	8036.91
10/12/09 03:06:16	60.03	3703.815	350	-223.015732	16	814	10	0	-103	8037.24
10/12/09 03:06:18	60.028	3701.863	350	-223.015732	16	814.5	10	0	-103	8037.57
10/12/09 03:06:20	60.021	3699.956	350	-223.015732	16	815	10	0	-103	8037.9
10/12/09 03:06:22	60.015	3700.816	350	-223.015732	16	815.5	10	0	-103	8038.23
10/12/09 03:06:24	60.015	3703.802	350	-223.015732	16	816	10	0	-103	8038.56
10/12/09 03:06:26	60.012	3706.943	350	-223.015732	16	816.5	10	0	-103	8038.89
10/12/09 03:06:28	60.011	3708.527	350	-223.015732	16	817	10	0	-103	8039.22
10/12/09 03:06:30	60.014	3707.49	350	-223.015732	16	817.5	10	0	-103	8039.55
10/12/09 03:06:32	60.013	3707.647	350	-223.015732	16	818	10	0	-103	8039.88
10/12/09 03:06:34	60.014	3706.991	350	-223.015732	16	818.5	10	0	-103	8040.21
10/12/09 03:06:36	60.016	3707.495	350	-223.015732	16	819	10	0	-103	8040.54
10/12/09 03:06:38	60.016	3705.584	350	-223.015732	16	819.5	10	0	-103	8040.87
10/12/09 03:06:40	60.015	3705.398	350	-223.015732	16	820	10	0	-103	8041.2
10/12/09 03:06:42	60.013	3707.12	350	-223.015732	16	820.5	10	0	-103	8041.53
10/12/09 03:06:44	60.007	3709.144	350	-223.015732	16	821	10	0	-103	8041.86
10/12/09 03:06:46	59.997	3708.99	350	-223.015732	16	821.5	10	0	-103	8042.19
10/12/09 03:06:48	59.994	3708.291	350	-223.015732	16	822	10	0	-103	8042.52
10/12/09 03:06:50	59.993	3706.193	350	-223.015732	16	822.5	10	0	-103	8042.85
10/12/09 03:06:52	59.99	3707.304	350	-223.015732	16	823	10	0	-103	8043.18
10/12/09 03:06:54	59.993	3707.903	350	-223.015732	16	823.5	10	0	-103	8043.51
10/12/09 03:06:56	59.994	3706.76	350	-223.015732	16	824	10	0	-103	8043.84
10/12/09 03:06:58	59.993	3706.921	350	-223.015732	16	824.5	10	0	-103	8044.17
10/12/09 03:07:00	59.994	3706.683	350	-223.015732	16	825	10	0	-103	8044.5
10/12/09 03:07:02	59.993	3706.888	350	-223.015732	16	825.5	10	0	-103	8044.83
10/12/09 03:07:04	59.996	3704.934	350	-223.015732	16	826	10	0	-103	8045.16
10/12/09 03:07:06	59.988	3705.678	350	-223.015732	16	826.5	10	0	-103	8045.49
10/12/09 03:07:08	59.985	3706.481	350	-223.015732	16	827	10	0	-103	8045.82
10/12/09 03:07:10	59.983	3707.071	350	-223.015732	16	827.5	10	0	-103	8046.15
10/12/09 03:07:12	59.982	3706.696	350	-223.015732	16	828	10	0	-103	8046.48
10/12/09 03:07:14	59.98	3707.479	350	-223.015732	16	828.5	10	0	-103	8046.81
10/12/09 03:07:16	59.977	3708.246	350	-223.015732	16	829	10	0	-103	8047.14
10/12/09 03:07:18	59.981	3709.436	350	-223.015732	16	829.5	10	0	-103	8047.47
10/12/09 03:07:20	59.982	3710.419	350	-223.015732	16	830	10	0	-103	8047.8

10/12/09 03:07:22	59.978	3710.134	350	-223.015732	16	830.5	10	0	-103	8048.13
10/12/09 03:07:24	59.98	3708.708	350	-223.015732	16	831	10	0	-103	8048.46
10/12/09 03:07:26	59.98	3710.024	350	-223.015732	16	831.5	10	0	-103	8048.79
10/12/09 03:07:28	59.977	3709.192	350	-223.015732	16	832	10	0	-103	8049.12
10/12/09 03:07:30	59.98	3708.335	350	-223.015732	16	832.5	10	0	-103	8049.45
10/12/09 03:07:32	59.983	3709.399	350	-223.015732	16	833	10	0	-103	8049.78
10/12/09 03:07:34	59.984	3707.911	350	-223.015732	16	833.5	10	0	-103	8050.11
10/12/09 03:07:36	59.981	3709.004	350	-223.015732	16	834	10	0	-103	8050.44
10/12/09 03:07:38	59.981	3707.638	350	-223.015732	16	834.5	10	0	-103	8050.77
10/12/09 03:07:40	59.98	3709.689	350	-223.015732	16	835	10	0	-103	8051.1
10/12/09 03:07:42	59.981	3708.945	350	-223.015732	16	835.5	10	0	-103	8051.43
10/12/09 03:07:44	59.981	3706.541	350	-223.015732	16	836	10	0	-103	8051.76
10/12/09 03:07:46	59.981	3711.256	350	-223.015732	16	836.5	10	0	-103	8052.09
10/12/09 03:07:48	59.98	3711.362	350	-223.015732	16	837	10	0	-103	8052.42
10/12/09 03:07:50	59.978	3712.303	350	-223.015732	16	837.5	10	0	-103	8052.75
10/12/09 03:07:52	59.978	3712.012	350	-223.015732	16	838	10	0	-103	8053.08
10/12/09 03:07:54	59.979	3711.703	350	-223.015732	16	838.5	10	0	-103	8053.41
10/12/09 03:07:56	59.978	3712.093	350	-223.015732	16	839	10	0	-103	8053.74
10/12/09 03:07:58	59.976	3713.992	350	-223.015732	16					8054.07
10/12/09 03:08:00	59.976	3714.612	350	-223.015732	16					8054.4
10/12/09 03:08:02	59.975	3715.083	350	-223.015732	16					8054.73
10/12/09 03:08:04	59.976	3715.323	350	-223.015732	16					8055.06
10/12/09 03:08:06	59.975	3714.794	350	-223.015732	16					8055.39
10/12/09 03:08:08	59.979	3714.717	350	-223.015732	16					8055.72
10/12/09 03:08:10	59.978	3715.161	350	-223.015732	16					8056.05
10/12/09 03:08:12	59.975	3715.001	350	-223.015732	16					8056.38
10/12/09 03:08:14	59.976	3713.996	350	-223.015732	16					8056.71
10/12/09 03:08:16	59.981	3714.063	350	-223.015732	16					8057.04
10/12/09 03:08:18	59.977	3714.335	350	-223.015732	16					8057.37
10/12/09 03:08:20	59.975	3715.631	350	-223.015732	16					8057.7
10/12/09 03:08:22	59.976	3715.688	350	-223.015732	16					8058.03
10/12/09 03:08:24	59.979	3715.567	350	-223.015732	16					8058.36
10/12/09 03:08:26	59.98	3715.725	350	-223.015732	16					8058.69
10/12/09 03:08:28	59.979	3714.848	350	-223.015732	16					8059.02
10/12/09 03:08:30	59.978	3713.142	350	-223.015732	16					8059.35
10/12/09 03:08:32	59.979	3713.358	350	-223.015732	16					8059.68
10/12/09 03:08:34	59.982	3712.275	350	-223.015732	16					8060.01
10/12/09 03:08:36	59.983	3712.619	350	-223.015732	16					8060.34
10/12/09 03:08:38	59.987	3712.153	350	-223.015732	16					8060.67
10/12/09 03:08:40	59.988	3710.05	350	-223.015732	16					8061
10/12/09 03:08:42	59.984	3709.082	350	-223.015732	16					8061.33
10/12/09 03:08:44	59.98	3710.472	350	-223.015732	16					8061.66
10/12/09 03:08:46	59.979	3710.624	350	-223.015732	16					8061.99
10/12/09 03:08:48	59.98	3710.946	350	-223.015732	16					8062.32
10/12/09 03:08:50	59.979	3710.2	350	-223.015732	16					8062.65
10/12/09 03:08:52	59.978	3710.475	350	-223.015732	16					8062.98
10/12/09 03:08:54	59.975	3709.462	350	-223.015732	16					8063.31
10/12/09 03:08:56	59.979	3710.803	350	-223.015732	16					8063.64
10/12/09 03:08:58	59.982	3709.286	350	-223.015732	16					8063.97

10/12/09 03:09:00	59.983	3710.573	350	-223.015732	16	8064.3
10/12/09 03:09:02	59.983	3709.525	350	-223.015732	16	8064.63
10/12/09 03:09:04	59.985	3708.371	350	-223.015732	16	8064.96
10/12/09 03:09:06	59.99	3708.527	350	-223.015732	16	8065.29
10/12/09 03:09:08	59.987	3706.512	350	-223.015732	16	8065.62
10/12/09 03:09:10	59.984	3707.49	350	-223.015732	16	8065.95
10/12/09 03:09:12	59.976	3708.962	350	-223.015732	16	8066.28
10/12/09 03:09:14	59.979	3709.894	350	-223.015732	16	8066.61
10/12/09 03:09:16	59.985	3712.303	350	-223.015732	16	8066.94
10/12/09 03:09:18	59.983	3711.35	350	-223.015732	16	8067.27
10/12/09 03:09:20	59.979	3711.627	350	-223.015732	16	8067.6
10/12/09 03:09:22	59.981	3712.076	350	-223.015732	16	8067.93
10/12/09 03:09:24	59.978	3712.393	350	-223.015732	16	8068.26
10/12/09 03:09:26	59.975	3712.999	350	-223.015732	16	8068.59
10/12/09 03:09:28	59.978	3713.51	350	-223.015732	16	8068.92
10/12/09 03:09:30	59.989	3716.626	350	-223.015732	16	8069.25
10/12/09 03:09:32	59.999	3715.443	350	-223.015732	16	8069.58
10/12/09 03:09:34	59.994	3712.092	350	-223.015732	16	8069.91
10/12/09 03:09:36	59.989	3713.906	350	-223.015732	16	8070.24
10/12/09 03:09:38	59.986	3714.894	350	-223.015732	16	8070.57
10/12/09 03:09:40	59.984	3714.953	350	-223.015732	16	8070.9
10/12/09 03:09:42	59.983	3716.122	350	-223.015732	16	8071.23
10/12/09 03:09:44	59.982	3716.308	350	-223.015732	16	8071.56
10/12/09 03:09:46	59.98	3715.438	350	-223.015732	16	8071.89
10/12/09 03:09:48	59.99	3714.764	350	-223.015732	16	8072.22
10/12/09 03:09:50	59.995	3714.714	350	-223.015732	16	8072.55
10/12/09 03:09:52	59.995	3715.068	350	-223.015732	16	8072.88
10/12/09 03:09:54	59.99	3715.927	350	-223.015732	16	8073.21
10/12/09 03:09:56	59.989	3715.791	350	-223.015732	16	8073.54
10/12/09 03:09:58	59.991	3716.285	350	-223.015732	16	8073.87
10/12/09 03:10:00	59.996	3715.324	350	-223.015732	16	8074.2
10/12/09 03:10:02	60	3714.46	350	-223.015732	16	8074.53
10/12/09 03:10:04	60.002	3711.708	350	-223.015732	16	8074.86
10/12/09 03:10:06	60.004	3712.698	350	-223.015732	16	8075.19
10/12/09 03:10:08	60.004	3712.851	350	-223.015732	16	8075.52
10/12/09 03:10:10	60.002	3713.362	350	-223.015732	16	8075.85
10/12/09 03:10:12	59.999	3716.641	350	-223.015732	16	8076.18
10/12/09 03:10:14	59.998	3718.292	350	-223.015732	16	8076.51
10/12/09 03:10:16	59.995	3719.079	350	-223.015732	16	8076.84
10/12/09 03:10:18	59.996	3718.233	350	-223.015732	16	8077.17
10/12/09 03:10:20	60.001	3717.815	350	-223.015732	16	8077.5
10/12/09 03:10:22	60.002	3717.889	350	-223.015732	16	8077.83
10/12/09 03:10:24	60.001	3718.56	350	-223.015732	16	8078.16
10/12/09 03:10:26	60.003	3718.195	350	-223.015732	16	8078.49
10/12/09 03:10:28	60.005	3719.021	350	-223.015732	16	8078.82
10/12/09 03:10:30	60.004	3718.821	350	-223.015732	16	8079.15
10/12/09 03:10:32	60.004	3719.897	350	-223.015732	16	8079.48
10/12/09 03:10:34	60.004	3719.299	350	-223.015732	16	8079.81
10/12/09 03:10:36	60.006	3719.643	350	-223.015732	16	8080.14

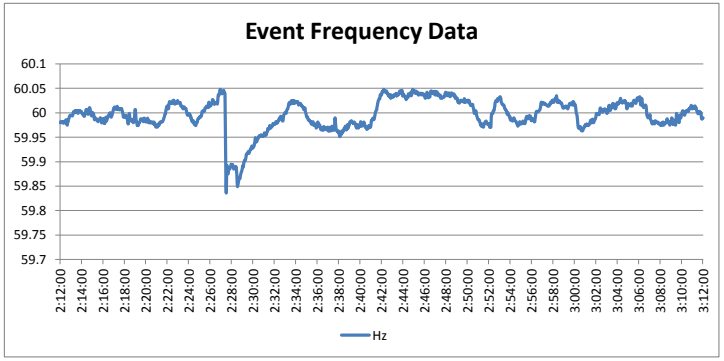
10/12/09 03:10:38	60.003	3719.527	350	-223.015732	16	8080.47
10/12/09 03:10:40	60.005	3719.731	350	-223.015732	16	8080.8
10/12/09 03:10:42	60.006	3720.279	350	-223.015732	16	8081.13
10/12/09 03:10:44	60.009	3718.58	350	-223.015732	16	8081.46
10/12/09 03:10:46	60.009	3718.976	350	-223.015732	16	8081.79
10/12/09 03:10:48	60.01	3718.982	350	-223.015732	16	8082.12
10/12/09 03:10:50	60.009	3720.034	350	-223.015732	16	8082.45
10/12/09 03:10:52	60.013	3720.609	350	-223.015732	16	8082.78
10/12/09 03:10:54	60.015	3720.811	350	-223.015732	16	8083.11
10/12/09 03:10:56	60.014	3721.239	350	-223.015732	16	8083.44
10/12/09 03:10:58	60.009	3720.38	350	-223.015732	16	8083.77
10/12/09 03:11:00	60.009	3719.447	350	-223.015732	16	8084.1
10/12/09 03:11:02	60.008	3720.807	350	-223.015732	16	8084.43
10/12/09 03:11:04	60.011	3721.272	350	-223.015732	16	8084.76
10/12/09 03:11:06	60.01	3720.592	350	-223.015732	16	8085.09
10/12/09 03:11:08	60.009	3721.245	350	-223.015732	16	8085.42
10/12/09 03:11:10	60.013	3721.594	350	-223.015732	16	8085.75
10/12/09 03:11:12	60.013	3722.176	350	-223.015732	16	8086.08
10/12/09 03:11:14	60.014	3721.999	350	-223.015732	16	8086.41
10/12/09 03:11:16	60.014	3721.646	350	-223.015732	16	8086.74
10/12/09 03:11:18	60.012	3721.678	350	-223.015732	16	8087.07
10/12/09 03:11:20	60.01	3720.86	350	-223.015732	16	8087.4
10/12/09 03:11:22	60.011	3721.645	350	-223.015732	16	8087.73
10/12/09 03:11:24	60.007	3723.816	350	-223.015732	16	8088.06
10/12/09 03:11:26	60.003	3725.07	350	-223.015732	16	8088.39
10/12/09 03:11:28	60.001	3724.656	350	-223.015732	16	8088.72
10/12/09 03:11:30	60	3724.869	350	-223.015732	16	8089.05
10/12/09 03:11:32	59.998	3724.661	350	-223.015732	16	8089.38
10/12/09 03:11:34	59.998	3723.696	350	-223.015732	16	8089.71
10/12/09 03:11:36	59.999	3723.58	350	-223.015732	16	8090.04
10/12/09 03:11:38	60.002	3723.405	350	-223.015732	16	8090.37
10/12/09 03:11:40	60.003	3721.879	350	-223.015732	16	8090.7
10/12/09 03:11:42	60.003	3722.401	350	-223.015732	16	8091.03
10/12/09 03:11:44	59.999	3722.906	350	-223.015732	16	8091.36
10/12/09 03:11:46	59.998	3724.142	350	-223.015732	16	8091.69
10/12/09 03:11:48	60.001	3723.65	350	-223.015732	16	8092.02
10/12/09 03:11:50	59.995	3723.201	350	-223.015732	16	8092.35
10/12/09 03:11:52	59.989	3723.639	350	-223.015732	16	8092.68
10/12/09 03:11:54	59.987	3723.881	350	-223.015732	16	8093.01
10/12/09 03:11:56	59.988	3724.654	350	-223.015732	16	8093.34
10/12/09 03:11:58	59.988	3725.361	350	-223.015732	16	8093.67
10/12/09 03:12:00	59.99	3724.944	350	-223.015732	16	8094

Balancing Authority Name:	My BA
Balancing Authority Frequency Response Obligation (FRO from FRS Form 1)	-80

Note: See "Instruction" tab for more detailed instructions.

Step 1.	Copy and Paste Event Data into the appropriate cells of the "Data" worksheet. Maintain date and time format of mm/dd/yy hh:mm:ss.		
Step 2.	Determine Time of T(0) and edit formula in cell "C8" to reference the correct row of the "Data" worksheet. T(0) is the first change in frequency of about 0.010 Hz (10 mHz) which should be the first scan of frequency data of the event.	2:27:26	
Step 3.	Time of Frequency Recovery to 60 Hz or Pre-Perturbation Hz	2:32:54	
Step 4.	Enter MW output of generator or load that caused event (+ for gen loss, - for load loss) (Value from NERC Event List. If multiple units, enter total MW loss.) If MW loss value is not known, enter a default 1000 MW.	633	MW
Step 5.	Hit the big blue button to copy your data for pasting into FRS Form 1 "BA Event Data" worksheet.		
Step 6.	Paste data into "FRS Form 1" in the appropriate row on the "BA Event Data" worksheet.		

Copy Form 2 data for Pasting into Form 1



Step 7. Save this workbook using the following file name format:MyBA_yymmdd_hhmm_FRS_Form2.xlsm

09/10/12 Date yymmdd

2:27 Time hh:ss of T(0)

Where "MyBA" = your BA mnemonic

scan rate 2 seconds

Date:	Monday, October 12, 2009	
Time of T(0)	2:27:26	
Time of Frequency Recovery to 60 Hz or Pre-Perturbation Hz	2:32:54	
Value A Pre-Perturbation Average Frequency [T(-2) to T(-16)]	60.0421	Hz
Value B Post-Perturbation Average Frequency [T(+20 to T(+52)]	59.8891	Hz
Pre to Post Perturbation Delta Frequency Actual	-0.153	Hz
Value A Pre-Perturbation Average Interchange MW [T(-2) to T(-16)]	3645.73	MW
Value B Post-Perturbation Average Interchange MW [T(+20 to T(+52)]	3788.35	MW
Pre to Post Perturbation Interchange Delta MW Actual	142.63	MW
Initial Performance Ramp Magnitude Adjustment	-15.40	MW
EPFR Pre-Perturbation Average	-33.70	MW
EPFR Post-Perturbation Average	88.71	MW
EPFR Delta	122.41	MW

Balancing Authority	My BA	
Grid Nominal Frequency	60.000	Hz
Capacity @ Droop for Minimum Performance	2400.0	MW
Droop Setting	5.00%	3.00000 Hz
Deadband Setting	0.000	Hz
Hz Span	3.00000	Hz
Frequency Response Obligation (FRO)	-80	MW/0.1 Hz
TC (frequency response filter constant)	0.350	Time Constant for delayed delivery of PFR during Sustained Measure

A Point	2:27:24	
FPointA	60.0390	2:27:24 AM
A Value	60.0421	
C Value	59.8360	#N/A
Delta FCA	-0.20612669	
FR C	-307.1	MW/0.1 Hz
Slope A-C dF/dT	#N/A	Hz/second
C Value Maximum Resource Loss	633	
Secondary C Value	No	n/a
Tzero	2:27:24	
FT+4	59.83599854	
FT+10	59.89199829	
FT+20	59.88299942	
FT+60	59.88999939	

Interconnection Evaluation

Low Hz	Delta Hz Event
3764.46	Actual Interchange MW Average during frequency recovery period
3774.78	Target Interchange MW Average during frequency recovery period
3719.65	Interchange Average Ramp MW during frequency recovery period
3640.68	Actual MW @ T(-4)
92.16	Starting and Ending Difference in Interchange MW during frequency recovery period (indicates ramp direction during recovery period)
0:05:28	Event Duration (h:mm:ss)
No	Target MW Average minus MW @ T(-4) less than zero
134.10	Interchange Target Relative Average Change - MW (Low Frequency Event)
123.78	Interchange Actual Relative Average Change - MW (Low Frequency Event)
No	Interchange Actual Average minus MW @ T(-4) less than zero
Yes	Interchange Average MW minus MW @ T(-4) greater than zero
Yes	Interchange Target MW Average minus MW @ T(-4) greater than zero
41.94	Interchange Target Relative Average Change - MW (High Frequency Event)
31.61	Interchange Actual Relative Average Change - MW (High Frequency Event)
Up	Ramp Direction during frequency recovery period

EPFR = Expected Primary Frequency Response — EPFR(Final) 107.00 MW

MW Response in right direction for frequency delta — Yes

B Value Average Resource Loss	633	
B Value Average LaaR Loss	0	
B Value Average Net Loss	633	
Interconnection Bias Setting	-660	
IPFR as a % of Bias Setting	0.00%	
Interconnection Total Energy	37446	60.07%
Interconnection Peak Energy	62339	

Initial Response P.U. Performance 1.333 P.U.

0.923 P.U. Sustianed Response P.U. Performance

	T	Frequency Hz	Interchange MW	Value B 20 to 52 sec Average Frequency	Average MW	FRO (EPFR) Expected Primary Frequency Response	(TC) Delayed Delivery Frequency Response	Initial Measure Final Expected Primary Frequency Response	Average Ramp MW/scan	Recovery Period Target MW	Average Output During Recovery Period MW	Average Target During Recovery Period MW	Recovery Period Ramp MW	Average Ramp During Recovery Period MW	Generator Trip MW	Generator Trip MW	Generator Trip MW	Generator Trip MW	Generator Trip MW	Generator Trip MW	Generator Trip MW	LaaR Trip MW
															633							
T-72 sec	2:26:14	60.027	3671.189			-21.600	-7.560															
T-70 sec	2:26:16	60.026	3668.611			-20.801	-12.194															
T-68 sec	2:26:18	60.026	3665.232			-20.801	-15.207															
T-66 sec	2:26:20	60.022	3664.495			-17.599	-16.044															
T-64 sec	2:26:22	60.019	3666.062			-15.201	-15.749															
T-62 sec	2:26:24	60.017	3666.821			-13.599	-14.996															
T-60 sec	2:26:26	60.019	3666.787			-15.201	-15.068		-0.276	3666.787												
T-58 sec	2:26:28	60.02	3670.454			-16.000	-15.394		-0.276	3666.185												
T-56 sec	2:26:30	60.019	3670.267			-15.201	-15.327		-0.276	3665.976												
T-54 sec	2:26:32	60.021	3671.668			-16.800	-15.842		-0.276	3665.185												
T-52 sec	2:26:34	60.021	3672.493			-16.800	-16.177		-0.276	3664.573												
T-50 sec	2:26:36	60.021	3672.685			-16.800	-16.395		-0.276	3664.079												
T-48 sec	2:26:38	60.019	3672.857			-15.201	-15.977		-0.276	3664.221												
T-46 sec	2:26:40	60.018	3672.164			-14.401	-15.426		-0.276	3664.497												
T-44 sec	2:26:42	60.022	3671.413			-17.599	-16.186		-0.276	3663.460												
T-42 sec	2:26:44	60.031	3669.983			-24.799	-19.201		-0.276	3660.170												
T-40 sec	2:26:46	60.037	3666.467			-29.599	-22.840		-0.276	3656.254												
T-38 sec	2:26:48	60.037	3663.758			-29.599	-25.206		-0.276	3653.612												
T-36 sec	2:26:50	60.036	3661.599			-28.799	-26.464		-0.276	3652.078												

T-34 sec	2:26:52	60.037	3660.672			-29.599	-27.561		-0.276	3650.705						
T-32 sec	2:26:54	60.046	3651.492			-36.801	-30.795		-0.276	3647.195						
T-30 sec	2:26:56	60.048	3649.190			-38.400	-33.457		-0.276	3644.257						
T-28 sec	2:26:58	60.048	3650.025			-38.400	-35.187		-0.276	3642.250						
T-26 sec	2:27:00	60.043	3648.246			-34.399	-34.911		-0.276	3642.250						
T-24 sec	2:27:02	60.041	3649.512			-32.800	-34.172		-0.276	3642.713						
T-22 sec	2:27:04	60.041	3654.294			-32.800	-33.692		-0.276	3642.917						
T-20 sec	2:27:06	60.041	3655.007			-32.800	-33.380		-0.276	3642.953						
T-18 sec	2:27:08	60.039	3651.874			-31.201	-32.617		-0.276	3643.439						
T-16 sec	2:27:10	60.041	3651.059	60.042	3645.727	-32.800	-32.681		-0.276	3643.099						
T-14 sec	2:27:12	60.043	3649.187	60.042	3645.727	-34.399	-33.283		-0.276	3642.222						
T-12 sec	2:27:14	60.045	3648.236	60.042	3645.727	-35.999	-34.233		-0.276	3640.995						
T-10 sec	2:27:16	60.046	3645.387	60.042	3645.727	-36.801	-35.132		-0.276	3639.820						
T-08 sec	2:27:18	60.041	3644.628	60.042	3645.727	-32.800	-34.316		-0.276	3640.360						
T-06 sec	2:27:20	60.041	3645.446	60.042	3645.727	-32.800	-33.785		-0.276	3640.615						
T-04 sec	2:27:22	60.041	3640.682	60.042	3645.727	-32.800	-33.441		-0.276	3640.683						
T-02 sec	2:27:24	60.039	3641.191	60.042	3645.727	-31.201	-32.657		-0.276	3641.191						
T+0 sec	2:27:26	59.978	3659.465			17.599	-15.067		0.000	3658.781					633	
T+02 sec	2:27:28	59.852	3696.362			118.399	31.646		0.562	3706.056	3677.914	3682.418	3673.847	3673.847	633	
T+04 sec	2:27:30	59.836	3734.904			131.201	66.490		0.562	3741.462	3696.910	3702.100	3674.409	3674.128	633	
T+06 sec	2:27:32	59.869	3734.673			104.800	79.899		0.562	3755.433	3706.351	3715.433	3674.971	3674.409	633	0
T+08 sec	2:27:34	59.869	3734.673			104.800	88.614		0.562	3764.710	3712.015	3725.288	3675.533	3674.690	633	0
T+10 sec	2:27:36	59.892	3737.157			86.401	87.840		0.562	3764.498	3716.206	3731.823	3676.095	3674.971	633	0
T+12 sec	2:27:38	59.891	3761.250			87.201	87.616		0.562	3764.836	3722.640	3736.539	3676.656	3675.252	633	0
T+14 sec	2:27:40	59.88	3766.113			95.999	90.550		0.562	3768.332	3728.074	3740.513	3677.218	3675.533	633	0
T+16 sec	2:27:42	59.876	3766.194			99.200	93.578		0.562	3771.921	3732.310	3744.003	3677.780	3675.814	633	0
T+18 sec	2:27:44	59.875	3768.877			100.000	95.826		0.562	3774.731	3735.967	3747.076	3678.342	3676.095	633	0
T+20 sec	2:27:46	59.883	3769.925	59.889	3788.355	93.600	95.047	3752.731	0.562	3774.514	3739.054	3749.570	3678.904	3676.375	633	0
T+22 sec	2:27:48	59.887	3780.621	59.889	3788.355	90.399	93.420	3752.731	0.562	3773.450	3742.518	3751.560	3679.466	3676.656	633	0
T+24 sec	2:27:50	59.886	3781.592	59.889	3788.355	91.199	92.643	3752.731	0.562	3773.234	3745.523	3753.228	3680.028	3676.937	633	0
T+26 sec	2:27:52	59.885	3782.500	59.889	3788.355	92.001	92.418	3752.731	0.562	3773.572	3748.165	3754.681	3680.590	3677.218	633	0
T+28 sec	2:27:54	59.887	3784.962	59.889	3788.355	90.399	91.712	3752.731	0.562	3773.427	3750.618	3755.930	3681.152	3677.499	633	0
T+30 sec	2:27:56	59.888	3784.730	59.889	3788.355	89.600	90.972	3752.731	0.562	3773.250	3752.750	3757.013	3681.714	3677.780	633	0
T+32 sec	2:27:58	59.89	3784.419	59.889	3788.355	88.000	89.932	3752.731	0.562	3772.772	3754.613	3757.940	3682.276	3678.061	633	0
T+34 sec	2:28:00	59.895	3788.072	59.889	3788.355	84.000	87.856	3752.731	0.562	3771.257	3756.471	3758.680	3682.838	3678.342	633	0
T+36 sec	2:28:02	59.894	3788.328	59.889	3788.355	84.799	86.786	3752.731	0.562	3770.749	3758.148	3759.315	3683.400	3678.623	633	0
T+38 sec	2:28:04	59.893	3788.868	59.889	3788.355	85.599	86.370	3752.731	0.562	3770.896	3759.684	3759.894	3683.962	3678.904	633	0
T+40 sec	2:28:06	59.894	3788.472	59.889	3788.355	84.799	85.821	3752.731	0.562	3770.908	3761.055	3760.418	3684.524	3679.185	633	0
T+42 sec	2:28:08	59.894	3792.276	59.889	3788.355	84.799	85.463	3752.731	0.562	3771.112	3762.474	3760.905	3685.086	3679.466	633	0
T+44 sec	2:28:10	59.891	3793.074	59.889	3788.355	87.201	86.071	3752.731	0.562	3772.282	3763.805	3761.399	3685.648	3679.747	633	0
T+46 sec	2:28:12	59.89	3794.374	59.889	3788.355	88.000	86.747	3752.731	0.562	3773.520	3765.078	3761.904	3686.210	3680.028	633	0
T+48 sec	2:28:14	59.885	3799.428	59.889	3788.355	92.001	88.586	3752.731	0.562	3775.921	3766.452	3762.465	3686.772	3680.309	633	0
T+50 sec	2:28:16	59.885	3800.427	59.889	3788.355	92.001	89.781	3752.731	0.562	3777.678	3767.759	3763.050	3687.334	3680.590	633	0
T+52 sec	2:28:18	59.888	3799.959	59.889	3788.355	89.600	89.718	3752.731	0.562	3778.177	3768.952	3763.610	3687.896	3680.871	633	0
T+54 sec	2:28:20	59.887	3803.625			90.399	89.956		0.562	3778.977	3770.190	3764.159	3688.458	3681.152	633	0
T+56 sec	2:28:22	59.888	3802.925			89.600	89.831		0.562	3779.414	3771.319	3764.685	3689.020	3681.433	633	0
T+58 sec	2:28:24	59.888	3802.951			89.600	89.750		0.562	3779.895	3772.373	3765.192	3689.582	3681.714	633	0
T+60 sec	2:28:26	59.89	3804.388			88.000	89.138		0.562	3779.845	3773.406	3765.665	3690.144	3681.995	633	0
T+62 sec	2:28:28	59.889	3805.496			88.800	89.020		0.562	3780.288	3774.409	3766.122	3690.705	3682.276	633	0
T+64 sec	2:28:30	59.882	3805.617			94.400	90.903		0.562	3782.733	3775.354	3766.625	3691.267	3682.557	633	0
T+66 sec	2:28:32	59.873	3809.237			101.599	94.646		0.562	3787.039	3776.351	3767.226	3691.829	3682.838	633	0
T+68 sec	2:28:34	59.857	3811.503			114.401	101.561		0.562	3794.515	3777.355	3768.005	3692.391	3683.119	633	0
T+70 sec	2:28:36	59.849	3814.862			120.801	108.295		0.562	3801.811	3778.397	3768.944	3692.953	3683.400	633	0
T+72 sec	2:28:38	59.852	3815.889			118.399	111.831		0.562	3805.910	3779.410	3769.943	3693.515	3683.681	633	0
T+74 sec	2:28:40	59.858	3825.643			113.599	112.450		0.562	3807.090	3780.627	3770.921	3694.077	3683.962	633	0
T+76 sec	2:28:42	59.863	3826.053			109.601	111.453		0.562	3806.655	3781.792	3771.837	3694.639	3684.243	633	0
T+78 sec	2:28:44	59.866	3826.002			107.199	109.964		0.562	3805.728	3782.897	3772.685	3695.201	3684.524	633	0
T+80 sec	2:28:46	59.865	3827.524			107.999	109.276		0.562	3805.602	3783.986	3773.487	3695.763	3684.805	633	0
	2:28:48	59.867	3826.753			106.400	108.269		0.562	3805.158	3785.004	3774.241	3696.325	3685.086	633	0
	2:28:50	59.866	3826.783			107.199	107.895		0.562	3805.345	3785.975	3774.965	3696.887	3685.367	633	0
	2:28:52	59.871	3826.454			103.201	106.252		0.562	3804.264	3786.895	3775.631	3697.449	3685.648	633	0
	2:28:54	59.874	3825.713			100.800	104.344		0.562	3802.918	3787.758	3776.237	3698.011	3685.929	633	0

2:28:56	59.879	3823.826	96.799	101.703	0.562	3800.839	3788.542	3776.772	3698.573	3686.210	633	0
2:28:58	59.88	3822.505	95.999	99.707	0.562	3799.405	3789.265	3777.253	3699.135	3686.491	633	0
2:29:00	59.883	3819.081	93.600	97.569	0.562	3797.830	3789.886	3777.682	3699.697	3686.772	633	0
2:29:02	59.886	3818.055	91.199	95.340	0.562	3796.162	3790.461	3778.059	3700.259	3687.053	633	0
2:29:04	59.89	3816.815	88.000	92.771	0.562	3794.155	3790.988	3778.381	3700.821	3687.334	633	0
2:29:06	59.892	3815.010	86.401	90.542	0.562	3792.488	3791.459	3778.658	3701.383	3687.615	633	0
2:29:08	59.889	3813.783	88.800	89.932	0.562	3792.440	3791.888	3778.923	3701.945	3687.896	633	0
2:29:10	59.893	3811.838	85.599	88.415	0.562	3791.485	3792.265	3779.160	3702.507	3688.177	633	0
2:29:12	59.899	3809.652	80.801	85.751	0.562	3789.382	3792.587	3779.349	3703.069	3688.458	633	0
2:29:14	59.903	3806.972	77.600	82.898	0.562	3787.092	3792.848	3779.490	3703.631	3688.739	633	0
2:29:16	59.902	3805.593	78.400	81.323	0.562	3786.079	3793.076	3779.608	3704.193	3689.020	633	0
2:29:18	59.902	3804.188	78.400	80.300	0.562	3785.618	3793.271	3779.713	3704.754	3689.301	633	0
2:29:20	59.904	3796.078	76.801	79.075	0.562	3784.955	3793.319	3779.803	3705.316	3689.582	633	0
2:29:22	59.907	3793.975	74.399	77.439	0.562	3783.880	3793.330	3779.872	3705.878	3689.863	633	0
2:29:24	59.911	3792.169	71.201	75.255	0.562	3782.259	3793.311	3779.912	3706.440	3690.144	633	0
2:29:26	59.916	3791.502	67.200	72.436	0.562	3780.001	3793.281	3779.914	3707.002	3690.424	633	0
2:29:28	59.916	3789.534	67.200	70.603	0.562	3778.731	3793.221	3779.895	3707.564	3690.705	633	0
2:29:30	59.917	3788.132	66.400	69.132	0.562	3777.822	3793.140	3779.862	3708.126	3690.986	633	0
2:29:32	59.918	3784.563	65.601	67.896	0.562	3777.148	3793.006	3779.819	3708.688	3691.267	633	0
2:29:34	59.92	3783.028	64.001	66.533	0.562	3776.346	3792.853	3779.766	3709.250	3691.548	633	0
2:29:36	59.921	3781.701	63.199	65.366	0.562	3775.741	3792.684	3779.705	3709.812	3691.829	633	0
2:29:38	59.92	3776.358	64.001	64.888	0.562	3775.826	3792.440	3779.647	3710.374	3692.110	633	0
2:29:40	59.917	3775.635	66.400	65.418	0.562	3776.917	3792.193	3779.607	3710.936	3692.391	633	0
2:29:42	59.92	3774.604	64.001	64.922	0.562	3776.983	3791.938	3779.569	3711.498	3692.672	633	0
2:29:44	59.921	3773.334	63.199	64.319	0.562	3776.942	3791.672	3779.531	3712.060	3692.953	633	0
2:29:46	59.923	3773.958	61.600	63.367	0.562	3776.552	3791.423	3779.489	3712.622	3693.234	633	0
2:29:48	59.926	3772.722	59.201	61.909	0.562	3775.656	3791.163	3779.436	3713.184	3693.515	633	0
2:29:50	59.925	3771.670	60.001	61.241	0.562	3775.550	3790.896	3779.383	3713.746	3693.796	633	0
2:29:52	59.928	3769.630	57.599	59.966	0.562	3774.837	3790.608	3779.321	3714.308	3694.077	633	0
2:29:54	59.927	3768.707	58.401	59.419	0.562	3774.852	3790.316	3779.262	3714.870	3694.358	633	0
2:29:56	59.932	3767.643	54.401	57.662	0.562	3773.657	3790.018	3779.188	3715.432	3694.639	633	0
2:29:58	59.927	3767.021	58.401	57.921	0.562	3774.478	3789.719	3779.127	3715.994	3694.920	633	0
2:30:00	59.928	3767.408	57.599	57.808	0.562	3774.927	3789.433	3779.073	3716.556	3695.201	633	0
2:30:02	59.931	3766.788	55.200	56.895	0.562	3774.576	3789.147	3779.016	3717.118	3695.482	633	0
2:30:04	59.929	3766.259	56.799	56.862	0.562	3775.105	3788.861	3778.967	3717.680	3695.763	633	0
2:30:06	59.931	3765.672	55.200	56.280	0.562	3775.085	3788.574	3778.919	3718.242	3696.044	633	0
2:30:08	59.933	3766.123	53.601	55.343	0.562	3774.709	3788.301	3778.868	3718.803	3696.325	633	0
2:30:10	59.937	3764.243	50.400	53.613	0.562	3773.541	3788.011	3778.804	3719.365	3696.606	633	0
2:30:12	59.937	3765.105	50.400	52.488	0.562	3772.979	3787.738	3778.735	3719.927	3696.887	633	0
2:30:14	59.945	3762.935	44.000	49.517	0.562	3770.570	3787.446	3778.638	3720.489	3697.168	633	0
2:30:16	59.949	3758.387	40.799	46.466	0.562	3768.081	3787.108	3778.516	3721.051	3697.449	633	0
2:30:18	59.947	3753.922	42.401	45.043	0.562	3767.220	3786.727	3778.386	3721.613	3697.730	633	0
2:30:20	59.942	3749.867	46.399	45.518	0.562	3768.256	3786.308	3778.271	3722.175	3698.011	633	0
2:30:22	59.941	3746.889	47.198	46.106	0.562	3769.406	3785.865	3778.171	3722.737	3698.292	633	0
2:30:24	59.942	3747.875	46.399	46.209	0.562	3770.071	3785.443	3778.081	3723.299	3698.573	633	0
2:30:26	59.945	3749.593	44.000	45.436	0.562	3769.860	3785.049	3777.991	3723.861	3698.854	633	0
2:30:28	59.948	3748.661	41.599	44.093	0.562	3769.079	3784.654	3777.894	3724.423	3699.135	633	0
2:30:30	59.947	3746.706	42.401	43.501	0.562	3769.049	3784.245	3777.799	3724.985	3699.416	633	0
2:30:32	59.949	3749.077	40.799	42.555	0.562	3768.665	3783.871	3777.702	3725.547	3699.697	633	0
2:30:34	59.951	3742.741	39.200	41.381	0.562	3768.053	3783.438	3777.600	3726.109	3699.978	633	0
2:30:36	59.952	3740.259	38.400	40.338	0.562	3767.572	3782.989	3777.496	3726.671	3700.259	633	0
2:30:38	59.953	3736.139	37.601	39.380	0.562	3767.176	3782.506	3777.389	3727.233	3700.540	633	0
2:30:40	59.951	3731.382	39.200	39.317	0.562	3767.675	3781.984	3777.290	3727.795	3700.821	633	0
2:30:42	59.952	3727.838	38.400	38.996	0.562	3767.916	3781.437	3777.195	3728.357	3701.102	633	0
2:30:44	59.952	3725.952	38.400	38.787	0.562	3768.270	3780.882	3777.106	3728.919	3701.383	633	0
2:30:46	59.952	3722.649	38.400	38.652	0.562	3768.696	3780.306	3777.023	3729.481	3701.664	633	0
2:30:48	59.955	3720.578	35.999	37.723	0.562	3768.329	3779.720	3776.938	3730.043	3701.945	633	0
2:30:50	59.952	3717.996	38.400	37.960	0.562	3769.128	3779.121	3776.862	3730.605	3702.226	633	0
2:30:52	59.954	3718.142	36.801	37.555	0.562	3769.284	3778.534	3776.789	3731.167	3702.507	633	0
2:30:54	59.952	3715.753	38.400	37.851	0.562	3770.142	3777.937	3776.726	3731.729	3702.788	633	0
2:30:56	59.953	3713.694	37.601	37.763	0.562	3770.617	3777.330	3776.668	3732.291	3703.069	633	0
2:30:58	59.953	3713.484	37.601	37.706	0.562	3771.122	3776.734	3776.616	3732.852	3703.350	633	0

2:31:00	59.952	3710.848	38.400	37.949	0.562	3771.927	3776.124	3776.573	3733.414	3703.631	633	0
2:31:02	59.954	3710.810	36.801	37.547	0.562	3772.087	3775.525	3776.532	3733.976	3703.912	633	0
2:31:04	59.954	3712.092	36.801	37.286	0.562	3772.388	3774.948	3776.494	3734.538	3704.193	633	0
2:31:06	59.959	3714.623	32.800	35.716	0.562	3771.380	3774.404	3776.448	3735.100	3704.473	633	0
2:31:08	59.957	3715.130	34.399	35.255	0.562	3771.481	3773.875	3776.404	3735.662	3704.754	633	0
2:31:10	59.956	3716.168	35.199	35.236	0.562	3772.023	3773.364	3776.365	3736.224	3705.035	633	0
2:31:12	59.954	3716.461	36.801	35.784	0.562	3773.133	3772.865	3776.336	3736.786	3705.316	633	0
2:31:14	59.956	3716.980	35.199	35.579	0.562	3773.490	3772.379	3776.312	3737.348	3705.597	633	0
2:31:16	59.955	3717.759	35.999	35.726	0.562	3774.199	3771.908	3776.293	3737.910	3705.878	633	0
2:31:18	59.958	3722.361	33.600	34.982	0.562	3774.017	3771.485	3776.274	3738.472	3706.159	633	0
2:31:20	59.961	3721.973	31.201	33.659	0.562	3773.256	3771.065	3776.248	3739.034	3706.440	633	0
2:31:22	59.962	3722.658	30.399	32.518	0.562	3772.677	3770.659	3776.218	3739.596	3706.721	633	0
2:31:24	59.962	3722.267	30.399	31.776	0.562	3772.497	3770.255	3776.187	3740.158	3707.002	633	0
2:31:26	59.968	3722.278	25.601	29.615	0.562	3770.898	3769.859	3776.144	3740.720	3707.283	633	0
2:31:28	59.966	3721.787	27.200	28.770	0.562	3770.615	3769.465	3776.098	3741.282	3707.564	633	0
2:31:30	59.966	3723.091	27.200	28.220	0.562	3770.628	3769.088	3776.054	3741.844	3707.845	633	0
2:31:32	59.968	3723.984	25.601	27.304	0.562	3770.273	3768.724	3776.007	3742.406	3708.126	633	0
2:31:34	59.97	3723.435	23.999	26.147	0.562	3769.678	3768.362	3775.957	3742.968	3708.407	633	0
2:31:36	59.974	3723.893	20.801	24.276	0.562	3768.369	3768.009	3775.896	3743.530	3708.688	633	0
2:31:38	59.97	3725.403	23.999	24.179	0.562	3768.834	3767.673	3775.841	3744.092	3708.969	633	0
2:31:40	59.969	3727.121	24.799	24.396	0.562	3769.613	3767.357	3775.792	3744.654	3709.250	633	0
2:31:42	59.969	3728.053	24.799	24.537	0.562	3770.316	3767.052	3775.750	3745.216	3709.531	633	0
2:31:44	59.97	3731.130	23.999	24.349	0.562	3770.689	3766.776	3775.711	3745.778	3709.812	633	0
2:31:46	59.971	3732.530	23.199	23.946	0.562	3770.849	3766.514	3775.674	3746.340	3710.093	633	0
2:31:48	59.973	3733.327	21.600	23.125	0.562	3770.590	3766.263	3775.635	3746.901	3710.374	633	0
2:31:50	59.973	3736.535	21.600	22.592	0.562	3770.618	3766.039	3775.597	3747.463	3710.655	633	0
2:31:52	59.976	3736.907	19.199	21.404	0.562	3769.993	3765.822	3775.556	3748.025	3710.936	633	0
2:31:54	59.978	3736.822	17.599	20.072	0.562	3769.223	3765.607	3775.509	3748.587	3711.217	633	0
2:31:56	59.978	3738.699	17.599	19.207	0.562	3768.920	3765.409	3775.460	3749.149	3711.498	633	0
2:31:58	59.976	3739.944	19.199	19.204	0.562	3769.479	3765.223	3775.417	3749.711	3711.779	633	0
2:32:00	59.978	3740.877	17.599	18.642	0.562	3769.479	3765.047	3775.374	3750.273	3712.060	633	0
2:32:02	59.976	3741.794	19.199	18.837	0.562	3770.236	3764.880	3775.337	3750.835	3712.341	633	0
2:32:04	59.978	3745.234	17.599	18.404	0.562	3770.364	3764.739	3775.301	3751.397	3712.622	633	0
2:32:06	59.977	3746.608	18.399	18.402	0.562	3770.925	3764.611	3775.270	3751.959	3712.903	633	0
2:32:08	59.98	3748.300	16.000	17.562	0.562	3770.646	3764.496	3775.237	3752.521	3713.184	633	0
2:32:10	59.982	3750.716	14.401	16.455	0.562	3770.102	3764.399	3775.202	3753.083	3713.465	633	0
2:32:12	59.981	3751.558	15.201	16.016	0.562	3770.225	3764.310	3775.167	3753.645	3713.746	633	0
2:32:14	59.98	3752.748	16.000	16.011	0.562	3770.781	3764.230	3775.137	3754.207	3714.027	633	0
2:32:16	59.979	3755.599	16.800	16.287	0.562	3771.619	3764.171	3775.113	3754.769	3714.308	633	0
2:32:18	59.98	3756.407	16.000	16.187	0.562	3772.081	3764.119	3775.092	3755.331	3714.589	633	0
2:32:20	59.979	3756.975	16.800	16.401	0.562	3772.857	3764.070	3775.077	3755.893	3714.870	633	0
2:32:22	59.983	3760.405	13.599	15.420	0.562	3772.438	3764.046	3775.059	3756.455	3715.151	633	0
2:32:24	59.983	3760.982	13.599	14.783	0.562	3772.363	3764.025	3775.041	3757.017	3715.432	633	0
2:32:26	59.984	3761.407	12.799	14.088	0.562	3772.230	3764.008	3775.023	3757.579	3715.713	633	0
2:32:28	59.988	3762.737	9.601	12.518	0.562	3771.222	3764.000	3774.998	3758.141	3715.994	633	0
2:32:30	59.989	3763.212	8.801	11.217	0.562	3770.483	3763.994	3774.968	3758.703	3716.275	633	0
2:32:32	59.987	3764.958	10.400	10.931	0.562	3770.759	3764.001	3774.941	3759.265	3716.556	633	0
2:32:34	59.987	3766.085	10.400	10.745	0.562	3771.135	3764.014	3774.916	3759.827	3716.837	633	0
2:32:36	59.991	3766.433	7.199	9.504	0.562	3770.456	3764.030	3774.888	3760.389	3717.118	633	0
2:32:38	59.993	3767.251	5.600	8.138	0.562	3769.651	3764.050	3774.854	3760.950	3717.399	633	0
2:32:40	59.992	3767.792	6.400	7.529	0.562	3769.605	3764.074	3774.821	3761.512	3717.680	633	0
2:32:42	59.991	3768.634	7.199	7.414	0.562	3770.051	3764.102	3774.791	3762.074	3717.961	633	0
2:32:44	59.989	3771.146	8.801	7.899	0.562	3771.099	3764.146	3774.768	3762.636	3718.242	633	0
2:32:46	59.986	3772.445	11.200	9.055	0.562	3772.816	3764.198	3774.756	3763.198	3718.522	633	0
2:32:48	59.983	3773.695	13.599	10.645	0.562	3774.969	3764.257	3774.757	3763.760	3718.803	633	0
2:32:50	59.983	3774.668	13.599	11.679	0.562	3776.564	3764.321	3774.768	3764.322	3719.084	633	0
2:32:52	59.988	3775.841	9.601	10.951	0.562	3776.399	3764.391	3774.778	3764.884	3719.365	633	0
2:32:54	59.993	3775.363	5.600	9.078	0.562	3775.088	3764.457	3774.780	3765.446	3719.646	633	0
2:32:56	59.996	3774.866	3.201	7.021	0.000	3773.031	3764.520	3774.770	3765.446	3719.924	633	0
2:32:58	59.998	3775.492	1.599	5.124	0.000	3771.133	3764.586	3774.748	3765.446	3720.198	633	0
2:33:00	59.999	3776.420	0.800	3.610	0.000	3769.620	3764.656	3774.717	3765.446	3720.469	633	0
2:33:02	60.001	3778.554	-0.800	2.067	0.000	3768.076	3764.738	3774.678	3765.446	3720.737	633	0

2:33:04	59.999	3779.692	0.800	1.623	0.000	3767.633	3764.826	3774.637	3765.446	3721.001	633	0
2:33:06	59.999	3781.256	0.800	1.335	0.000	3767.344	3764.922	3774.594	3765.446	3721.263	633	0
2:33:08	59.999	3780.595	0.800	1.148	0.000	3767.157	3765.014	3774.551	3765.446	3721.521	633	0
2:33:10	60.002	3783.092	-1.599	0.186	0.000	3766.196	3765.118	3774.502	3765.446	3721.777	633	0
2:33:12	60.005	3783.896	-4.001	-1.279	0.000	3764.730	3765.226	3774.446	3765.446	3722.029	633	0
2:33:14	60.007	3784.421	-5.600	-2.792	0.000	3763.218	3765.336	3774.382	3765.446	3722.279	633	0
2:33:16	60.008	3785.768	-6.400	-4.054	0.000	3761.955	3765.452	3774.311	3765.446	3722.525	633	0
2:33:18	60.011	3785.463	-8.801	-5.716	0.000	3760.294	3765.565	3774.232	3765.446	3722.769	633	0
2:33:20	60.014	3786.850	-11.200	-7.635	0.000	3758.374	3765.684	3774.143	3765.446	3723.010	633	0
2:33:22	60.017	3786.304	-13.599	-9.722	0.000	3756.287	3765.800	3774.043	3765.446	3723.249	633	0
2:33:24	60.019	3787.259	-15.201	-11.640	0.000	3754.370	3765.919	3773.934	3765.446	3723.484	633	0
2:33:26	60.021	3787.516	-16.800	-13.446	0.000	3752.564	3766.038	3773.816	3765.446	3723.717	633	0
2:33:28	60.017	3787.955	-13.599	-13.499	0.000	3752.510	3766.159	3773.699	3765.446	3723.948	633	0
2:33:30	60.017	3788.030	-13.599	-13.534	0.000	3752.475	3766.278	3773.583	3765.446	3724.176	633	0
2:33:32	60.019	3788.607	-15.201	-14.117	0.000	3751.892	3766.399	3773.465	3765.446	3724.402	633	0
2:33:34	60.023	3789.216	-18.399	-15.616	0.000	3750.393	3766.523	3773.340	3765.446	3724.625	633	0
2:33:36	60.024	3787.537	-19.199	-16.870	0.000	3749.140	3766.636	3773.210	3765.446	3724.845	633	0
2:33:38	60.025	3785.842	-20.001	-17.966	0.000	3748.044	3766.738	3773.076	3765.446	3725.064	633	0
2:33:40	60.021	3786.077	-16.800	-17.558	0.000	3748.452	3766.841	3772.945	3765.446	3725.280	633	0
2:33:42	60.019	3787.930	-15.201	-16.733	0.000	3749.277	3766.953	3772.819	3765.446	3725.493	633	0
2:33:44	60.024	3788.760	-19.199	-17.596	0.000	3748.414	3767.068	3772.691	3765.446	3725.705	633	0
2:33:46	60.024	3786.875	-19.199	-18.157	0.000	3747.853	3767.171	3772.561	3765.446	3725.914	633	0
2:33:48	60.021	3786.550	-16.800	-17.682	0.000	3748.328	3767.272	3772.435	3765.446	3726.121	633	0
2:33:50	60.02	3787.358	-16.000	-17.093	0.000	3748.916	3767.376	3772.313	3765.446	3726.326	633	0
2:33:52	60.025	3785.018	-20.001	-18.111	0.000	3747.898	3767.467	3772.187	3765.446	3726.528	633	0
2:33:54	60.024	3785.614	-19.199	-18.492	0.000	3747.518	3767.560	3772.061	3765.446	3726.729	633	0
2:33:56	60.02	3785.949	-16.000	-17.620	0.000	3748.390	3767.654	3771.940	3765.446	3726.927	633	0
2:33:58	60.02	3785.804	-16.000	-17.053	0.000	3748.956	3767.746	3771.823	3765.446	3727.124	633	0
2:34:00	60.022	3786.864	-17.599	-17.244	0.000	3748.765	3767.843	3771.707	3765.446	3727.318	633	0
2:34:02	60.022	3786.877	-17.599	-17.369	0.000	3748.641	3767.938	3771.591	3765.446	3727.511	633	0
2:34:04	60.022	3785.254	-17.599	-17.449	0.000	3748.560	3768.025	3771.476	3765.446	3727.702	633	0
2:34:06	60.021	3785.726	-16.800	-17.222	0.000	3748.787	3768.113	3771.363	3765.446	3727.890	633	0
2:34:08	60.021	3786.347	-16.800	-17.074	0.000	3748.935	3768.203	3771.252	3765.446	3728.077	633	0
2:34:10	60.023	3785.821	-18.399	-17.538	0.000	3748.471	3768.290	3771.139	3765.446	3728.262	633	0
2:34:12	60.023	3785.798	-18.399	-17.839	0.000	3748.170	3768.376	3771.027	3765.446	3728.445	633	0
2:34:14	60.022	3786.284	-17.599	-17.755	0.000	3748.254	3768.463	3770.916	3765.446	3728.627	633	0
2:34:16	60.019	3786.939	-15.201	-16.861	0.000	3749.148	3768.553	3770.810	3765.446	3728.806	633	0
2:34:18	60.016	3787.627	-12.799	-15.440	0.000	3750.570	3768.645	3770.712	3765.446	3728.984	633	0
2:34:20	60.018	3789.444	-14.401	-15.076	0.000	3750.933	3768.745	3770.617	3765.446	3729.160	633	0
2:34:22	60.018	3789.673	-14.401	-14.840	0.000	3751.170	3768.845	3770.524	3765.446	3729.335	633	0
2:34:24	60.018	3789.404	-14.401	-14.686	0.000	3751.323	3768.943	3770.433	3765.446	3729.508	633	0
2:34:26	60.019	3788.479	-15.201	-14.866	0.000	3751.143	3769.036	3770.341	3765.446	3729.679	633	0
2:34:28	60.019	3789.183	-15.201	-14.983	0.000	3751.026	3769.131	3770.250	3765.446	3729.848	633	0
2:34:30	60.016	3789.369	-12.799	-14.219	0.000	3751.791	3769.226	3770.164	3765.446	3730.016	633	0
2:34:32	60.015	3789.005	-12.000	-13.442	0.000	3752.567	3769.318	3770.081	3765.446	3730.183	633	0
2:34:34	60.016	3788.665	-12.799	-13.217	0.000	3752.792	3769.408	3770.001	3765.446	3730.347	633	0
2:34:36	60.014	3788.933	-11.200	-12.511	0.000	3753.498	3769.499	3769.925	3765.446	3730.511	633	0
2:34:38	60.013	3790.667	-10.400	-11.772	0.000	3754.237	3769.596	3769.852	3765.446	3730.672	633	0
2:34:40	60.012	3790.805	-9.601	-11.012	0.000	3754.997	3769.693	3769.784	3765.446	3730.833	633	0
2:34:42	60.012	3790.411	-9.601	-10.518	0.000	3755.491	3769.788	3769.719	3765.446	3730.991	633	0
2:34:44	60.01	3789.769	-7.999	-9.636	0.000	3756.373	3769.879	3769.658	3765.446	3731.149	633	0
2:34:46	60.007	3791.540	-5.600	-8.224	0.000	3757.786	3769.977	3769.604	3765.446	3731.305	633	0
2:34:48	60.007	3792.945	-5.600	-7.305	0.000	3758.704	3770.080	3769.555	3765.446	3731.459	633	0
2:34:50	60.009	3791.027	-7.199	-7.268	0.000	3758.741	3770.174	3769.507	3765.446	3731.612	633	0
2:34:52	60.009	3791.443	-7.199	-7.244	0.000	3758.765	3770.269	3769.459	3765.446	3731.764	633	0
2:34:54	60.01	3791.426	-7.999	-7.508	0.000	3758.501	3770.363	3769.410	3765.446	3731.914	633	0
2:34:56	60.003	3790.603	-2.399	-5.720	0.000	3760.290	3770.453	3769.370	3765.446	3732.063	633	0
2:34:58	59.999	3790.457	0.800	-3.438	0.000	3762.571	3770.541	3769.340	3765.446	3732.211	633	0
2:35:00	59.995	3790.216	4.001	-0.834	0.000	3765.175	3770.627	3769.322	3765.446	3732.357	633	0
2:35:02	59.992	3789.585	6.400	1.697	0.000	3767.707	3770.710	3769.315	3765.446	3732.502	633	0
2:35:04	59.991	3788.457	7.199	3.623	0.000	3769.632	3770.787	3769.316	3765.446	3732.646	633	0
2:35:06	59.992	3788.105	6.400	4.595	0.000	3770.604	3770.862	3769.322	3765.446	3732.789	633	0

2:35:08	59.992	3788.057	6.400	5.226	0.000	3771.236	3770.936	3769.330	3765.446	3732.930	633	0
2:35:10	59.988	3788.189	9.601	6.757	0.000	3772.767	3771.010	3769.345	3765.446	3733.070	633	0
2:35:12	59.986	3788.497	11.200	8.312	0.000	3774.322	3771.085	3769.366	3765.446	3733.209	633	0
2:35:14	59.985	3788.540	12.000	9.603	0.000	3775.612	3771.159	3769.392	3765.446	3733.347	633	0
2:35:16	59.984	3788.571	12.799	10.722	0.000	3776.731	3771.233	3769.423	3765.446	3733.484	633	0
2:35:18	59.985	3788.101	12.000	11.169	0.000	3777.178	3771.304	3769.456	3765.446	3733.619	633	0
2:35:20	59.984	3787.133	12.799	11.739	0.000	3777.749	3771.371	3769.491	3765.446	3733.754	633	0
2:35:22	59.982	3786.453	14.401	12.671	0.000	3778.681	3771.434	3769.530	3765.446	3733.887	633	0
2:35:24	59.981	3787.732	15.201	13.556	0.000	3779.566	3771.502	3769.571	3765.446	3734.019	633	0
2:35:26	59.982	3788.813	14.401	13.852	0.000	3779.862	3771.574	3769.614	3765.446	3734.150	633	0
2:35:28	59.979	3789.285	16.800	14.884	0.000	3780.893	3771.647	3769.661	3765.446	3734.280	633	0
2:35:30	59.977	3788.256	18.399	16.114	0.000	3782.124	3771.715	3769.712	3765.446	3734.408	633	0
2:35:32	59.976	3788.410	19.199	17.194	0.000	3783.203	3771.784	3769.767	3765.446	3734.536	633	0
2:35:34	59.976	3790.467	19.199	17.895	0.000	3783.905	3771.860	3769.825	3765.446	3734.663	633	0
2:35:36	59.979	3790.665	16.800	17.512	0.000	3783.521	3771.936	3769.881	3765.446	3734.788	633	0
2:35:38	59.982	3790.420	14.401	16.423	0.000	3782.433	3772.011	3769.931	3765.446	3734.913	633	0
2:35:40	59.978	3789.674	17.599	16.835	0.000	3782.844	3772.082	3769.983	3765.446	3735.037	633	0
2:35:42	59.976	3789.267	19.199	17.662	0.000	3783.672	3772.151	3770.038	3765.446	3735.159	633	0
2:35:44	59.974	3789.148	20.801	18.761	0.000	3784.770	3772.219	3770.097	3765.446	3735.281	633	0
2:35:46	59.976	3790.430	19.199	18.914	0.000	3784.923	3772.292	3770.156	3765.446	3735.402	633	0
2:35:48	59.977	3789.914	18.399	18.734	0.000	3784.743	3772.362	3770.214	3765.446	3735.521	633	0
2:35:50	59.977	3786.243	18.399	18.617	0.000	3784.626	3772.417	3770.271	3765.446	3735.640	633	0
2:35:52	59.975	3787.442	20.001	19.101	0.000	3785.111	3772.476	3770.330	3765.446	3735.758	633	0
2:35:54	59.973	3788.963	21.600	19.976	0.000	3785.985	3772.541	3770.391	3765.446	3735.875	633	0
2:35:56	59.969	3790.602	24.799	21.664	0.000	3787.673	3772.611	3770.459	3765.446	3735.991	633	0
2:35:58	59.97	3791.877	23.999	22.481	0.000	3788.491	3772.686	3770.529	3765.446	3736.106	633	0
2:36:00	59.971	3792.911	23.199	22.733	0.000	3788.742	3772.764	3770.599	3765.446	3736.220	633	0
2:36:02	59.973	3792.311	21.600	22.336	0.000	3788.346	3772.840	3770.668	3765.446	3736.333	633	0
2:36:04	59.978	3789.125	17.599	20.678	0.000	3786.688	3772.903	3770.730	3765.446	3736.446	633	0
2:36:06	59.981	3788.080	15.201	18.761	0.000	3784.771	3772.961	3770.783	3765.446	3736.557	633	0
2:36:08	59.978	3787.844	17.599	18.355	0.000	3784.364	3773.018	3770.835	3765.446	3736.668	633	0
2:36:10	59.975	3787.135	20.001	18.931	0.000	3784.940	3773.071	3770.889	3765.446	3736.778	633	0
2:36:12	59.972	3787.164	22.400	20.145	0.000	3786.155	3773.125	3770.947	3765.446	3736.887	633	0
2:36:14	59.976	3786.996	19.199	19.814	0.000	3785.823	3773.177	3771.003	3765.446	3736.995	633	0
2:36:16	59.975	3787.405	20.001	19.879	0.000	3785.889	3773.230	3771.059	3765.446	3737.102	633	0
2:36:18	59.973	3786.487	21.600	20.482	0.000	3786.491	3773.280	3771.116	3765.446	3737.209	633	0
2:36:20	59.969	3787.079	24.799	21.993	0.000	3788.002	3773.332	3771.180	3765.446	3737.314	633	0
2:36:22	59.966	3789.214	27.200	23.815	0.000	3789.825	3773.391	3771.249	3765.446	3737.419	633	0
2:36:24	59.965	3790.512	28.000	25.280	0.000	3791.289	3773.454	3771.323	3765.446	3737.524	633	0
2:36:26	59.966	3791.221	27.200	25.952	0.000	3791.962	3773.520	3771.399	3765.446	3737.627	633	0
2:36:28	59.969	3792.218	24.799	25.548	0.000	3791.558	3773.588	3771.473	3765.446	3737.730	633	0
2:36:30	59.97	3790.959	23.999	25.006	0.000	3791.016	3773.652	3771.545	3765.446	3737.832	633	0
2:36:32	59.968	3788.824	25.601	25.214	0.000	3791.224	3773.707	3771.617	3765.446	3737.933	633	0
2:36:34	59.965	3789.026	28.000	26.189	0.000	3792.199	3773.763	3771.692	3765.446	3738.033	633	0
2:36:36	59.964	3789.167	28.799	27.103	0.000	3793.112	3773.819	3771.769	3765.446	3738.133	633	0
2:36:38	59.97	3787.394	23.999	26.017	0.000	3792.026	3773.868	3771.842	3765.446	3738.232	633	0
2:36:40	59.972	3785.690	22.400	24.751	0.000	3790.760	3773.910	3771.910	3765.446	3738.330	633	0
2:36:42	59.967	3784.831	26.401	25.328	0.000	3791.338	3773.950	3771.980	3765.446	3738.428	633	0
2:36:44	59.967	3785.010	26.401	25.704	0.000	3791.713	3773.989	3772.050	3765.446	3738.524	633	0
2:36:46	59.969	3784.320	24.799	25.387	0.000	3791.396	3774.026	3772.119	3765.446	3738.621	633	0
2:36:48	59.968	3782.809	25.601	25.462	0.000	3791.471	3774.057	3772.188	3765.446	3738.716	633	0
2:36:50	59.969	3782.110	24.799	25.230	0.000	3791.239	3774.085	3772.255	3765.446	3738.811	633	0
2:36:52	59.967	3779.352	26.401	25.640	0.000	3791.649	3774.104	3772.324	3765.446	3738.905	633	0
2:36:54	59.967	3779.056	26.401	25.906	0.000	3791.915	3774.121	3772.392	3765.446	3738.998	633	0
2:36:56	59.966	3778.633	27.200	26.359	0.000	3792.368	3774.137	3772.462	3765.446	3739.091	633	0
2:36:58	59.965	3779.212	28.000	26.933	0.000	3792.943	3774.155	3772.533	3765.446	3739.183	633	0
2:37:00	59.971	3779.335	23.199	25.626	0.000	3791.636	3774.173	3772.600	3765.446	3739.275	633	0
2:37:02	59.967	3776.429	26.401	25.897	0.000	3791.907	3774.181	3772.667	3765.446	3739.366	633	0
2:37:04	59.965	3775.647	28.000	26.633	0.000	3792.643	3774.186	3772.736	3765.446	3739.456	633	0
2:37:06	59.962	3776.597	30.399	27.951	0.000	3793.961	3774.194	3772.808	3765.446	3739.546	633	0
2:37:08	59.964	3776.559	28.799	28.248	0.000	3794.257	3774.202	3772.882	3765.446	3739.635	633	0
2:37:10	59.97	3776.023	23.999	26.761	0.000	3792.770	3774.208	3772.950	3765.446	3739.723	633	0

2:37:12	59.967	3773.170	26.401	26.635	0.000	3792.644	3774.205	3773.017	3765.446	3739.811	633	0
2:37:14	59.969	3771.730	24.799	25.992	0.000	3792.002	3774.196	3773.081	3765.446	3739.898	633	0
2:37:16	59.968	3768.793	25.601	25.855	0.000	3791.865	3774.178	3773.145	3765.446	3739.985	633	0
2:37:18	59.963	3768.503	29.599	27.166	0.000	3793.175	3774.159	3773.212	3765.446	3740.071	633	0
2:37:20	59.965	3768.917	28.000	27.458	0.000	3793.467	3774.141	3773.280	3765.446	3740.156	633	0
2:37:22	59.97	3767.366	23.999	26.247	0.000	3792.257	3774.119	3773.343	3765.446	3740.241	633	0
2:37:24	59.973	3764.786	21.600	24.621	0.000	3790.630	3774.088	3773.401	3765.446	3740.325	633	0
2:37:26	59.968	3760.295	25.601	24.964	0.000	3790.973	3774.042	3773.459	3765.446	3740.409	633	0
2:37:28	59.965	3759.592	28.000	26.026	0.000	3792.036	3773.994	3773.521	3765.446	3740.492	633	0
2:37:30	59.968	3761.894	25.601	25.878	0.000	3791.887	3773.954	3773.582	3765.446	3740.575	633	0
2:37:32	59.969	3761.777	24.799	25.500	0.000	3791.509	3773.914	3773.641	3765.446	3740.657	633	0
2:37:34	59.967	3760.583	26.401	25.815	0.000	3791.825	3773.870	3773.700	3765.446	3740.738	633	0
2:37:36	59.964	3760.157	28.799	26.860	0.000	3792.869	3773.825	3773.763	3765.446	3740.819	633	0
2:37:38	59.966	3759.781	27.200	26.979	0.000	3792.988	3773.780	3773.825	3765.446	3740.900	633	0
2:37:40	59.979	3759.495	16.800	23.416	0.000	3789.426	3773.733	3773.876	3765.446	3740.980	633	0
2:37:42	59.99	3757.773	7.999	18.020	0.000	3784.030	3773.682	3773.909	3765.446	3741.059	633	0
2:37:44	59.983	3753.277	13.599	16.473	0.000	3782.482	3773.616	3773.937	3765.446	3741.138	633	0
2:37:46	59.974	3753.087	20.801	17.987	0.000	3783.997	3773.550	3773.969	3765.446	3741.217	633	0
2:37:48	59.967	3751.637	26.401	20.932	0.000	3786.942	3773.480	3774.011	3765.446	3741.295	633	0
2:37:50	59.965	3753.751	28.000	23.406	0.000	3789.415	3773.417	3774.060	3765.446	3741.372	633	0
2:37:52	59.962	3758.225	30.399	25.853	0.000	3791.863	3773.368	3774.116	3765.446	3741.449	633	0
2:37:54	59.962	3759.250	30.399	27.444	0.000	3793.454	3773.323	3774.178	3765.446	3741.525	633	0
2:37:56	59.961	3758.041	31.201	28.759	0.000	3794.769	3773.275	3774.243	3765.446	3741.601	633	0
2:37:58	59.961	3760.965	31.201	29.614	0.000	3795.623	3773.236	3774.310	3765.446	3741.677	633	0
2:38:00	59.96	3762.022	32.001	30.449	0.000	3796.459	3773.201	3774.380	3765.446	3741.752	633	0
2:38:02	59.963	3763.822	29.599	30.152	0.000	3796.161	3773.171	3774.448	3765.446	3741.826	633	0
2:38:04	59.959	3763.100	32.800	31.079	0.000	3797.088	3773.140	3774.519	3765.446	3741.900	633	0
2:38:06	59.956	3763.858	35.199	32.521	0.000	3798.530	3773.111	3774.594	3765.446	3741.974	633	0
2:38:08	59.951	3764.158	39.200	34.858	0.000	3800.868	3773.083	3774.676	3765.446	3742.047	633	0
2:38:10	59.953	3766.127	37.601	35.818	0.000	3801.828	3773.062	3774.760	3765.446	3742.120	633	0
2:38:12	59.954	3768.339	36.801	36.162	0.000	3802.172	3773.047	3774.844	3765.446	3742.192	633	0
2:38:14	59.957	3767.972	34.399	35.545	0.000	3801.555	3773.032	3774.926	3765.446	3742.264	633	0
2:38:16	59.956	3767.438	35.199	35.424	0.000	3801.434	3773.014	3775.008	3765.446	3742.335	633	0
2:38:18	59.961	3765.606	31.201	33.946	0.000	3799.955	3772.992	3775.084	3765.446	3742.406	633	0
2:38:20	59.963	3762.688	29.599	32.425	0.000	3798.434	3772.960	3775.155	3765.446	3742.476	633	0
2:38:22	59.961	3761.570	31.201	31.996	0.000	3798.006	3772.926	3775.225	3765.446	3742.546	633	0
2:38:24	59.959	3761.920	32.800	32.278	0.000	3798.287	3772.892	3775.295	3765.446	3742.616	633	0
2:38:26	59.963	3759.627	29.599	31.340	0.000	3797.350	3772.852	3775.361	3765.446	3742.685	633	0
2:38:28	59.963	3758.522	29.599	30.731	0.000	3796.740	3772.809	3775.426	3765.446	3742.754	633	0
2:38:30	59.965	3752.429	28.000	29.775	0.000	3795.784	3772.748	3775.487	3765.446	3742.822	633	0
2:38:32	59.968	3750.102	25.601	28.314	0.000	3794.324	3772.680	3775.543	3765.446	3742.890	633	0
2:38:34	59.968	3753.830	25.601	27.365	0.000	3793.374	3772.624	3775.596	3765.446	3742.958	633	0
2:38:36	59.968	3753.510	25.601	26.747	0.000	3792.757	3772.567	3775.647	3765.446	3743.025	633	0
2:38:38	59.97	3753.523	23.999	25.785	0.000	3791.795	3772.510	3775.695	3765.446	3743.092	633	0
2:38:40	59.973	3752.741	21.600	24.321	0.000	3790.330	3772.452	3775.739	3765.446	3743.158	633	0
2:38:42	59.971	3753.178	23.199	23.928	0.000	3789.938	3772.395	3775.780	3765.446	3743.224	633	0
2:38:44	59.965	3752.729	28.000	25.353	0.000	3791.363	3772.337	3775.826	3765.446	3743.289	633	0
2:38:46	59.967	3753.291	26.401	25.720	0.000	3791.729	3772.281	3775.873	3765.446	3743.355	633	0
2:38:48	59.967	3752.872	26.401	25.958	0.000	3791.968	3772.225	3775.920	3765.446	3743.419	633	0
2:38:50	59.972	3752.359	22.400	24.713	0.000	3790.722	3772.167	3775.963	3765.446	3743.484	633	0
2:38:52	59.976	3749.398	19.199	22.783	0.000	3788.792	3772.101	3776.000	3765.446	3743.548	633	0
2:38:54	59.975	3747.476	20.001	21.809	0.000	3787.819	3772.029	3776.035	3765.446	3743.611	633	0
2:38:56	59.969	3740.370	24.799	22.856	0.000	3788.865	3771.938	3776.072	3765.446	3743.675	633	0
2:38:58	59.973	3741.285	21.600	22.416	0.000	3788.426	3771.849	3776.107	3765.446	3743.738	633	0
2:39:00	59.974	3746.651	20.801	21.851	0.000	3787.860	3771.777	3776.141	3765.446	3743.800	633	0
2:39:02	59.978	3745.738	17.599	20.363	0.000	3786.372	3771.702	3776.170	3765.446	3743.862	633	0
2:39:04	59.981	3743.351	15.201	18.556	0.000	3784.566	3771.621	3776.194	3765.446	3743.924	633	0
2:39:06	59.981	3741.618	15.201	17.382	0.000	3783.391	3771.536	3776.215	3765.446	3743.986	633	0
2:39:08	59.981	3740.306	15.201	16.618	0.000	3782.628	3771.447	3776.233	3765.446	3744.047	633	0
2:39:10	59.982	3738.484	14.401	15.842	0.000	3781.852	3771.354	3776.249	3765.446	3744.108	633	0
2:39:12	59.982	3738.901	14.401	15.338	0.000	3781.347	3771.262	3776.263	3765.446	3744.168	633	0
2:39:14	59.984	3737.404	12.799	14.449	0.000	3780.459	3771.167	3776.275	3765.446	3744.228	633	0

2:39:16	59.982	3737.273	14.401	14.433	0.000	3780.442	3771.071	3776.287	3765.446	3744.288	633	0
2:39:18	59.981	3736.308	15.201	14.701	0.000	3780.711	3770.974	3776.299	3765.446	3744.347	633	0
2:39:20	59.979	3736.272	16.800	15.436	0.000	3781.445	3770.877	3776.314	3765.446	3744.406	633	0
2:39:22	59.98	3735.448	16.000	15.633	0.000	3781.643	3770.778	3776.329	3765.446	3744.465	633	0
2:39:24	59.978	3735.650	17.599	16.322	0.000	3782.331	3770.681	3776.345	3765.446	3744.524	633	0
2:39:26	59.978	3737.541	17.599	16.769	0.000	3782.778	3770.589	3776.363	3765.446	3744.582	633	0
2:39:28	59.98	3738.012	16.000	16.500	0.000	3782.509	3770.499	3776.380	3765.446	3744.640	633	0
2:39:30	59.981	3736.748	15.201	16.045	0.000	3782.055	3770.406	3776.396	3765.446	3744.697	633	0
2:39:32	59.98	3736.693	16.000	16.030	0.000	3782.039	3770.313	3776.411	3765.446	3744.754	633	0
2:39:34	59.978	3736.067	17.599	16.579	0.000	3782.588	3770.220	3776.428	3765.446	3744.811	633	0
2:39:36	59.976	3736.094	19.199	17.496	0.000	3783.505	3770.126	3776.447	3765.446	3744.868	633	0
2:39:38	59.972	3736.575	22.400	19.212	0.000	3785.222	3770.035	3776.471	3765.446	3744.924	633	0
2:39:40	59.971	3738.571	23.199	20.608	0.000	3786.617	3769.949	3776.499	3765.446	3744.980	633	0
2:39:42	59.969	3738.875	24.799	22.075	0.000	3788.084	3769.865	3776.530	3765.446	3745.035	633	0
2:39:44	59.974	3738.935	20.801	21.629	0.000	3787.638	3769.782	3776.560	3765.446	3745.091	633	0
2:39:46	59.975	3738.647	20.001	21.059	0.000	3787.069	3769.698	3776.589	3765.446	3745.146	633	0
2:39:48	59.976	3737.684	19.199	20.408	0.000	3786.417	3769.612	3776.615	3765.446	3745.200	633	0
2:39:50	59.972	3737.382	22.400	21.105	0.000	3787.115	3769.525	3776.643	3765.446	3745.255	633	0
2:39:52	59.969	3737.892	24.799	22.398	0.000	3788.407	3769.441	3776.675	3765.446	3745.309	633	0
2:39:54	59.971	3740.017	23.199	22.678	0.000	3788.688	3769.362	3776.707	3765.446	3745.363	633	0
2:39:56	59.974	3740.329	20.801	22.021	0.000	3788.031	3769.285	3776.737	3765.446	3745.416	633	0
2:39:58	59.972	3742.053	22.400	22.154	0.000	3788.163	3769.213	3776.767	3765.446	3745.470	633	0
2:40:00	59.972	3742.424	22.400	22.240	0.000	3788.249	3769.142	3776.798	3765.446	3745.523	633	0
2:40:02	59.972	3742.524	22.400	22.296	0.000	3788.305	3769.072	3776.828	3765.446	3745.575	633	0
2:40:04	59.977	3742.245	18.399	20.932	0.000	3786.941	3769.001	3776.855	3765.446	3745.628	633	0
2:40:06	59.982	3741.723	14.401	18.646	0.000	3784.656	3768.930	3776.875	3765.446	3745.680	633	0
2:40:08	59.978	3740.085	17.599	18.280	0.000	3784.289	3768.854	3776.894	3765.446	3745.732	633	0
2:40:10	59.976	3740.629	19.199	18.601	0.000	3784.611	3768.780	3776.915	3765.446	3745.783	633	0
2:40:12	59.973	3739.964	21.600	19.651	0.000	3785.660	3768.705	3776.937	3765.446	3745.835	633	0
2:40:14	59.974	3740.775	20.801	20.053	0.000	3786.063	3768.633	3776.961	3765.446	3745.886	633	0
2:40:16	59.977	3742.833	18.399	19.474	0.000	3785.484	3768.566	3776.983	3765.446	3745.937	633	0
2:40:18	59.977	3741.268	18.399	19.098	0.000	3785.107	3768.495	3777.004	3765.446	3745.987	633	0
2:40:20	59.978	3739.776	17.599	18.574	0.000	3784.583	3768.421	3777.024	3765.446	3746.037	633	0
2:40:22	59.979	3738.966	16.800	17.953	0.000	3783.962	3768.346	3777.042	3765.446	3746.088	633	0
2:40:24	59.981	3738.706	15.201	16.990	0.000	3782.999	3768.270	3777.057	3765.446	3746.137	633	0
2:40:26	59.977	3738.879	18.399	17.483	0.000	3783.492	3768.194	3777.073	3765.446	3746.187	633	0
2:40:28	59.974	3739.860	20.801	18.644	0.000	3784.654	3768.122	3777.093	3765.446	3746.236	633	0
2:40:30	59.971	3738.102	23.199	20.239	0.000	3786.248	3768.046	3777.116	3765.446	3746.285	633	0
2:40:32	59.971	3738.558	23.199	21.275	0.000	3787.284	3767.971	3777.142	3765.446	3746.334	633	0
2:40:34	59.971	3743.507	23.199	21.948	0.000	3787.958	3767.909	3777.169	3765.446	3746.382	633	0
2:40:36	59.972	3743.419	22.400	22.106	0.000	3788.116	3767.847	3777.197	3765.446	3746.431	633	0
2:40:38	59.968	3745.251	25.601	23.330	0.000	3789.339	3767.790	3777.227	3765.446	3746.479	633	0
2:40:40	59.966	3745.744	27.200	24.684	0.000	3790.694	3767.735	3777.261	3765.446	3746.526	633	0
2:40:42	59.966	3747.340	27.200	25.565	0.000	3791.574	3767.684	3777.297	3765.446	3746.574	633	0
2:40:44	59.971	3750.700	23.199	24.737	0.000	3790.746	3767.641	3777.331	3765.446	3746.621	633	0
2:40:46	59.973	3749.750	21.600	23.639	0.000	3789.649	3767.597	3777.361	3765.446	3746.668	633	0
2:40:48	59.972	3746.217	22.400	23.205	0.000	3789.215	3767.543	3777.391	3765.446	3746.715	633	0
2:40:50	59.969	3744.683	24.799	23.763	0.000	3789.772	3767.487	3777.422	3765.446	3746.762	633	0
2:40:52	59.972	3743.745	22.400	23.286	0.000	3789.295	3767.428	3777.451	3765.446	3746.808	633	0
2:40:54	59.974	3743.149	20.801	22.416	0.000	3788.426	3767.368	3777.478	3765.446	3746.854	633	0
2:40:56	59.973	3740.299	21.600	22.131	0.000	3788.140	3767.301	3777.504	3765.446	3746.900	633	0
2:40:58	59.97	3739.453	23.999	22.785	0.000	3788.794	3767.233	3777.532	3765.446	3746.946	633	0
2:41:00	59.971	3733.376	23.199	22.930	0.000	3788.939	3767.150	3777.560	3765.446	3746.991	633	0
2:41:02	59.974	3731.830	20.801	22.185	0.000	3788.194	3767.064	3777.586	3765.446	3747.036	633	0
2:41:04	59.982	3737.583	14.401	19.460	0.000	3785.470	3766.992	3777.605	3765.446	3747.081	633	0
2:41:06	59.985	3736.229	12.000	16.849	0.000	3782.859	3766.917	3777.618	3765.446	3747.126	633	0
2:41:08	59.985	3734.897	12.000	15.152	0.000	3781.161	3766.839	3777.627	3765.446	3747.171	633	0
2:41:10	59.985	3733.434	12.000	14.048	0.000	3780.058	3766.758	3777.633	3765.446	3747.215	633	0
2:41:12	59.987	3733.115	10.400	12.772	0.000	3778.781	3766.677	3777.635	3765.446	3747.259	633	0
2:41:14	59.989	3730.510	8.801	11.382	0.000	3777.391	3766.590	3777.635	3765.446	3747.303	633	0
2:41:16	59.989	3729.180	8.801	10.479	0.000	3776.488	3766.500	3777.632	3765.446	3747.347	633	0
2:41:18	59.986	3725.459	11.200	10.731	0.000	3776.741	3766.401	3777.630	3765.446	3747.390	633	0

2:41:20	59.987	3724.785	10.400	10.615	0.000	3776.625	3766.302	3777.627	3765.446	3747.434	633	0
2:41:22	59.99	3720.108	7.999	9.700	0.000	3775.709	3766.192	3777.623	3765.446	3747.477	633	0
2:41:24	59.994	3720.938	4.800	7.985	0.000	3773.994	3766.084	3777.614	3765.446	3747.520	633	0
2:41:26	59.996	3725.661	3.201	6.311	0.000	3772.320	3765.988	3777.602	3765.446	3747.562	633	0
2:41:28	60.001	3725.677	-0.800	3.822	0.000	3769.831	3765.892	3777.583	3765.446	3747.605	633	0
2:41:30	60.003	3727.754	-2.399	1.645	0.000	3767.654	3765.802	3777.560	3765.446	3747.647	633	0
2:41:32	60.004	3727.825	-3.201	-0.051	0.000	3765.958	3765.713	3777.532	3765.446	3747.689	633	0
2:41:34	60.006	3727.683	-4.800	-1.714	0.000	3764.296	3765.623	3777.501	3765.446	3747.731	633	0
2:41:36	60.012	3727.231	-9.601	-4.474	0.000	3761.535	3765.533	3777.464	3765.446	3747.773	633	0
2:41:38	60.014	3725.012	-11.200	-6.828	0.000	3759.181	3765.438	3777.421	3765.446	3747.814	633	0
2:41:40	60.019	3726.446	-15.201	-9.759	0.000	3756.251	3765.347	3777.371	3765.446	3747.856	633	0
2:41:42	60.021	3726.016	-16.800	-12.223	0.000	3753.786	3765.255	3777.316	3765.446	3747.897	633	0
2:41:44	60.025	3719.123	-20.001	-14.945	0.000	3751.064	3765.148	3777.255	3765.446	3747.938	633	0
2:41:46	60.026	3716.375	-20.801	-16.995	0.000	3749.015	3765.035	3777.190	3765.446	3747.978	633	0
2:41:48	60.027	3717.333	-21.600	-18.607	0.000	3747.403	3764.924	3777.121	3765.446	3748.019	633	0
2:41:50	60.029	3717.560	-23.199	-20.214	0.000	3745.795	3764.815	3777.049	3765.446	3748.059	633	0
2:41:52	60.029	3717.142	-23.199	-21.259	0.000	3744.750	3764.705	3776.974	3765.446	3748.099	633	0
2:41:54	60.037	3715.166	-29.599	-24.178	0.000	3741.831	3764.591	3776.893	3765.446	3748.139	633	0
2:41:56	60.036	3713.632	-28.799	-25.796	0.000	3740.214	3764.474	3776.809	3765.446	3748.179	633	0
2:41:58	60.037	3710.283	-29.599	-27.127	0.000	3738.883	3764.350	3776.722	3765.446	3748.219	633	0
2:42:00	60.037	3710.158	-29.599	-27.992	0.000	3738.017	3764.227	3776.634	3765.446	3748.258	633	0
2:42:02	60.036	3699.356	-28.799	-28.275	0.000	3737.735	3764.079	3776.546	3765.446	3748.297	633	0
2:42:04	60.041	3698.591	-32.800	-29.859	0.000	3736.151	3763.930	3776.454	3765.446	3748.336	633	0
2:42:06	60.043	3704.591	-34.399	-31.448	0.000	3734.562	3763.796	3776.359	3765.446	3748.375	633	0
2:42:08	60.044	3703.275	-35.199	-32.761	0.000	3733.249	3763.659	3776.261	3765.446	3748.414	633	0
2:42:10	60.043	3702.482	-34.399	-33.334	0.000	3732.675	3763.521	3776.163	3765.446	3748.453	633	0
2:42:12	60.046	3701.316	-36.801	-34.548	0.000	3731.462	3763.380	3776.062	3765.446	3748.491	633	0
2:42:14	60.048	3700.826	-38.400	-35.896	0.000	3730.113	3763.240	3775.959	3765.446	3748.529	633	0
2:42:16	60.046	3699.529	-36.801	-36.213	0.000	3729.797	3763.097	3775.855	3765.446	3748.567	633	0
2:42:18	60.046	3699.726	-36.801	-36.419	0.000	3729.591	3762.955	3775.752	3765.446	3748.605	633	0
2:42:20	60.043	3690.100	-34.399	-35.712	0.000	3730.297	3762.793	3775.650	3765.446	3748.643	633	0
2:42:22	60.043	3690.477	-34.399	-35.253	0.000	3730.757	3762.632	3775.550	3765.446	3748.680	633	0
2:42:24	60.044	3696.865	-35.199	-35.234	0.000	3730.776	3762.485	3775.451	3765.446	3748.718	633	0
2:42:26	60.043	3696.877	-34.399	-34.942	0.000	3731.068	3762.340	3775.352	3765.446	3748.755	633	0

A Point	2:27:24	
FPointA	60.03900146	2:27:24
A Value	60.04212523	
C Value	59.83599854	#N/A
Delta FC		

Non-Conforming Load sign convention: + (Data is positive for Load then enter "+" else "-"

Time		Value B 12 to 24 sec	FR B 12 to 24 sec	Value B 18 to 30 sec	FR B 18 to 30 sec	Value B 20 to 40 sec	FR B 20 to 40 sec	Value B 18 to 52 sec	FR B 18 to 52 sec	Value B 20 to 52 sec	FR B 20 to 52 sec
	B Frequency Value	59.8826		59.8844		59.8891		59.8883		59.8891	
	Delta FB	-0.1596	-397.200	-0.1577	-401.670	-0.1530	-414.405	-0.1538	-411.996	-0.1530	-413.952
	Slope B dF/dT	-0.00797768		-0.00788482		-0.0076504		-0.0076896		-0.0076504	
	RatioB-C	77.4056		76.5046		74.2298		74.6103		74.2298	
	Sustainability Index	-0.0172		-0.0190		-0.0237		-0.0229		-0.0237	

Interconnection Bias Total		
EI	ERCOT	WECC
-6349	-660	-2024

Frequency and Interconnection Frequency Response @ different Average periods of B

Total Generation Trip MW	Interconne Primary Frequency Response MW/0.1 Hz	FR B 20 to 52 sec Average MW		Value B 12 to 24 sec Average Frequency	FR B 12 to 24 sec Average MW	Value B 18 to 30 sec Average Frequency	FR B 18 to 30 sec Average MW	Value B 20 to 40 sec Average Frequency	FR B 20 to 40 sec Average MW	Value B 18 to 52 sec Average Frequency	FR B 18 to 52 sec Average MW	Value B 20 to 52 sec Average Frequency	FR B 20 to 52 sec Average MW
0													
0			T-72 sec										
0			T-70 sec										
0			T-68 sec										
0			T-66 sec										
0			T-64 sec										
0			T-62 sec										
0			T-60 sec										
0			T-58 sec										
0			T-56 sec										
0			T-54 sec										
0			T-52 sec										
0			T-50 sec										
0			T-48 sec										
0			T-46 sec										
0			T-44 sec										
0			T-42 sec										
0			T-40 sec										
0			T-38 sec										
0			T-36 sec										

Frequency, Actual Interchange, Adjustment Data, Bias and Load used in the evaluation

	T	Frequency Hz	Net Actual Interchange MW	JOU Dynamic Schedules Imp(-) Exp (+) MW	Non-Conforming Load Load (-) MW	Pumped Hydro Load (-) Gen (+) MW	Ramping Units Gen (+) MW	Transferred Frequency Response Rec (-) Del (+) MW/0.1 Hz	Contingent BA Lost Generation Load (-) Gen (+) MW	BA Bias Setting MW/0.1 Hz
T-72 sec	2:26:14	60.0270	3671.19	350.00	157.63	0.00	213.50	10.00	15.00	-103.00
T-70 sec	2:26:16	60.0260	3668.61	350.00	155.53	0.00	214.00	10.00	15.00	-103.00
T-68 sec	2:26:18	60.0260	3665.23	350.00	155.53	0.00	214.50	10.00	15.00	-103.00
T-66 sec	2:26:20	60.0220	3664.50	350.00	155.53	0.00	215.00	10.00	15.00	-103.00
T-64 sec	2:26:22	60.0190	3666.06	350.00	155.53	0.00	215.50	10.00	15.00	-103.00
T-62 sec	2:26:24	60.0170	3666.82	350.00	155.53	0.00	216.00	10.00	15.00	-103.00
T-60 sec	2:26:26	60.0190	3666.79	350.00	160.45	0.00	216.50	10.00	15.00	-103.00
T-58 sec	2:26:28	60.0200	3670.45	350.00	160.45	0.00	217.00	10.00	15.00	-103.00
T-56 sec	2:26:30	60.0190	3670.27	350.00	160.45	0.00	217.50	10.00	15.00	-103.00
T-54 sec	2:26:32	60.0210	3671.67	350.00	160.45	0.00	218.00	10.00	15.00	-103.00
T-52 sec	2:26:34	60.0210	3672.49	350.00	160.45	0.00	218.50	10.00	15.00	-103.00
T-50 sec	2:26:36	60.0210	3672.69	350.00	163.96	0.00	219.00	10.00	15.00	-103.00
T-48 sec	2:26:38	60.0190	3672.86	350.00	163.96	0.00	219.50	10.00	15.00	-103.00
T-46 sec	2:26:40	60.0180	3672.16	350.00	163.96	0.00	220.00	10.00	15.00	-103.00
T-44 sec	2:26:42	60.0220	3671.41	350.00	163.96	0.00	220.50	10.00	15.00	-103.00
T-42 sec	2:26:44	60.0310	3669.98	350.00	163.96	0.00	221.00	10.00	15.00	-103.00
T-40 sec	2:26:46	60.0370	3666.47	350.00	166.07	0.00	221.50	10.00	15.00	-103.00
T-38 sec	2:26:48	60.0370	3663.76	350.00	166.07	0.00	222.00	10.00	15.00	-103.00
T-36 sec	2:26:50	60.0360	3661.60	350.00	166.07	0.00	222.50	10.00	15.00	-103.00

0		T-34 sec										T-34 sec	2:26:52	60.0370	3660.67	350.00	166.07	0.00	223.00	10.00	15.00	-103.00
0		T-32 sec										T-32 sec	2:26:54	60.0460	3651.49	350.00	166.07	0.00	223.50	10.00	15.00	-103.00
0		T-30 sec										T-30 sec	2:26:56	60.0480	3649.19	350.00	163.77	0.00	224.00	10.00	15.00	-103.00
0		T-28 sec										T-28 sec	2:26:58	60.0480	3650.03	350.00	163.77	0.00	224.50	10.00	15.00	-103.00
0		T-26 sec										T-26 sec	2:27:00	60.0430	3648.25	350.00	163.77	0.00	225.00	10.00	15.00	-103.00
0		T-24 sec										T-24 sec	2:27:02	60.0410	3649.51	350.00	163.77	0.00	225.50	10.00	15.00	-103.00
0		T-22 sec										T-22 sec	2:27:04	60.0410	3654.29	350.00	163.77	0.00	226.00	10.00	15.00	-103.00
0		T-20 sec										T-20 sec	2:27:06	60.0410	3655.01	350.00	165.10	0.00	226.50	10.00	15.00	-103.00
0		T-18 sec										T-18 sec	2:27:08	60.0390	3651.87	350.00	165.10	0.00	227.00	10.00	15.00	-103.00
0		T-16 sec	60.042									T-16 sec	2:27:10	60.0410	3651.06	350.00	165.10	0.00	227.50	10.00	15.00	-103.00
0		T-14 sec	60.042									T-14 sec	2:27:12	60.0430	3649.19	350.00	165.10	0.00	228.00	10.00	15.00	-103.00
0		T-12 sec	60.042									T-12 sec	2:27:14	60.0450	3648.24	350.00	165.10	0.00	228.50	10.00	15.00	-103.00
0		T-10 sec	60.042									T-10 sec	2:27:16	60.0460	3645.39	350.00	165.48	0.00	229.00	10.00	15.00	-103.00
0		T-08 sec	60.042									T-08 sec	2:27:18	60.0410	3644.63	350.00	165.48	0.00	229.50	10.00	15.00	-103.00
0		T-06 sec	60.042									T-06 sec	2:27:20	60.0410	3645.45	350.00	165.48	0.00	230.00	10.00	15.00	-103.00
0		T-04 sec	60.042									T-04 sec	2:27:22	60.0410	3640.68	350.00	165.48	0.00	230.50	10.00	15.00	-103.00
0		T-02 sec	60.042									T-02 sec	2:27:24	60.0390	3641.19	350.00	165.48	0.00	231.00	10.00	15.00	-103.00
633	-987.1409	T+0 sec										T+0 sec	2:27:26	59.9780	3659.46	350.00	206.46	0.00	231.50	10.00	15.00	-103.00
633	-332.9405	T+02 sec										T+02 sec	2:27:28	59.8520	3696.36	350.00	206.46	0.00	232.00	10.00	0.00	-103.00
633	-307.0927	T+04 sec										T+04 sec	2:27:30	59.8360	3734.90	335.00	206.46	0.00	232.50	10.00	0.00	-103.00
633	-365.6302	T+06 sec										T+06 sec	2:27:32	59.8690	3734.67	335.00	206.46	0.00	233.00	10.00	0.00	-103.00
633	-365.6302	T+08 sec										T+08 sec	2:27:34	59.8690	3734.67	335.00	206.46	0.00	233.00	10.00	0.00	-103.00
633	-421.6432	T+10 sec										T+10 sec	2:27:36	59.8920	3737.16	335.00	206.46	0.00	233.50	10.00	0.00	-103.00
633	-418.8547	T+12 sec	59.8826	-397.200								T+12 sec	2:27:38	59.8910	3761.25	335.00	211.26	0.00	234.00	10.00	0.00	-103.00
633	-390.4415	T+14 sec	59.8826	-397.200								T+14 sec	2:27:40	59.8800	3766.11	335.00	211.26	1.00	234.50	10.00	0.00	-103.00
633	-381.0366	T+16 sec	59.8826	-397.200								T+16 sec	2:27:42	59.8760	3766.19	335.00	211.26	1.00	235.00	10.00	0.00	-103.00
633	-378.7579	T+18 sec	59.8826	-397.200	59.8844	-401.670			59.8883	-411.996		T+18 sec	2:27:44	59.8750	3768.88	335.00	211.26	1.00	235.50	10.00	0.00	-103.00
633	-397.7985	-413.951533	T+20 sec	59.8826	-397.200	59.8844	-401.670	59.8891	-414.405	59.8883	-411.996	59.8891	-413.952	T+20 sec	2:27:46	59.8830	3769.93	335.00	211.26	1.00	236.00	10.00	0.00	-103.00
633	-408.0602	-413.951533	T+22 sec	59.8826	-397.200	59.8844	-401.670	59.8891	-414.405	59.8883	-411.996	59.8891	-413.952	T+22 sec	2:27:48	59.8870	3780.62	335.00	214.35	1.00	236.50	10.00	0.00	-103.00
633	-405.4479	-413.951533	T+24 sec	59.8826	-397.200	59.8844	-401.670	59.8891	-414.405	59.8883	-411.996	59.8891	-413.952	T+24 sec	2:27:50	59.8860	3781.59	335.00	214.35	1.00	237.00	10.00	0.00	-103.00
633	-402.8591	-413.951533	T+26 sec			59.8844	-401.670	59.8891	-414.405	59.8883	-411.996	59.8891	-413.952	T+26 sec	2:27:52	59.8850	3782.50	335.00	214.35	1.00	237.50	10.00	0.00	-103.00
633	-408.0602	-413.951533	T+28 sec			59.8844	-401.670	59.8891	-414.405	59.8883	-411.996	59.8891	-413.952	T+28 sec	2:27:54	59.8870	3784.96	335.00	214.35	2.00	238.00	10.00	0.00	-103.00
633	-410.7063	-413.951533	T+30 sec			59.8844	-401.670	59.8891	-414.405	59.8883	-411.996	59.8891	-413.952	T+30 sec	2:27:56	59.8880	3784.73	335.00	214.35	3.00	238.50	10.00	0.00	-103.00
633	-416.1029	-413.951533	T+32 sec					59.8891	-414.405	59.8883	-411.996	59.8891	-413.952	T+32 sec	2:27:58	59.8900	3784.42	335.00	212.17	4.00	239.00	10.00	0.00	-103.00
633	-430.2471	-413.951533	T+34 sec					59.8891	-414.405	59.8883	-411.996	59.8891	-413.952	T+34 sec	2:28:00	59.8950	3788.07	335.00	212.17	5.00	239.50	10.00	0.00	-103.00
633	-427.344	-413.951533	T+36 sec					59.8891	-414.405	59.8883	-411.996	59.8891	-413.952	T+36 sec	2:28:02	59.8940	3788.33	335.00	212.17	6.00	240.00	10.00	0.00	-103.00
633	-424.4799	-413.951533	T+38 sec					59.8891	-414.405	59.8883	-411.996	59.8891	-413.952	T+38 sec	2:28:04	59.8930	3788.87	335.00	212.17	7.00	240.50	10.00	0.00	-103.00
633	-427.344	-413.951533	T+40 sec					59.8891	-414.405	59.8883	-411.996	59.8891	-413.952	T+40 sec	2:28:06	59.8940	3788.47	335.00	212.17	8.00	241.00	10.00	0.00	-103.00
633	-427.344	-413.951533	T+42 sec							59.8883	-411.996	59.8891	-413.952	T+42 sec	2:28:08	59.8940	3792.28	335.00	215.60	9.00	241.50	10.00	0.00	-103.00
633	-418.8547	-413.951533	T+44 sec							59.8883	-411.996	59.8891	-413.952	T+44 sec	2:28:10	59.8910	3793.07	335.00	215.60	10.00	242.00	10.00	0.00	-103.00
633	-416.1029	-413.951533	T+46 sec							59.8883	-411.996	59.8891	-413.952	T+46 sec	2:28:12	59.8900	3794.37	335.00	215.60	11.00	242.50	10.00	0.00	-103.00
633	-402.8591	-413.951533	T+48 sec							59.8883	-411.996	59.8891	-413.952	T+48 sec	2:28:14	59.8850	3799.43	335.00	215.60	12.00	243.00	10.00	0.00	-103.00
633	-402.8591	-413.951533	T+50 sec							59.8883	-411.996	59.8891	-413.952	T+50 sec	2:28:16	59.8850	3800.43	335.00	215.60	13.00	243.50	10.00	0.00	-103.00
633	-410.7063	-413.951533	T+52 sec							59.8883	-411.996	59.8891	-413.952	T+52 sec	2:28:18	59.8880	3799.96	335.00	218.33	14.00	244.00	10.00	0.00	-103.00
633	-408.0602		T+54 sec											T+54 sec	2:28:20	59.8870	3803.63	335.00	218.33	15.00	244.50	10.00	0.00	-103.00
633	-410.7063		T+56 sec											T+56 sec	2:28:22	59.8880	3802.93	335.00	218.33	16.00	245.00	10.00	0.00	-103.00
633	-410.7063		T+58 sec											T+58 sec	2:28:24	59.8880	3802.95	335.00	218.33	16.00	245.50	10.00	0.00	-103.00
633	-416.1029		T+60 sec											T+60 sec	2:28:26	59.8900	3804.39	335.00	218.33	16.00	246.00	10.00	0.00	-103.00
633	-413.387		T+62 sec											T+62 sec	2:28:28	59.8890	3805.50	335.00	217.38	16.00	246.50	10.00	0.00	-103.00
633	-395.3155		T+64 sec											T+64 sec	2:28:30	59.8820	3805.62	335.00	217.38	16.00	247.00	10.00	0.00	-103.00
633	-374.2813		T+66 sec											T+66 sec	2:28:32	59.8730	3809.24	335.00	217.38	16.00	247.50	10.00	0.00	-103.00
633	-341.9278		T+68 sec											T+68 sec	2:28:34	59.8570	3811.50	335.00	217.38	16.00	248.00	10.00	0.00	-103.00
633	-327.765		T+70 sec											T+70 sec	2:28:36	59.8490	3814.86	335.00	217.38	16.00	248.50	10.00	0.00	-103.00
633	-332.9405		T+72 sec											T+72 sec	2:28:38	59.8520	3815.89	335.00	214.83	16.00	249.00	10.00	0.00	-103.00
633	-343.791		T+74 sec											T+74 sec	2:28:40	59.8580	3825.64	335.00	214.83	16.00	249.50	10.00	0.00	-103.00
633	-353.382		T+76 sec											T+76 sec	2:28:42	59.8630	3826.05	335.00	214.83	16.00	250.00	10.00	0.00	-103.00
633	-359.4057		T+78 sec											T+78 sec	2:28:44	59.8660	3826.00	335.00	214.83	16.00	250.50	10.00	0.00	-103.00
633	-357.3777		T+80 sec											T+80 sec	2:28:46	59.8650	3827.52	335.00	214.83	16.00	251.00	10.00	0.00	-103.00
633	-361.4568														2:28:48	59.8670	3826.75	335.00	227.66	16.00	251.50	10.00	0.00	-103.00
633	-359.4057														2:28:50	59.8660	3826.78	335.00	227.66	16.00	252.00	10.00	0.00	-103.00
633	-369.9011														2:28:52	59.8710	3826.45	335.00	227.66	16.00	252.50	10.00	0.00	-103.00
633	-376.5063														2:28:54	59.8740	3825.71	335.00	227.66	16.00	253.00	10.00	0.00	-103.00

633	-388.0493	2:28:56	59.8790	3823.83	335.00	227.66	16.00	253.50	10.00	0.00	-103.00
633	-390.4415	2:28:58	59.8800	3822.51	335.00	225.02	16.00	254.00	10.00	0.00	-103.00
633	-397.7985	2:29:00	59.8830	3819.08	335.00	225.02	16.00	254.50	10.00	0.00	-103.00
633	-405.4479	2:29:02	59.8860	3818.06	335.00	225.02	16.00	255.00	10.00	0.00	-103.00
633	-416.1029	2:29:04	59.8900	3816.81	335.00	225.02	16.00	255.50	10.00	0.00	-103.00
633	-421.6432	2:29:06	59.8920	3815.01	335.00	225.02	16.00	256.00	10.00	0.00	-103.00
633	-413.387	2:29:08	59.8890	3813.78	335.00	228.37	16.00	256.50	10.00	0.00	-103.00
633	-424.4799	2:29:10	59.8930	3811.84	335.00	228.37	16.00	257.00	10.00	0.00	-103.00
633	-442.2647	2:29:12	59.8990	3809.65	335.00	228.37	16.00	257.50	10.00	0.00	-103.00
633	-454.9854	2:29:14	59.9030	3806.97	335.00	228.37	16.00	258.00	10.00	0.00	-103.00
633	-451.7402	2:29:16	59.9020	3805.59	335.00	228.37	16.00	258.50	10.00	0.00	-103.00
633	-451.7402	2:29:18	59.9020	3804.19	335.00	234.08	16.00	259.00	10.00	0.00	-103.00
633	-458.2776	2:29:20	59.9040	3796.08	335.00	234.08	16.00	259.50	10.00	0.00	-103.00
633	-468.4595	2:29:22	59.9070	3793.98	335.00	234.08	16.00	260.00	10.00	0.00	-103.00
633	-482.7421	2:29:24	59.9110	3792.17	335.00	234.08	16.00	260.50	10.00	0.00	-103.00
633	-501.8836	2:29:26	59.9160	3791.50	335.00	234.08	16.00	261.00	10.00	0.00	-103.00
633	-501.8836	2:29:28	59.9160	3789.53	335.00	228.80	16.00	261.50	10.00	0.00	-103.00
633	-505.8925	2:29:30	59.9170	3788.13	335.00	228.80	16.00	262.00	10.00	0.00	-103.00
633	-509.9659	2:29:32	59.9180	3784.56	335.00	228.80	16.00	262.50	10.00	0.00	-103.00
633	-518.3127	2:29:34	59.9200	3783.03	335.00	228.80	16.00	263.00	10.00	0.00	-103.00
633	-522.6058	2:29:36	59.9210	3781.70	335.00	228.80	16.00	263.50	10.00	0.00	-103.00
633	-518.3127	2:29:38	59.9200	3776.36	335.00	229.47	16.00	264.00	10.00	0.00	-103.00
633	-505.8925	2:29:40	59.9170	3775.64	335.00	229.47	16.00	264.50	10.00	0.00	-103.00
633	-518.3127	2:29:42	59.9200	3774.60	335.00	229.47	16.00	265.00	10.00	0.00	-103.00
633	-522.6058	2:29:44	59.9210	3773.33	335.00	229.47	16.00	265.50	10.00	0.00	-103.00
633	-531.3751	2:29:46	59.9230	3773.96	335.00	229.47	16.00	266.00	10.00	0.00	-103.00
633	-545.095	2:29:48	59.9260	3772.72	335.00	228.98	16.00	266.50	10.00	0.00	-103.00
633	-540.4437	2:29:50	59.9250	3771.67	335.00	228.98	16.00	267.00	10.00	0.00	-103.00
633	-554.6607	2:29:52	59.9280	3769.63	335.00	228.98	16.00	267.50	10.00	0.00	-103.00
633	-549.8272	2:29:54	59.9270	3768.71	335.00	228.98	16.00	268.00	10.00	0.00	-103.00
633	-574.796	2:29:56	59.9320	3767.64	335.00	228.98	16.00	268.50	10.00	0.00	-103.00
633	-549.8272	2:29:58	59.9270	3767.02	335.00	219.98	16.00	269.00	10.00	0.00	-103.00
633	-554.6607	2:30:00	59.9280	3767.41	335.00	219.98	16.00	269.50	10.00	0.00	-103.00
633	-569.6264	2:30:02	59.9310	3766.79	335.00	219.98	16.00	270.00	10.00	0.00	-103.00
633	-559.5611	2:30:04	59.9290	3766.26	335.00	219.98	16.00	270.50	10.00	0.00	-103.00
633	-569.6264	2:30:06	59.9310	3765.67	335.00	219.98	16.00	271.00	10.00	0.00	-103.00
633	-580.0604	2:30:08	59.9330	3766.12	335.00	229.09	16.00	271.50	10.00	0.00	-103.00
633	-602.1406	2:30:10	59.9370	3764.24	335.00	229.09	16.00	272.00	10.00	0.00	-103.00
633	-602.1406	2:30:12	59.9370	3765.10	335.00	229.09	16.00	272.50	10.00	0.00	-103.00
633	-651.7339	2:30:14	59.9450	3762.94	335.00	229.09	16.00	273.00	10.00	0.00	-103.00
633	-679.7395	2:30:16	59.9490	3758.39	335.00	229.09	16.00	273.50	10.00	0.00	-103.00
633	-665.4288	2:30:18	59.9470	3753.92	335.00	229.66	16.00	274.00	10.00	0.00	-103.00
633	-632.2168	2:30:20	59.9420	3749.87	335.00	229.66	16.00	274.50	10.00	0.00	-103.00
633	-625.9683	2:30:22	59.9410	3746.89	335.00	229.66	16.00	275.00	10.00	0.00	-103.00
633	-632.2168	2:30:24	59.9420	3747.88	335.00	229.66	16.00	275.50	10.00	0.00	-103.00
633	-651.7339	2:30:26	59.9450	3749.59	335.00	229.66	16.00	276.00	10.00	0.00	-103.00
633	-672.5217	2:30:28	59.9480	3748.66	335.00	229.23	16.00	276.50	10.00	0.00	-103.00
633	-665.4288	2:30:30	59.9470	3746.71	335.00	229.23	16.00	277.00	10.00	0.00	-103.00
633	-679.7395	2:30:32	59.9490	3749.08	335.00	229.23	16.00	277.50	10.00	0.00	-103.00
633	-694.6501	2:30:34	59.9510	3742.74	335.00	229.23	16.00	278.00	10.00	0.00	-103.00
633	-702.3535	2:30:36	59.9520	3740.26	350.00	229.23	16.00	278.50	10.00	0.00	-103.00
633	-710.2296	2:30:38	59.9530	3736.14	350.00	231.41	16.00	279.00	10.00	0.00	-103.00
633	-694.6501	2:30:40	59.9510	3731.38	350.00	231.41	16.00	279.50	10.00	0.00	-103.00
633	-702.3535	2:30:42	59.9520	3727.84	350.00	231.41	16.00	280.00	10.00	0.00	-103.00
633	-702.3535	2:30:44	59.9520	3725.95	350.00	231.41	16.00	280.50	10.00	0.00	-103.00
633	-702.3535	2:30:46	59.9520	3722.65	350.00	231.41	16.00	281.00	10.00	0.00	-103.00
633	-726.5557	2:30:48	59.9550	3720.58	350.00	218.62	16.00	281.50	10.00	0.00	-103.00
633	-702.3535	2:30:50	59.9520	3718.00	350.00	218.62	16.00	282.00	10.00	0.00	-103.00
633	-718.2843	2:30:52	59.9540	3718.14	350.00	218.62	16.00	282.50	10.00	0.00	-103.00
633	-702.3535	2:30:54	59.9520	3715.75	350.00	218.62	16.00	283.00	10.00	0.00	-103.00
633	-710.2296	2:30:56	59.9530	3713.69	350.00	218.62	16.00	283.50	10.00	0.00	-103.00
633	-710.2296	2:30:58	59.9530	3713.48	350.00	213.54	16.00	284.00	10.00	0.00	-103.00

633	-702.3535	2:31:00	59.9520	3710.85	350.00	213.54	16.00	284.50	10.00	0.00	-103.00
633	-718.2843	2:31:02	59.9540	3710.81	350.00	213.54	16.00	285.00	10.00	0.00	-103.00
633	-718.2843	2:31:04	59.9540	3712.09	350.00	213.54	16.00	285.50	10.00	0.00	-103.00
633	-761.4983	2:31:06	59.9590	3714.62	350.00	213.54	16.00	286.00	10.00	0.00	-103.00
633	-743.6168	2:31:08	59.9570	3715.13	350.00	225.65	16.00	286.50	10.00	0.00	-103.00
633	-734.9872	2:31:10	59.9560	3716.17	350.00	225.65	16.00	287.00	10.00	0.00	-103.00
633	-718.2843	2:31:12	59.9540	3716.46	350.00	225.65	16.00	287.50	10.00	0.00	-103.00
633	-734.9872	2:31:14	59.9560	3716.98	350.00	225.65	16.00	288.00	10.00	0.00	-103.00
633	-726.5557	2:31:16	59.9550	3717.76	350.00	225.65	16.00	288.50	10.00	0.00	-103.00
633	-752.4513	2:31:18	59.9580	3722.36	350.00	212.57	16.00	289.00	10.00	0.00	-103.00
633	-780.2611	2:31:20	59.9610	3721.97	350.00	212.57	16.00	289.50	10.00	0.00	-103.00
633	-790.0311	2:31:22	59.9620	3722.66	350.00	212.57	16.00	290.00	10.00	0.00	-103.00
633	-790.0311	2:31:24	59.9620	3722.27	350.00	212.57	16.00	290.50	10.00	0.00	-103.00
633	-853.9431	2:31:26	59.9680	3722.28	350.00	212.57	16.00	291.00	10.00	0.00	-103.00
633	-831.5203	2:31:28	59.9660	3721.79	350.00	219.90	16.00	291.50	10.00	0.00	-103.00
633	-831.5203	2:31:30	59.9660	3723.09	350.00	219.90	16.00	292.00	10.00	0.00	-103.00
633	-853.9431	2:31:32	59.9680	3723.98	350.00	219.90	16.00	292.50	10.00	0.00	-103.00
633	-877.6551	2:31:34	59.9700	3723.43	350.00	219.90	16.00	293.00	10.00	0.00	-103.00
633	-929.1579	2:31:36	59.9740	3723.89	350.00	219.90	16.00	293.50	10.00	0.00	-103.00
633	-877.6551	2:31:38	59.9700	3725.40	350.00	231.18	16.00	294.00	10.00	0.00	-103.00
633	-865.6593	2:31:40	59.9690	3727.12	350.00	231.18	16.00	294.50	10.00	0.00	-103.00
633	-865.6593	2:31:42	59.9690	3728.05	350.00	231.18	16.00	295.00	10.00	0.00	-103.00
633	-877.6551	2:31:44	59.9700	3731.13	350.00	231.18	16.00	295.50	10.00	0.00	-103.00
633	-889.988	2:31:46	59.9710	3732.53	350.00	231.18	16.00	296.00	10.00	0.00	-103.00
633	-915.7237	2:31:48	59.9730	3733.33	350.00	226.63	16.00	296.50	10.00	0.00	-103.00
633	-915.7237	2:31:50	59.9730	3736.54	350.00	226.63	16.00	297.00	10.00	0.00	-103.00
633	-957.2998	2:31:52	59.9760	3736.91	350.00	226.63	16.00	297.50	10.00	0.00	-103.00
633	-987.1409	2:31:54	59.9780	3736.82	350.00	226.63	16.00	298.00	10.00	0.00	-103.00
633	-987.1409	2:31:56	59.9780	3738.70	350.00	226.63	16.00	298.50	10.00	0.00	-103.00
633	-957.2998	2:31:58	59.9760	3739.94	350.00	227.26	16.00	299.00	10.00	0.00	-103.00
633	-987.1409	2:32:00	59.9780	3740.88	350.00	227.26	16.00	299.50	10.00	0.00	-103.00
633	-957.2998	2:32:02	59.9760	3741.79	350.00	227.26	16.00	300.00	10.00	0.00	-103.00
633	-987.1409	2:32:04	59.9780	3745.23	350.00	227.26	16.00	300.50	10.00	0.00	-103.00
633	-971.9914	2:32:06	59.9770	3746.61	350.00	227.26	16.00	301.00	10.00	0.00	-103.00
633	-1018.902	2:32:08	59.9800	3748.30	350.00	229.29	16.00	301.50	10.00	0.00	-103.00
633	-1052.775	2:32:10	59.9820	3750.72	350.00	229.29	16.00	302.00	10.00	0.00	-103.00
633	-1035.562	2:32:12	59.9810	3751.56	350.00	229.29	16.00	302.50	10.00	0.00	-103.00
633	-1018.902	2:32:14	59.9800	3752.75	350.00	229.29	16.00	303.00	10.00	0.00	-103.00
633	-1002.77	2:32:16	59.9790	3755.60	350.00	229.29	16.00	303.50	10.00	0.00	-103.00
633	-1018.902	2:32:18	59.9800	3756.41	350.00	221.46	16.00	304.00	10.00	0.00	-103.00
633	-1002.77	2:32:20	59.9790	3756.98	350.00	221.46	16.00	304.50	10.00	0.00	-103.00
633	-1070.64	2:32:22	59.9830	3760.41	350.00	221.46	16.00	305.00	10.00	0.00	-103.00
633	-1070.64	2:32:24	59.9830	3760.98	350.00	221.46	16.00	305.50	10.00	0.00	-103.00
633	-1089.05	2:32:26	59.9840	3761.41	350.00	221.46	16.00	306.00	10.00	0.00	-103.00
633	-1169.488	2:32:28	59.9880	3762.74	350.00	241.27	16.00	306.50	10.00	0.00	-103.00
633	-1191.489	2:32:30	59.9890	3763.21	350.00	241.27	16.00	307.00	10.00	0.00	-103.00
633	-1148.284	2:32:32	59.9870	3764.96	350.00	241.27	16.00	307.50	10.00	0.00	-103.00
633	-1148.284	2:32:34	59.9870	3766.09	350.00	241.27	16.00	308.00	10.00	0.00	-103.00
633	-1238.164	2:32:36	59.9910	3766.43	350.00	241.27	16.00	308.50	10.00	0.00	-103.00
633	-1288.545	2:32:38	59.9930	3767.25	350.00	243.07	16.00	309.00	10.00	0.00	-103.00
633	-1262.852	2:32:40	59.9920	3767.79	350.00	243.07	16.00	309.50	10.00	0.00	-103.00
633	-1238.164	2:32:42	59.9910	3768.63	350.00	243.07	16.00	310.00	10.00	0.00	-103.00
633	-1191.489	2:32:44	59.9890	3771.15	350.00	243.07	16.00	310.50	10.00	0.00	-103.00
633	-1127.836	2:32:46	59.9860	3772.44	350.00	243.07	16.00	311.00	10.00	0.00	-103.00
633	-1070.64	2:32:48	59.9830	3773.69	350.00	241.67	16.00	311.50	10.00	0.00	-103.00
633	-1070.64	2:32:50	59.9830	3774.67	350.00	241.67	16.00	312.00	10.00	0.00	-103.00
633	-1169.488	2:32:52	59.9880	3775.84	350.00	241.67	16.00	312.50	10.00	0.00	-103.00
633	-1288.545	2:32:54	59.9930	3775.36	350.00	241.67	16.00	313.00	10.00	0.00	-103.00
633	-1372.303	2:32:56	59.9960	3774.87	350.00	241.67	16.00	313.50	10.00	0.00	-103.00
633	-1434.589	2:32:58	59.9980	3775.49	350.00	228.15	16.00	314.00	10.00	0.00	-103.00
633	-1467.837	2:33:00	59.9990	3776.42	350.00	228.15	16.00	314.50	10.00	0.00	-103.00
633	-1539.181	2:33:02	60.0010	3778.55	350.00	228.15	16.00	315.00	10.00	0.00	-103.00

633	-1467.837	2:33:04	59.9990	3779.69	350.00	228.15	16.00	315.50	10.00	0.00	-103.00
633	-1467.837	2:33:06	59.9990	3781.26	350.00	228.15	16.00	316.00	10.00	0.00	-103.00
633	-1467.837	2:33:08	59.9990	3780.59	350.00	235.13	16.00	316.50	10.00	0.00	-103.00
633	-1577.518	2:33:10	60.0020	3783.09	350.00	235.13	16.00	317.00	10.00	0.00	-103.00
633	-1705.089	2:33:12	60.0050	3783.90	350.00	235.13	16.00	317.50	10.00	0.00	-103.00
633	-1802.122	2:33:14	60.0070	3784.42	350.00	235.13	16.00	318.00	10.00	0.00	-103.00
633	-1854.901	2:33:16	60.0080	3785.77	350.00	235.13	16.00	318.50	10.00	0.00	-103.00
633	-2033.824	2:33:18	60.0110	3785.46	350.00	246.43	16.00	319.00	10.00	0.00	-103.00
633	-2250.644	2:33:20	60.0140	3786.85	350.00	246.43	16.00	319.50	10.00	0.00	-103.00
633	-2519.209	2:33:22	60.0170	3786.30	350.00	246.43	16.00	320.00	10.00	0.00	-103.00
633	-2737.39	2:33:24	60.0190	3787.26	350.00	246.43	16.00	320.50	10.00	0.00	-103.00
633	-2996.405	2:33:26	60.0210	3787.52	350.00	246.43	16.00	321.00	10.00	0.00	-103.00
633	-2519.209	2:33:28	60.0170	3787.96	350.00	236.55	16.00	321.50	10.00	0.00	-103.00
633	-2519.209	2:33:30	60.0170	3788.03	350.00	236.55	16.00	322.00	10.00	0.00	-103.00
633	-2737.39	2:33:32	60.0190	3788.61	350.00	236.55	16.00	322.50	10.00	0.00	-103.00
633	-3309.559	2:33:34	60.0230	3789.22	350.00	236.55	16.00	323.00	10.00	0.00	-103.00
633	-3492.035	2:33:36	60.0240	3787.54	350.00	236.55	16.00	323.50	10.00	0.00	-103.00
633	-3696.631	2:33:38	60.0250	3785.84	350.00	230.30	16.00	324.00	10.00	0.00	-103.00
633	-2996.405	2:33:40	60.0210	3786.08	350.00	230.30	16.00	324.50	10.00	0.00	-103.00
633	-2737.39	2:33:42	60.0190	3787.93	350.00	230.30	16.00	325.00	10.00	0.00	-103.00
633	-3492.035	2:33:44	60.0240	3788.76	350.00	230.30	16.00	325.50	10.00	0.00	-103.00
633	-3492.035	2:33:46	60.0240	3786.87	350.00	230.30	16.00	326.00	10.00	0.00	-103.00
633	-2996.405	2:33:48	60.0210	3786.55	350.00	231.18	16.00	326.50	10.00	0.00	-103.00
633	-2861.047	2:33:50	60.0200	3787.36	350.00	231.18	16.00	327.00	10.00	0.00	-103.00
633	-3696.631	2:33:52	60.0250	3785.02	350.00	231.18	16.00	327.50	10.00	0.00	-103.00
633	-3492.035	2:33:54	60.0240	3785.61	350.00	231.18	16.00	328.00	10.00	0.00	-103.00
633	-2861.047	2:33:56	60.0200	3785.95	350.00	231.18	16.00	328.50	10.00	0.00	-103.00
633	-2861.047	2:33:58	60.0200	3785.80	350.00	225.62	16.00	329.00	10.00	0.00	-103.00
633	-3145.206	2:34:00	60.0220	3786.86	350.00	225.62	16.00	329.50	10.00	0.00	-103.00
633	-3145.206	2:34:02	60.0220	3786.88	350.00	225.62	16.00	330.00	10.00	0.00	-103.00
633	-3145.206	2:34:04	60.0220	3785.25	350.00	225.62	16.00	330.50	10.00	0.00	-103.00
633	-2996.405	2:34:06	60.0210	3785.73	350.00	225.62	16.00	331.00	10.00	0.00	-103.00
633	-2996.405	2:34:08	60.0210	3786.35	350.00	230.73	16.00	331.50	10.00	0.00	-103.00
633	-3309.559	2:34:10	60.0230	3785.82	350.00	230.73	16.00	332.00	10.00	0.00	-103.00
633	-3309.559	2:34:12	60.0230	3785.80	350.00	230.73	16.00	332.50	10.00	0.00	-103.00
633	-3145.206	2:34:14	60.0220	3786.28	350.00	230.73	16.00	333.00	10.00	0.00	-103.00
633	-2737.39	2:34:16	60.0190	3786.94	350.00	230.73	16.00	333.50	10.00	0.00	-103.00
633	-2422.838	2:34:18	60.0160	3787.63	350.00	234.85	16.00	334.00	10.00	0.00	-103.00
633	-2623.979	2:34:20	60.0180	3789.44	350.00	234.85	16.00	334.50	10.00	0.00	-103.00
633	-2623.979	2:34:22	60.0180	3789.67	350.00	234.85	16.00	335.00	10.00	0.00	-103.00
633	-2623.979	2:34:24	60.0180	3789.40	350.00	234.85	16.00	335.50	10.00	0.00	-103.00
633	-2737.39	2:34:26	60.0190	3788.48	350.00	234.85	16.00	336.00	10.00	0.00	-103.00
633	-2737.39	2:34:28	60.0190	3789.18	350.00	228.96	16.00	336.50	10.00	0.00	-103.00
633	-2422.838	2:34:30	60.0160	3789.37	350.00	228.96	16.00	337.00	10.00	0.00	-103.00
633	-2333.569	2:34:32	60.0150	3789.00	350.00	228.96	16.00	337.50	10.00	0.00	-103.00
633	-2422.838	2:34:34	60.0160	3788.66	350.00	228.96	16.00	338.00	10.00	0.00	-103.00
633	-2250.644	2:34:36	60.0140	3788.93	350.00	228.96	16.00	338.50	10.00	0.00	-103.00
633	-2173.41	2:34:38	60.0130	3790.67	350.00	231.18	16.00	339.00	10.00	0.00	-103.00
633	-2101.301	2:34:40	60.0120	3790.81	350.00	231.18	16.00	339.50	10.00	0.00	-103.00
633	-2101.301	2:34:42	60.0120	3790.41	350.00	231.18	16.00	340.00	10.00	0.00	-103.00
633	-1970.311	2:34:44	60.0100	3789.77	350.00	231.18	16.00	340.50	10.00	0.00	-103.00
633	-1802.122	2:34:46	60.0070	3791.54	350.00	231.18	16.00	341.00	10.00	0.00	-103.00
633	-1802.122	2:34:48	60.0070	3792.95	350.00	236.49	16.00	341.50	10.00	0.00	-103.00
633	-1910.865	2:34:50	60.0090	3791.03	350.00	236.49	16.00	342.00	10.00	0.00	-103.00
633	-1910.865	2:34:52	60.0090	3791.44	350.00	236.49	16.00	342.50	10.00	0.00	-103.00
633	-1970.311	2:34:54	60.0100	3791.43	350.00	236.49	16.00	343.00	10.00	0.00	-103.00
633	-1617.814	2:34:56	60.0030	3790.60	350.00	236.49	16.00	343.50	10.00	0.00	-103.00
633	-1467.837	2:34:58	59.9990	3790.46	350.00	245.04	16.00	344.00	10.00	0.00	-103.00
633	-1343.199	2:35:00	59.9950	3790.22	350.00	245.04	16.00	344.50	10.00	0.00	-103.00
633	-1262.852	2:35:02	59.9920	3789.58	350.00	245.04	16.00	345.00	10.00	0.00	-103.00
633	-1238.164	2:35:04	59.9910	3788.46	350.00	245.04	16.00	345.50	10.00	0.00	-103.00
633	-1262.852	2:35:06	59.9920	3788.10	350.00	245.04	16.00	346.00	10.00	0.00	-103.00

633	-1262.852	2:35:08	59.9920	3788.06	350.00	223.61	16.00	346.50	10.00	0.00	-103.00
633	-1169.488	2:35:10	59.9880	3788.19	350.00	223.61	16.00	347.00	10.00	0.00	-103.00
633	-1127.836	2:35:12	59.9860	3788.50	350.00	223.61	16.00	347.50	10.00	0.00	-103.00
633	-1108.104	2:35:14	59.9850	3788.54	350.00	223.61	16.00	348.00	10.00	0.00	-103.00
633	-1089.05	2:35:16	59.9840	3788.57	350.00	223.61	16.00	348.50	10.00	0.00	-103.00
633	-1108.104	2:35:18	59.9850	3788.10	350.00	231.12	16.00	349.00	10.00	0.00	-103.00
633	-1089.05	2:35:20	59.9840	3787.13	350.00	231.12	16.00	349.50	10.00	0.00	-103.00
633	-1052.775	2:35:22	59.9820	3786.45	350.00	231.12	16.00	350.00	10.00	0.00	-103.00
633	-1035.562	2:35:24	59.9810	3787.73	350.00	231.12	16.00	350.50	10.00	0.00	-103.00
633	-1052.775	2:35:26	59.9820	3788.81	350.00	231.12	16.00	351.00	10.00	0.00	-103.00
633	-1002.77	2:35:28	59.9790	3789.29	350.00	237.21	16.00	351.50	10.00	0.00	-103.00
633	-971.9914	2:35:30	59.9770	3788.26	350.00	237.21	16.00	352.00	10.00	0.00	-103.00
633	-957.2998	2:35:32	59.9760	3788.41	350.00	237.21	16.00	352.50	10.00	0.00	-103.00
633	-957.2998	2:35:34	59.9760	3790.47	350.00	237.21	16.00	353.00	10.00	0.00	-103.00
633	-1002.77	2:35:36	59.9790	3790.66	350.00	237.21	16.00	353.50	10.00	0.00	-103.00
633	-1052.775	2:35:38	59.9820	3790.42	350.00	240.52	16.00	354.00	10.00	0.00	-103.00
633	-987.1409	2:35:40	59.9780	3789.67	350.00	240.52	16.00	354.50	10.00	0.00	-103.00
633	-957.2998	2:35:42	59.9760	3789.27	350.00	240.52	16.00	355.00	10.00	0.00	-103.00
633	-929.1579	2:35:44	59.9740	3789.15	350.00	240.52	16.00	355.50	10.00	0.00	-103.00
633	-957.2998	2:35:46	59.9760	3790.43	350.00	240.52	16.00	356.00	10.00	0.00	-103.00
633	-971.9914	2:35:48	59.9770	3789.91	350.00	237.57	16.00	356.50	10.00	0.00	-103.00
633	-971.9914	2:35:50	59.9770	3786.24	350.00	237.57	16.00	357.00	10.00	0.00	-103.00
633	-942.9922	2:35:52	59.9750	3787.44	350.00	237.57	16.00	357.50	10.00	0.00	-103.00
633	-915.7237	2:35:54	59.9730	3788.96	350.00	237.57	16.00	358.00	10.00	0.00	-103.00
633	-865.6593	2:35:56	59.9690	3790.60	350.00	237.57	16.00	358.50	10.00	0.00	-103.00
633	-877.6551	2:35:58	59.9700	3791.88	350.00	231.58	16.00	359.00	10.00	0.00	-103.00
633	-889.988	2:36:00	59.9710	3792.91	350.00	231.58	16.00	359.50	10.00	0.00	-103.00
633	-915.7237	2:36:02	59.9730	3792.31	350.00	231.58	16.00	360.00	10.00	0.00	-103.00
633	-987.1409	2:36:04	59.9780	3789.13	350.00	231.58	16.00	360.50	10.00	0.00	-103.00
633	-1035.562	2:36:06	59.9810	3788.08	350.00	231.58	16.00	361.00	10.00	0.00	-103.00
633	-987.1409	2:36:08	59.9780	3787.84	350.00	235.85	16.00	361.50	10.00	0.00	-103.00
633	-942.9922	2:36:10	59.9750	3787.14	350.00	235.85	16.00	362.00	10.00	0.00	-103.00
633	-902.6725	2:36:12	59.9720	3787.16	350.00	235.85	16.00	362.50	10.00	0.00	-103.00
633	-957.2998	2:36:14	59.9760	3787.00	350.00	235.85	16.00	363.00	10.00	0.00	-103.00
633	-942.9922	2:36:16	59.9750	3787.40	350.00	235.85	16.00	363.50	10.00	0.00	-103.00
633	-915.7237	2:36:18	59.9730	3786.49	350.00	233.56	16.00	364.00	10.00	0.00	-103.00
633	-865.6593	2:36:20	59.9690	3787.08	350.00	233.56	16.00	364.50	10.00	0.00	-103.00
633	-831.5203	2:36:22	59.9660	3789.21	350.00	233.56	16.00	365.00	10.00	0.00	-103.00
633	-820.7448	2:36:24	59.9650	3790.51	350.00	233.56	16.00	365.50	10.00	0.00	-103.00
633	-831.5203	2:36:26	59.9660	3791.22	350.00	233.56	16.00	366.00	10.00	0.00	-103.00
633	-865.6593	2:36:28	59.9690	3792.22	350.00	219.01	16.00	366.50	10.00	0.00	-103.00
633	-877.6551	2:36:30	59.9700	3790.96	350.00	219.01	16.00	367.00	10.00	0.00	-103.00
633	-853.9431	2:36:32	59.9680	3788.82	350.00	219.01	16.00	367.50	10.00	0.00	-103.00
633	-820.7448	2:36:34	59.9650	3789.03	350.00	219.01	16.00	368.00	10.00	0.00	-103.00
633	-810.2449	2:36:36	59.9640	3789.17	350.00	219.01	16.00	368.50	10.00	0.00	-103.00
633	-877.6551	2:36:38	59.9700	3787.39	350.00	205.34	16.00	369.00	10.00	0.00	-103.00
633	-902.6725	2:36:40	59.9720	3785.69	350.00	205.34	16.00	369.50	10.00	0.00	-103.00
633	-842.5825	2:36:42	59.9670	3784.83	350.00	205.34	16.00	370.00	10.00	0.00	-103.00
633	-842.5825	2:36:44	59.9670	3785.01	350.00	205.34	16.00	370.50	10.00	0.00	-103.00
633	-865.6593	2:36:46	59.9690	3784.32	350.00	205.34	16.00	371.00	10.00	0.00	-103.00
633	-853.9431	2:36:48	59.9680	3782.81	350.00	236.29	16.00	371.50	10.00	0.00	-103.00
633	-865.6593	2:36:50	59.9690	3782.11	350.00	236.29	16.00	372.00	10.00	0.00	-103.00
633	-842.5825	2:36:52	59.9670	3779.35	350.00	236.29	16.00	372.50	10.00	0.00	-103.00
633	-842.5825	2:36:54	59.9670	3779.06	350.00	236.29	16.00	373.00	10.00	0.00	-103.00
633	-831.5203	2:36:56	59.9660	3778.63	350.00	236.29	16.00	373.50	10.00	0.00	-103.00
633	-820.7448	2:36:58	59.9650	3779.21	350.00	223.02	16.00	374.00	10.00	0.00	-103.00
633	-889.988	2:37:00	59.9710	3779.33	350.00	223.02	16.00	374.50	10.00	0.00	-103.00
633	-842.5825	2:37:02	59.9670	3776.43	350.00	223.02	16.00	375.00	10.00	0.00	-103.00
633	-820.7448	2:37:04	59.9650	3775.65	350.00	223.02	16.00	375.50	10.00	0.00	-103.00
633	-790.0311	2:37:06	59.9620	3776.60	350.00	223.02	16.00	376.00	10.00	0.00	-103.00
633	-810.2449	2:37:08	59.9640	3776.56	350.00	223.02	16.00	376.50	10.00	0.00	-103.00
633	-877.6551	2:37:10	59.9700	3776.02	350.00	223.02	16.00	377.00	10.00	0.00	-103.00

633	-842.5825	2:37:12	59.9670	3773.17	350.00	223.02	16.00	377.50	10.00	0.00	-103.00
633	-865.6593	2:37:14	59.9690	3771.73	350.00	223.02	16.00	378.00	10.00	0.00	-103.00
633	-853.9431	2:37:16	59.9680	3768.79	350.00	223.02	16.00	378.50	10.00	0.00	-103.00
633	-800.0104	2:37:18	59.9630	3768.50	350.00	223.02	16.00	379.00	10.00	0.00	-103.00
633	-820.7448	2:37:20	59.9650	3768.92	350.00	223.02	16.00	379.50	10.00	0.00	-103.00
633	-877.6551	2:37:22	59.9700	3767.37	350.00	223.02	16.00	380.00	10.00	0.00	-103.00
633	-915.7237	2:37:24	59.9730	3764.79	350.00	223.02	16.00	380.50	10.00	0.00	-103.00
633	-853.9431	2:37:26	59.9680	3760.30	350.00	223.02	16.00	381.00	10.00	0.00	-103.00
633	-820.7448	2:37:28	59.9650	3759.59	350.00	223.02	16.00	381.50	10.00	0.00	-103.00
633	-853.9431	2:37:30	59.9680	3761.89	350.00	223.02	16.00	382.00	10.00	0.00	-103.00
633	-865.6593	2:37:32	59.9690	3761.78	350.00	223.02	16.00	382.50	10.00	0.00	-103.00
633	-842.5825	2:37:34	59.9670	3760.58	350.00	223.02	16.00	383.00	10.00	0.00	-103.00
633	-810.2449	2:37:36	59.9640	3760.16	350.00	223.02	16.00	383.50	10.00	0.00	-103.00
633	-831.5203	2:37:38	59.9660	3759.78	350.00	223.02	16.00	384.00	10.00	0.00	-103.00
633	-1002.77	2:37:40	59.9790	3759.49	350.00	223.02	16.00	384.50	10.00	0.00	-103.00
633	-1214.422	2:37:42	59.9900	3757.77	350.00	223.02	16.00	385.00	10.00	0.00	-103.00
633	-1070.64	2:37:44	59.9830	3753.28	350.00	223.02	16.00	385.50	10.00	0.00	-103.00
633	-929.1579	2:37:46	59.9740	3753.09	350.00	223.02	16.00	386.00	10.00	0.00	-103.00
633	-842.5825	2:37:48	59.9670	3751.64	350.00	223.02	16.00	386.50	10.00	0.00	-103.00
633	-820.7448	2:37:50	59.9650	3753.75	350.00	223.02	16.00	387.00	10.00	0.00	-103.00
633	-790.0311	2:37:52	59.9620	3758.22	350.00	223.02	16.00	387.50	10.00	0.00	-103.00
633	-790.0311	2:37:54	59.9620	3759.25	350.00	223.02	16.00	388.00	10.00	0.00	-103.00
633	-780.2611	2:37:56	59.9610	3758.04	350.00	223.02	16.00	388.50	10.00	0.00	-103.00
633	-780.2611	2:37:58	59.9610	3760.96	350.00	223.02	16.00	389.00	10.00	0.00	-103.00
633	-770.7656	2:38:00	59.9600	3762.02	350.00	223.02	16.00	389.50	10.00	0.00	-103.00
633	-800.0104	2:38:02	59.9630	3763.82	350.00	223.02	16.00	390.00	10.00	0.00	-103.00
633	-761.4983	2:38:04	59.9590	3763.10	350.00	223.02	16.00	390.50	10.00	0.00	-103.00
633	-734.9872	2:38:06	59.9560	3763.86	350.00	223.02	16.00	391.00	10.00	0.00	-103.00
633	-694.6501	2:38:08	59.9510	3764.16	350.00	223.02	16.00	391.50	10.00	0.00	-103.00
633	-710.2296	2:38:10	59.9530	3766.13	350.00	223.02	16.00	392.00	10.00	0.00	-103.00
633	-718.2843	2:38:12	59.9540	3768.34	350.00	223.02	16.00	392.50	10.00	0.00	-103.00
633	-743.6168	2:38:14	59.9570	3767.97	350.00	223.02	16.00	393.00	10.00	0.00	-103.00
633	-734.9872	2:38:16	59.9560	3767.44	350.00	223.02	16.00	393.50	10.00	0.00	-103.00
633	-780.2611	2:38:18	59.9610	3765.61	350.00	223.02	16.00	394.00	10.00	0.00	-103.00
633	-800.0104	2:38:20	59.9630	3762.69	350.00	223.02	16.00	394.50	10.00	0.00	-103.00
633	-780.2611	2:38:22	59.9610	3761.57	350.00	223.02	16.00	395.00	10.00	0.00	-103.00
633	-761.4983	2:38:24	59.9590	3761.92	350.00	223.02	16.00	395.50	10.00	0.00	-103.00
633	-800.0104	2:38:26	59.9630	3759.63	350.00	223.02	16.00	396.00	10.00	0.00	-103.00
633	-800.0104	2:38:28	59.9630	3758.52	350.00	223.02	16.00	396.50	10.00	0.00	-103.00
633	-820.7448	2:38:30	59.9650	3752.43	350.00	223.02	16.00	397.00	10.00	0.00	-103.00
633	-853.9431	2:38:32	59.9680	3750.10	350.00	223.02	16.00	397.50	10.00	0.00	-103.00
633	-853.9431	2:38:34	59.9680	3753.83	350.00	223.02	16.00	398.00	10.00	0.00	-103.00
633	-853.9431	2:38:36	59.9680	3753.51	350.00	223.02	16.00	398.50	10.00	0.00	-103.00
633	-877.6551	2:38:38	59.9700	3753.52	350.00	223.02	16.00	399.00	10.00	0.00	-103.00
633	-915.7237	2:38:40	59.9730	3752.74	350.00	223.02	16.00	399.50	10.00	0.00	-103.00
633	-889.988	2:38:42	59.9710	3753.18	350.00	223.02	16.00	400.00	10.00	0.00	-103.00
633	-820.7448	2:38:44	59.9650	3752.73	350.00	223.02	16.00	400.50	10.00	0.00	-103.00
633	-842.5825	2:38:46	59.9670	3753.29	350.00	223.02	16.00	401.00	10.00	0.00	-103.00
633	-842.5825	2:38:48	59.9670	3752.87	350.00	223.02	16.00	401.50	10.00	0.00	-103.00
633	-902.6725	2:38:50	59.9720	3752.36	350.00	223.02	16.00	402.00	10.00	0.00	-103.00
633	-957.2998	2:38:52	59.9760	3749.40	350.00	223.02	16.00	402.50	10.00	0.00	-103.00
633	-942.9922	2:38:54	59.9750	3747.48	350.00	223.02	16.00	403.00	10.00	0.00	-103.00
633	-865.6593	2:38:56	59.9690	3740.37	350.00	223.02	16.00	403.50	10.00	0.00	-103.00
633	-915.7237	2:38:58	59.9730	3741.29	350.00	223.02	16.00	404.00	10.00	0.00	-103.00
633	-929.1579	2:39:00	59.9740	3746.65	350.00	223.02	16.00	404.50	10.00	0.00	-103.00
633	-987.1409	2:39:02	59.9780	3745.74	350.00	223.02	16.00	405.00	10.00	0.00	-103.00
633	-1035.562	2:39:04	59.9810	3743.35	350.00	223.02	16.00	405.50	10.00	0.00	-103.00
633	-1035.562	2:39:06	59.9810	3741.62	350.00	223.02	16.00	406.00	10.00	0.00	-103.00
633	-1035.562	2:39:08	59.9810	3740.31	350.00	223.02	16.00	406.50	10.00	0.00	-103.00
633	-1052.775	2:39:10	59.9820	3738.48	350.00	223.02	16.00	407.00	10.00	0.00	-103.00
633	-1052.775	2:39:12	59.9820	3738.90	350.00	223.02	16.00	407.50	10.00	0.00	-103.00
633	-1089.05	2:39:14	59.9840	3737.40	350.00	223.02	16.00	408.00	10.00	0.00	-103.00

633	-1052.775	2:39:16	59.9820	3737.27	350.00	223.02	16.00	408.50	10.00	0.00	-103.00
633	-1035.562	2:39:18	59.9810	3736.31	350.00	223.02	16.00	409.00	10.00	0.00	-103.00
633	-1002.77	2:39:20	59.9790	3736.27	350.00	223.02	16.00	409.50	10.00	0.00	-103.00
633	-1018.902	2:39:22	59.9800	3735.45	350.00	223.02	16.00	410.00	10.00	0.00	-103.00
633	-987.1409	2:39:24	59.9780	3735.65	350.00	223.02	16.00	410.50	10.00	0.00	-103.00
633	-987.1409	2:39:26	59.9780	3737.54	350.00	223.02	16.00	411.00	10.00	0.00	-103.00
633	-1018.902	2:39:28	59.9800	3738.01	350.00	223.02	16.00	411.50	10.00	0.00	-103.00
633	-1035.562	2:39:30	59.9810	3736.75	350.00	223.02	16.00	412.00	10.00	0.00	-103.00
633	-1018.902	2:39:32	59.9800	3736.69	350.00	223.02	16.00	412.50	10.00	0.00	-103.00
633	-987.1409	2:39:34	59.9780	3736.07	350.00	223.02	16.00	413.00	10.00	0.00	-103.00
633	-957.2998	2:39:36	59.9760	3736.09	350.00	223.02	16.00	413.50	10.00	0.00	-103.00
633	-902.6725	2:39:38	59.9720	3736.57	350.00	223.02	16.00	414.00	10.00	0.00	-103.00
633	-889.988	2:39:40	59.9710	3738.57	350.00	223.02	16.00	414.50	10.00	0.00	-103.00
633	-865.6593	2:39:42	59.9690	3738.87	350.00	223.02	16.00	415.00	10.00	0.00	-103.00
633	-929.1579	2:39:44	59.9740	3738.93	350.00	223.02	16.00	415.50	10.00	0.00	-103.00
633	-942.9922	2:39:46	59.9750	3738.65	350.00	223.02	16.00	416.00	10.00	0.00	-103.00
633	-957.2998	2:39:48	59.9760	3737.68	350.00	223.02	16.00	416.50	10.00	0.00	-103.00
633	-902.6725	2:39:50	59.9720	3737.38	350.00	223.02	16.00	417.00	10.00	0.00	-103.00
633	-865.6593	2:39:52	59.9690	3737.89	350.00	223.02	16.00	417.50	10.00	0.00	-103.00
633	-889.988	2:39:54	59.9710	3740.02	350.00	223.02	16.00	418.00	10.00	0.00	-103.00
633	-929.1579	2:39:56	59.9740	3740.33	350.00	223.02	16.00	418.50	10.00	0.00	-103.00
633	-902.6725	2:39:58	59.9720	3742.05	350.00	223.02	16.00	419.00	10.00	0.00	-103.00
633	-902.6725	2:40:00	59.9720	3742.42	350.00	223.02	16.00	419.50	10.00	0.00	-103.00
633	-902.6725	2:40:02	59.9720	3742.52	350.00	223.02	16.00	420.00	10.00	0.00	-103.00
633	-971.9914	2:40:04	59.9770	3742.25	350.00	223.02	16.00	420.50	10.00	0.00	-103.00
633	-1052.775	2:40:06	59.9820	3741.72	350.00	223.02	16.00	421.00	10.00	0.00	-103.00
633	-987.1409	2:40:08	59.9780	3740.09	350.00	223.02	16.00	421.50	10.00	0.00	-103.00
633	-957.2998	2:40:10	59.9760	3740.63	350.00	223.02	16.00	422.00	10.00	0.00	-103.00
633	-915.7237	2:40:12	59.9730	3739.96	350.00	223.02	16.00	422.50	10.00	0.00	-103.00
633	-929.1579	2:40:14	59.9740	3740.78	350.00	223.02	16.00	423.00	10.00	0.00	-103.00
633	-971.9914	2:40:16	59.9770	3742.83	350.00	223.02	16.00	423.50	10.00	0.00	-103.00
633	-971.9914	2:40:18	59.9770	3741.27	350.00	223.02	16.00	424.00	10.00	0.00	-103.00
633	-987.1409	2:40:20	59.9780	3739.78	350.00	223.02	16.00	424.50	10.00	0.00	-103.00
633	-1002.77	2:40:22	59.9790	3738.97	350.00	223.02	16.00	425.00	10.00	0.00	-103.00
633	-1035.562	2:40:24	59.9810	3738.71	350.00	223.02	16.00	425.50	10.00	0.00	-103.00
633	-971.9914	2:40:26	59.9770	3738.88	350.00	223.02	16.00	426.00	10.00	0.00	-103.00
633	-929.1579	2:40:28	59.9740	3739.86	350.00	223.02	16.00	426.50	10.00	0.00	-103.00
633	-889.988	2:40:30	59.9710	3738.10	350.00	223.02	16.00	427.00	10.00	0.00	-103.00
633	-889.988	2:40:32	59.9710	3738.56	350.00	223.02	16.00	427.50	10.00	0.00	-103.00
633	-889.988	2:40:34	59.9710	3743.51	350.00	223.02	16.00	428.00	10.00	0.00	-103.00
633	-902.6725	2:40:36	59.9720	3743.42	350.00	223.02	16.00	428.50	10.00	0.00	-103.00
633	-853.9431	2:40:38	59.9680	3745.25	350.00	223.02	16.00	429.00	10.00	0.00	-103.00
633	-831.5203	2:40:40	59.9660	3745.74	350.00	223.02	16.00	429.50	10.00	0.00	-103.00
633	-831.5203	2:40:42	59.9660	3747.34	350.00	223.02	16.00	430.00	10.00	0.00	-103.00
633	-889.988	2:40:44	59.9710	3750.70	350.00	223.02	16.00	430.50	10.00	0.00	-103.00
633	-915.7237	2:40:46	59.9730	3749.75	350.00	223.02	16.00	431.00	10.00	0.00	-103.00
633	-902.6725	2:40:48	59.9720	3746.22	350.00	223.02	16.00	431.50	10.00	0.00	-103.00
633	-865.6593	2:40:50	59.9690	3744.68	350.00	223.02	16.00	432.00	10.00	0.00	-103.00
633	-902.6725	2:40:52	59.9720	3743.75	350.00	223.02	16.00	432.50	10.00	0.00	-103.00
633	-929.1579	2:40:54	59.9740	3743.15	350.00	223.02	16.00	433.00	10.00	0.00	-103.00
633	-915.7237	2:40:56	59.9730	3740.30	350.00	223.02	16.00	433.50	10.00	0.00	-103.00
633	-877.6551	2:40:58	59.9700	3739.45	350.00	223.02	16.00	434.00	10.00	0.00	-103.00
633	-889.988	2:41:00	59.9710	3733.38	350.00	223.02	16.00	434.50	10.00	0.00	-103.00
633	-929.1579	2:41:02	59.9740	3731.83	350.00	223.02	16.00	435.00	10.00	0.00	-103.00
633	-1052.775	2:41:04	59.9820	3737.58	350.00	223.02	16.00	435.50	10.00	0.00	-103.00
633	-1108.104	2:41:06	59.9850	3736.23	350.00	223.02	16.00	436.00	10.00	0.00	-103.00
633	-1108.104	2:41:08	59.9850	3734.90	350.00	223.02	16.00	436.50	10.00	0.00	-103.00
633	-1108.104	2:41:10	59.9850	3733.43	350.00	223.02	16.00	437.00	10.00	0.00	-103.00
633	-1148.284	2:41:12	59.9870	3733.12	350.00	223.02	16.00	437.50	10.00	0.00	-103.00
633	-1191.489	2:41:14	59.9890	3730.51	350.00	223.02	16.00	438.00	10.00	0.00	-103.00
633	-1191.489	2:41:16	59.9890	3729.18	350.00	223.02	16.00	438.50	10.00	0.00	-103.00
633	-1127.836	2:41:18	59.9860	3725.46	350.00	223.02	16.00	439.00	10.00	0.00	-103.00

633	-1148.284	2:41:20	59.9870	3724.78	350.00	223.02	16.00	439.50	10.00	0.00	-103.00
633	-1214.422	2:41:22	59.9900	3720.11	350.00	223.02	16.00	440.00	10.00	0.00	-103.00
633	-1315.304	2:41:24	59.9940	3720.94	350.00	223.02	16.00	440.50	10.00	0.00	-103.00
633	-1372.303	2:41:26	59.9960	3725.66	350.00	223.02	16.00	441.00	10.00	0.00	-103.00
633	-1539.181	2:41:28	60.0010	3725.68	350.00	223.02	16.00	441.50	10.00	0.00	-103.00
633	-1617.814	2:41:30	60.0030	3727.75	350.00	223.02	16.00	442.00	10.00	0.00	-103.00
633	-1660.389	2:41:32	60.0040	3727.82	350.00	223.02	16.00	442.50	10.00	0.00	-103.00
633	-1752.263	2:41:34	60.0060	3727.68	350.00	223.02	16.00	443.00	10.00	0.00	-103.00
633	-2101.301	2:41:36	60.0120	3727.23	350.00	223.02	16.00	443.50	10.00	0.00	-103.00
633	-2250.644	2:41:38	60.0140	3725.01	350.00	223.02	16.00	444.00	10.00	0.00	-103.00
633	-2737.39	2:41:40	60.0190	3726.45	350.00	223.02	16.00	444.50	10.00	0.00	-103.00
633	-2996.405	2:41:42	60.0210	3726.02	350.00	223.02	16.00	445.00	10.00	0.00	-103.00
633	-3696.631	2:41:44	60.0250	3719.12	350.00	223.02	16.00	445.50	10.00	0.00	-103.00
633	-3925.764	2:41:46	60.0260	3716.37	350.00	223.02	16.00	446.00	10.00	0.00	-103.00
633	-4185.18	2:41:48	60.0270	3717.33	350.00	223.02	16.00	446.50	10.00	0.00	-103.00
633	-4822.528	2:41:50	60.0290	3717.56	350.00	223.02	16.00	447.00	10.00	0.00	-103.00
633	-4822.528	2:41:52	60.0290	3717.14	350.00	223.02	16.00	447.50	10.00	0.00	-103.00
633	-12347.66	2:41:54	60.0370	3715.17	350.00	223.02	16.00	448.00	10.00	0.00	-103.00
633	-10333.13	2:41:56	60.0360	3713.63	350.00	223.02	16.00	448.50	10.00	0.00	-103.00
633	-12347.66	2:41:58	60.0370	3710.28	350.00	223.02	16.00	449.00	10.00	0.00	-103.00
633	-12347.66	2:42:00	60.0370	3710.16	350.00	223.02	16.00	449.50	10.00	0.00	-103.00
633	-10333.13	2:42:02	60.0360	3699.36	350.00	223.02	16.00	450.00	10.00	0.00	-103.00
633	-56273.73	2:42:04	60.0410	3698.59	350.00	223.02	16.00	450.50	10.00	0.00	-103.00
633	72422.11	2:42:06	60.0430	3704.59	350.00	223.02	16.00	451.00	10.00	0.00	-103.00
633	33787.15	2:42:08	60.0440	3703.28	350.00	223.02	16.00	451.50	10.00	0.00	-103.00
633	72422.11	2:42:10	60.0430	3702.48	350.00	223.02	16.00	452.00	10.00	0.00	-103.00
633	16330.39	2:42:12	60.0460	3701.32	350.00	223.02	16.00	452.50	10.00	0.00	-103.00
633	10774.27	2:42:14	60.0480	3700.83	350.00	223.02	16.00	453.00	10.00	0.00	-103.00
633	16330.39	2:42:16	60.0460	3699.53	350.00	223.02	16.00	453.50	10.00	0.00	-103.00
633	16330.39	2:42:18	60.0460	3699.73	350.00	223.02	16.00	454.00	10.00	0.00	-103.00
633	72422.11	2:42:20	60.0430	3690.10	350.00	223.02	16.00	454.50	10.00	0.00	-103.00
633	72422.11	2:42:22	60.0430	3690.48	350.00	223.02	16.00	455.00	10.00	0.00	-103.00
633	33787.15	2:42:24	60.0440	3696.86	350.00	223.02	16.00	455.50	10.00	0.00	-103.00
633	72422.11	2:42:26	60.0430	3696.88	350.00	223.02	16.00	456.00	10.00	0.00	-103.00

Date:	Monday, October 12, 2009	
Time of T(0)	2:27:26	
Time of Frequency Recovery to 60 Hz or Pre-Perturbation Hz	2:32:54	
Value A Pre-Perturbation Average Frequency [T(-2) to T(-16)]	60.0421	Hz
Value B Post-Perturbation Average Frequency [T(+12 to T(+24)]	59.8826	Hz
Pre to Post Perturbation Delta Frequency Actual	-0.160	Hz
Value A Pre-Perturbation Average Interchange MW [T(-2) to T(-16)]	3645.73	MW
Value B Post-Perturbation Average Interchange MW [T(+12 to T(+24)]	3770.65	MW
Pre to Post Perturbation Interchange Delta MW Actual	124.93	MW
Net Total Adjustments	39.87	MW
EPFR for FRO Pre-Perturbation Average	-33.70	MW
EPFR for FRO Post-Perturbation Average	93.94	MW
EPFR for FRO Delta	127.64	MW
EPFR for FRO Adjusted	167.51	MW
Pre JOU Dynamic Schedules MW	350.00	
Pre Non-Conforming Load MW	165.34	
Pre Pumped Hydro MW	0.00	
Pre Ramping Units MW	229.25	
Pre Transferred Frequency Response MW	-4.21	
Pre Contingent BA Lost Generation MW	15.00	
Sum of Pre Perturbation Adjustments	755.37	
Post JOU Dynamic Schedules MW	335.00	
Post Non-Conforming Load MW	212.14	
Post Pumped Hydro MW	0.86	
Post Ramping Units MW	235.50	
Post Transferred Frequency Response MW	11.74	
Post Contingent BA Lost Generation MW	0.00	
Sum of Post Perturbation Adjustments	795.24	
Net Total Adjustments MW	39.87	

Pre-Perturbation Bias Setting	-103.000	MW/0.1 Hz
Post-Perturbation Bias Setting	-103.000	MW/0.1 Hz
EPFR for Bias Setting Pre-Perturbation Average	-43.3890	MW
EPFR for Bias Setting Post-Perturbation Average	120.9512	MW
EPFR for Bias Setting Delta	164.3402	MW
Primary Frequency Response Delivery of Bias	76.02%	
Pre-Perturbation BA Load	7651.305	MW
Post-Perturbation BA Load	7632.000	MW
Pre to Post Perturbation BA Load Change	-19.305	MW
Load Dampening Frequency Response	-12.099	MW/0.1 Hz
Load Dampening % of Total BA Frequency Response	15.45%	

12 to 24 second Average Period Evaluation

Initial P.U. Performance for FRO	0.979	P.U.
Initial P.U. Performance Adjusted for FRO	0.666	P.U.

Date:	
Time of T(0)	
Time of Frequency Recovery to 60 Hz or Pre-Perturbation Hz	
Value A Pre-Perturbation Average Frequency [T(-2) to T(-16)]	
Value B Post-Perturbation Average Frequency [T(+18 to T(+30)]	
Pre to Post Perturbation Delta Frequency Actual	
Value A Pre-Perturbation Average Interchange MW [T(-2) to T(-16)]	
Value B Post-Perturbation Average Interchange MW [T(+18 to T(+30)]	
Pre to Post Perturbation Interchange Delta MW Actual	
Net Total Adjustments	
EPFR for FRO Pre-Perturbation Average	
EPFR for FRO Post-Perturbation Average	
EPFR for FRO Delta	
EPFR for FRO Adjusted	
Pre JOU Dynamic Schedules MW	
Pre Non-Conforming Load MW	
Pre Pumped Hydro MW	
Pre Ramping Units MW	
Pre Transferred Frequency Response MW	
Pre Contingent BA Lost Generation MW	
Sum of Pre Perturbation Adjustments	
Post JOU Dynamic Schedules MW	
Post Non-Conforming Load MW	
Post Pumped Hydro MW	
Post Ramping Units MW	
Post Transferred Frequency Response MW	
Post Contingent BA Lost Generation MW	
Sum of Post Perturbation Adjustments	
Net Total Adjustments MW	

18 to 30 second Average Period Evaluation

Initial P.U. Performance for FRO	
Initial P.U. Performance Adjusted for FRO	

BA Load MW	Expected Primary Freq Response MW		T	Frequency Hz	Net Actual Interchange MW	JOU Dynamic Schedules Imp(-) Exp (+) MW	Non-Conforming Load Load (-) MW	Pumped Hydro Load (-) Gen (+) MW	Ramping Units Gen (+) MW	Transferred Frequency Response Rec (-) Del (+) MW/0.1 Hz	Contingent BA Lost Generation Load (-) Gen (+) MW	BA Bias Setting MW/0.1 Hz	BA Load MW	EPFR MW	Expected Net Actual Interchange MW
7640.91	-21.600	T-72 sec	2:26:14												
7641.24	-20.801	T-70 sec	2:26:16												
7641.57	-20.801	T-68 sec	2:26:18												
7641.90	-17.599	T-66 sec	2:26:20												
7642.23	-15.201	T-64 sec	2:26:22												
7642.56	-13.599	T-62 sec	2:26:24												
7642.89	-15.201	T-60 sec	2:26:26												
7643.22	-16.000	T-58 sec	2:26:28												
7643.55	-15.201	T-56 sec	2:26:30												
7643.88	-16.800	T-54 sec	2:26:32												
7644.21	-16.800	T-52 sec	2:26:34												
7644.54	-16.800	T-50 sec	2:26:36												
7644.87	-15.201	T-48 sec	2:26:38												
7645.20	-14.401	T-46 sec	2:26:40												
7645.53	-17.599	T-44 sec	2:26:42												
7645.86	-24.799	T-42 sec	2:26:44												
7646.19	-29.599	T-40 sec	2:26:46												
7646.52	-29.599	T-38 sec	2:26:48												
7646.85	-28.799	T-36 sec	2:26:50												

	T	Frequency Hz	Net Actual Interchange MW	JOU Dynamic Schedules Imp(-) Exp (+) MW	Non-Conforming Load Load (-) MW
T-72 sec	2:26:14				
T-70 sec	2:26:16				
T-68 sec	2:26:18				
T-66 sec	2:26:20				
T-64 sec	2:26:22				
T-62 sec	2:26:24				
T-60 sec	2:26:26				
T-58 sec	2:26:28				
T-56 sec	2:26:30				
T-54 sec	2:26:32				
T-52 sec	2:26:34				
T-50 sec	2:26:36				
T-48 sec	2:26:38				
T-46 sec	2:26:40				
T-44 sec	2:26:42				
T-42 sec	2:26:44				
T-40 sec	2:26:46				
T-38 sec	2:26:48				
T-36 sec	2:26:50				

7647.18	-29.599	T-34 sec	2:26:52													T-34 sec	2:26:52					
7647.51	-36.801	T-32 sec	2:26:54													T-32 sec	2:26:54					
7647.84	-38.400	T-30 sec	2:26:56													T-30 sec	2:26:56					
7648.17	-38.400	T-28 sec	2:26:58													T-28 sec	2:26:58					
7648.50	-34.399	T-26 sec	2:27:00													T-26 sec	2:27:00					
7648.83	-32.800	T-24 sec	2:27:02													T-24 sec	2:27:02					
7649.16	-32.800	T-22 sec	2:27:04													T-22 sec	2:27:04					
7649.49	-32.800	T-20 sec	2:27:06													T-20 sec	2:27:06					
7649.82	-31.201	T-18 sec	2:27:08													T-18 sec	2:27:08					
7650.15	-32.800	T-16 sec	2:27:10	60.042	3645.727	350.000	165.336	0.000	229.250	10.000	15.000	-103.000	7651.305	-33.700		T-16 sec	2:27:10	60.042	3645.727	350.000	165.336	
7650.48	-34.399	T-14 sec	2:27:12	60.042	3645.727	350.000	165.336	0.000	229.250	10.000	15.000	-103.000	7651.305	-33.700		T-14 sec	2:27:12	60.042	3645.727	350.000	165.336	
7650.81	-35.999	T-12 sec	2:27:14	60.042	3645.727	350.000	165.336	0.000	229.250	10.000	15.000	-103.000	7651.305	-33.700		T-12 sec	2:27:14	60.042	3645.727	350.000	165.336	
7651.14	-36.801	T-10 sec	2:27:16	60.042	3645.727	350.000	165.336	0.000	229.250	10.000	15.000	-103.000	7651.305	-33.700		T-10 sec	2:27:16	60.042	3645.727	350.000	165.336	
7651.47	-32.800	T-08 sec	2:27:18	60.042	3645.727	350.000	165.336	0.000	229.250	10.000	15.000	-103.000	7651.305	-33.700		T-08 sec	2:27:18	60.042	3645.727	350.000	165.336	
7651.80	-32.800	T-06 sec	2:27:20	60.042	3645.727	350.000	165.336	0.000	229.250	10.000	15.000	-103.000	7651.305	-33.700		T-06 sec	2:27:20	60.042	3645.727	350.000	165.336	
7652.13	-32.800	T-04 sec	2:27:22	60.042	3645.727	350.000	165.336	0.000	229.250	10.000	15.000	-103.000	7651.305	-33.700		T-04 sec	2:27:22	60.042	3645.727	350.000	165.336	
7652.46	-31.201	T-02 sec	2:27:24	60.042	3645.727	350.000	165.336	0.000	229.250	10.000	15.000	-103.000	7651.305	-33.700		T-02 sec	2:27:24	60.042	3645.727	350.000	165.336	
7652.79	17.599	T+0 sec	2:27:26													T+0 sec	2:27:26					
7616.00	118.399	T+02 sec	2:27:28													T+02 sec	2:27:28					
7626.00	131.201	T+04 sec	2:27:30													T+04 sec	2:27:30					
7632.00	104.800	T+06 sec	2:27:32													T+06 sec	2:27:32					
7632.00	104.800	T+08 sec	2:27:34													T+08 sec	2:27:34					
7632.00	86.401	T+10 sec	2:27:36													T+10 sec	2:27:36					
7632.00	87.201	T+12 sec	2:27:38	59.883	3770.653	335.000	212.139	0.857	235.500	10.000	0.000	-103.000	7632.000	93.943	3813.236	T+12 sec	2:27:38					
7632.00	95.999	T+14 sec	2:27:40	59.883	3770.653	335.000	212.139	0.857	235.500	10.000	0.000	-103.000	7632.000	93.943	3813.236	T+14 sec	2:27:40					
7632.00	99.200	T+16 sec	2:27:42	59.883	3770.653	335.000	212.139	0.857	235.500	10.000	0.000	-103.000	7632.000	93.943	3813.236	T+16 sec	2:27:42					
7632.00	100.000	T+18 sec	2:27:44	59.883	3770.653	335.000	212.139	0.857	235.500	10.000	0.000	-103.000	7632.000	93.943	3813.236	T+18 sec	2:27:44	59.884	3779.029	335.000	213.464	
7632.00	93.600	T+20 sec	2:27:46	59.883	3770.653	335.000	212.139	0.857	235.500	10.000	0.000	-103.000	7632.000	93.943	3813.236	T+20 sec	2:27:46	59.884	3779.029	335.000	213.464	
7632.00	90.399	T+22 sec	2:27:48	59.883	3770.653	335.000	212.139	0.857	235.500	10.000	0.000	-103.000	7632.000	93.943	3813.236	T+22 sec	2:27:48	59.884	3779.029	335.000	213.464	
7632.00	91.199	T+24 sec	2:27:50	59.883	3770.653	335.000	212.139	0.857	235.500	10.000	0.000	-103.000	7632.000	93.943	3813.236	T+24 sec	2:27:50	59.884	3779.029	335.000	213.464	
7632.00	92.001	T+26 sec	2:27:52													T+26 sec	2:27:52	59.884	3779.029	335.000	213.464	
7632.00	90.399	T+28 sec	2:27:54													T+28 sec	2:27:54	59.884	3779.029	335.000	213.464	
7632.00	89.600	T+30 sec	2:27:56													T+30 sec	2:27:56	59.884	3779.029	335.000	213.464	
7632.00	88.000	T+32 sec	2:27:58													T+32 sec	2:27:58					
7632.00	84.000	T+34 sec	2:28:00													T+34 sec	2:28:00					
7632.00	84.799	T+36 sec	2:28:02													T+36 sec	2:28:02					
7632.00	85.599	T+38 sec	2:28:04													T+38 sec	2:28:04					
7632.00	84.799	T+40 sec	2:28:06													T+40 sec	2:28:06					
7632.00	84.799	T+42 sec	2:28:08													T+42 sec	2:28:08					
7632.00	87.201	T+44 sec	2:28:10													T+44 sec	2:28:10					
7632.00	88.000	T+46 sec	2:28:12													T+46 sec	2:28:12					
7632.00	92.001	T+48 sec	2:28:14													T+48 sec	2:28:14					
7632.00	92.001	T+50 sec	2:28:16													T+50 sec	2:28:16					
7632.00	89.600	T+52 sec	2:28:18													T+52 sec	2:28:18					
7632.00	90.399	T+54 sec	2:28:20													T+54 sec	2:28:20					
7632.00	89.600	T+56 sec	2:28:22													T+56 sec	2:28:22					
7632.00	89.600	T+58 sec	2:28:24													T+58 sec	2:28:24					
7632.00	88.000	T+60 sec	2:28:26													T+60 sec	2:28:26					
7632.00	88.800	T+62 sec	2:28:28													T+62 sec	2:28:28					
7632.00	94.400	T+64 sec	2:28:30													T+64 sec	2:28:30					
7631.00	101.599	T+66 sec	2:28:32													T+66 sec	2:28:32					
7625.00	114.401	T+68 sec	2:28:34													T+68 sec	2:28:34					
7623.00	120.801	T+70 sec	2:28:36													T+70 sec	2:28:36					
7621.00	118.399	T+72 sec	2:28:38													T+72 sec	2:28:38					
7623.00	113.599	T+74 sec	2:28:40													T+74 sec	2:28:40					
7625.00	109.601	T+76 sec	2:28:42													T+76 sec	2:28:42					
7627.00	107.199	T+78 sec	2:28:44													T+78 sec	2:28:44					
7628.00	107.999	T+80 sec	2:28:46													T+80 sec	2:28:46					
7628.00	106.400																					
7629.00	107.199																					
7630.00	103.201																					
7631.00	100.800																					

7635.00	96.799
7638.00	95.999
7639.00	93.600
7642.00	91.199
7644.00	88.000
7645.00	86.401
7647.00	88.800
7648.00	85.599
7649.00	80.801
7650.00	77.600
7651.00	78.400
7652.00	78.400
7653.00	76.801
7654.00	74.399
7655.00	71.201
7655.00	67.200
7656.00	67.200
7656.00	66.400
7657.00	65.601
7657.00	64.001
7658.00	63.199
7658.00	64.001
7659.00	66.400
7659.00	64.001
7659.00	63.199
7660.00	61.600
7660.00	59.201
7661.00	60.001
7661.00	57.599
7662.00	58.401
7662.00	54.401
7663.00	58.401
7663.00	57.599
7664.00	55.200
7664.00	56.799
7665.00	55.200
7666.00	53.601
7666.00	50.400
7667.00	50.400
7668.00	44.000
7668.00	40.799
7669.00	42.401
7669.00	46.399
7670.00	47.198
7670.00	46.399
7671.00	44.000
7671.00	41.599
7672.00	42.401
7673.00	40.799
7673.00	39.200
7673.00	38.400
7673.00	37.601
7673.00	39.200
7673.00	38.400
7673.00	38.400
7673.00	38.400
7673.00	35.999
7673.00	38.400
7673.00	36.801
7673.00	38.400
7673.00	37.601
7673.00	37.601

7673.00	38.400
7673.00	36.801
7674.00	36.801
7675.00	32.800
7676.00	34.399
7677.00	35.199
7678.00	36.801
7679.00	35.199
7680.00	35.999
7681.00	33.600
7682.00	31.201
7684.00	30.399
7685.00	30.399
7687.00	25.601
7689.00	27.200
7690.00	27.200
7692.00	25.601
7692.00	23.999
7693.00	20.801
7693.00	23.999
7694.00	24.799
7694.00	24.799
7695.00	23.999
7695.00	23.199
7695.00	21.600
7696.00	21.600
7696.00	19.199
7697.00	17.599
7697.00	17.599
7697.00	19.199
7698.00	17.599
7698.00	19.199
7698.33	17.599
7698.66	18.399
7698.99	16.000
7699.32	14.401
7699.65	15.201
7699.98	16.000
7700.31	16.800
7700.64	16.000
7700.97	16.800
7701.30	13.599
7701.63	13.599
7701.96	12.799
7702.29	9.601
7702.62	8.801
7702.95	10.400
7703.28	10.400
7703.61	7.199
7703.94	5.600
7704.27	6.400
7704.60	7.199
7704.93	8.801
7705.26	11.200
7705.59	13.599
7705.92	13.599
7706.25	9.601
7706.58	5.600
7706.91	3.201
7707.24	1.599
7707.57	0.800
7707.90	-0.800

7708.23	0.800
7708.56	0.800
7708.89	0.800
7709.22	-1.599
7709.55	-4.001
7709.88	-5.600
7710.21	-6.400
7710.54	-8.801
7710.87	-11.200
7711.20	-13.599
7711.53	-15.201
7711.86	-16.800
7712.19	-13.599
7712.52	-13.599
7712.85	-15.201
7713.18	-18.399
7713.51	-19.199
7713.84	-20.001
7714.17	-16.800
7714.50	-15.201
7714.83	-19.199
7715.16	-19.199
7715.49	-16.800
7715.82	-16.000
7716.15	-20.001
7716.48	-19.199
7716.81	-16.000
7717.14	-16.000
7717.47	-17.599
7717.80	-17.599
7718.13	-17.599
7718.46	-16.800
7718.79	-16.800
7719.12	-18.399
7719.45	-18.399
7719.78	-17.599
7720.11	-15.201
7720.44	-12.799
7720.77	-14.401
7721.10	-14.401
7721.43	-14.401
7721.76	-15.201
7722.09	-15.201
7722.42	-12.799
7722.75	-12.000
7723.08	-12.799
7723.41	-11.200
7723.74	-10.400
7724.07	-9.601
7724.40	-9.601
7724.73	-7.999
7725.06	-5.600
7725.39	-5.600
7725.72	-7.199
7726.05	-7.199
7726.38	-7.999
7726.71	-2.399
7727.04	0.800
7727.37	4.001
7727.70	6.400
7728.03	7.199
7728.36	6.400

7728.69	6.400
7729.02	9.601
7729.35	11.200
7729.68	12.000
7730.01	12.799
7730.34	12.000
7730.67	12.799
7731.00	14.401
7731.33	15.201
7731.66	14.401
7731.99	16.800
7732.32	18.399
7732.65	19.199
7732.98	19.199
7733.31	16.800
7733.64	14.401
7733.97	17.599
7734.30	19.199
7734.63	20.801
7734.96	19.199
7735.29	18.399
7735.62	18.399
7735.95	20.001
7736.28	21.600
7736.61	24.799
7736.94	23.999
7737.27	23.199
7737.60	21.600
7737.93	17.599
7738.26	15.201
7738.59	17.599
7738.92	20.001
7739.25	22.400
7739.58	19.199
7739.91	20.001
7740.24	21.600
7740.57	24.799
7740.90	27.200
7741.23	28.000
7741.56	27.200
7741.89	24.799
7742.22	23.999
7742.55	25.601
7742.88	28.000
7743.21	28.799
7743.54	23.999
7743.87	22.400
7744.20	26.401
7744.53	26.401
7744.86	24.799
7745.19	25.601
7745.52	24.799
7745.85	26.401
7746.18	26.401
7746.51	27.200
7746.84	28.000
7747.17	23.199
7747.50	26.401
7747.83	28.000
7748.16	30.399
7748.49	28.799
7748.82	23.999

7749.15	26.401
7749.48	24.799
7749.81	25.601
7750.14	29.599
7750.47	28.000
7750.80	23.999
7751.13	21.600
7751.46	25.601
7751.79	28.000
7752.12	25.601
7752.45	24.799
7752.78	26.401
7753.11	28.799
7753.44	27.200
7753.77	16.800
7754.10	7.999
7754.43	13.599
7754.76	20.801
7755.09	26.401
7755.42	28.000
7755.75	30.399
7756.08	30.399
7756.41	31.201
7756.74	31.201
7757.07	32.001
7757.40	29.599
7757.73	32.800
7758.06	35.199
7758.39	39.200
7758.72	37.601
7759.05	36.801
7759.38	34.399
7759.71	35.199
7760.04	31.201
7760.37	29.599
7760.70	31.201
7761.03	32.800
7761.36	29.599
7761.69	29.599
7762.02	28.000
7762.35	25.601
7762.68	25.601
7763.01	25.601
7763.34	23.999
7763.67	21.600
7764.00	23.199
7764.33	28.000
7764.66	26.401
7764.99	26.401
7765.32	22.400
7765.65	19.199
7765.98	20.001
7766.31	24.799
7766.64	21.600
7766.97	20.801
7767.30	17.599
7767.63	15.201
7767.96	15.201
7768.29	15.201
7768.62	14.401
7768.95	14.401
7769.28	12.799

7769.61	14.401
7769.94	15.201
7770.27	16.800
7770.60	16.000
7770.93	17.599
7771.26	17.599
7771.59	16.000
7771.92	15.201
7772.25	16.000
7772.58	17.599
7772.91	19.199
7773.24	22.400
7773.57	23.199
7773.90	24.799
7774.23	20.801
7774.56	20.001
7774.89	19.199
7775.22	22.400
7775.55	24.799
7775.88	23.199
7776.21	20.801
7776.54	22.400
7776.87	22.400
7777.20	22.400
7777.53	18.399
7777.86	14.401
7778.19	17.599
7778.52	19.199
7778.85	21.600
7779.18	20.801
7779.51	18.399
7779.84	18.399
7780.17	17.599
7780.50	16.800
7780.83	15.201
7781.16	18.399
7781.49	20.801
7781.82	23.199
7782.15	23.199
7782.48	23.199
7782.81	22.400
7783.14	25.601
7783.47	27.200
7783.80	27.200
7784.13	23.199
7784.46	21.600
7784.79	22.400
7785.12	24.799
7785.45	22.400
7785.78	20.801
7786.11	21.600
7786.44	23.999
7786.77	23.199
7787.10	20.801
7787.43	14.401
7787.76	12.000
7788.09	12.000
7788.42	12.000
7788.75	10.400
7789.08	8.801
7789.41	8.801
7789.74	11.200

7790.07	10.400
7790.40	7.999
7790.73	4.800
7791.06	3.201
7791.39	-0.800
7791.72	-2.399
7792.05	-3.201
7792.38	-4.800
7792.71	-9.601
7793.04	-11.200
7793.37	-15.201
7793.70	-16.800
7794.03	-20.001
7794.36	-20.801
7794.69	-21.600
7795.02	-23.199
7795.35	-23.199
7795.68	-29.599
7796.01	-28.799
7796.34	-29.599
7796.67	-29.599
7797.00	-28.799
7797.33	-32.800
7797.66	-34.399
7797.99	-35.199
7798.32	-34.399
7798.65	-36.801
7798.98	-38.400
7799.31	-36.801
7799.64	-36.801
7799.97	-34.399
7800.30	-34.399
7800.63	-35.199
7800.96	-34.399

Monday, October 12, 2009							
2:27:26							
2:32:54							
60.0421	Hz						
59.8844	Hz						
-0.158	Hz						
3645.73	MW						
3779.03	MW						
133.30	MW						
43.08	MW						
-33.70	MW						
92.46	MW						
126.16	MW						
169.23	MW						
350.00		Pre-Perturbation Bias Setting	-103.000	MW/0.1 Hz			
165.34		Post-Perturbation Bias Setting	-103.000	MW/0.1 Hz			
0.00		EPFR for Bias Setting Pre-Perturbation Average	-43.3890	MW			
229.25		EPFR for Bias Setting Post-Perturbation Average	119.0383	MW			
-4.21		EPFR for Bias Setting Delta	162.4273	MW			
15.00		Primary Frequency Response Delivery of Bias	82.07%				
755.37							
335.00		Pre-Perturbation BA Load	7651.305	MW			
213.46		Post-Perturbation BA Load	7632.000	MW			
1.43		Pre to Post Perturbation BA Load Change	-19.305	MW			
237.00		Load Dampening Frequency Response	-12.242	MW/0.1 Hz			
11.56		Load Dampening % of Total BA Frequency Response	14.48%				
0.00							
798.45							
43.08							
1.057	P.U.						
0.715	P.U.						

Date:	Monday, October 12, 2009						
Time of T(0)	2:27:26						
Time of Frequency Recovery to 60 Hz or Pre-Perturbation Hz	2:32:54						
Value A Pre-Perturbation Average Frequency [T(-2) to T(-16)]	60.0421	Hz					
Value B Post-Perturbation Average Frequency [T(+20 to T(+40)]	59.8893	Hz					
Pre to Post Perturbation Delta Frequency Actual	-0.153	Hz					
Value A Pre-Perturbation Average Interchange MW [T(-2) to T(-16)]	3645.73	MW					
Value B Post-Perturbation Average Interchange MW [T(+20 to T(+40)]	3783.86	MW					
Pre to Post Perturbation Interchange Delta MW Actual	138.14	MW					
Net Total Adjustments	45.82	MW					
EPFR for FRO Pre-Perturbation Average	-33.70	MW					
EPFR for FRO Post-Perturbation Average	88.58	MW					
EPFR for FRO Delta	122.28	MW					
EPFR for FRO Adjusted	168.10	MW					
Pre JOU Dynamic Schedules MW	350.00	MW	Pre-Perturbation Bias Setting	-103.000	MW/0.1 Hz		
Pre Non-Conforming Load MW	165.34	MW	Post-Perturbation Bias Setting	-103.000	MW/0.1 Hz		
Pre Pumped Hydro MW	0.00	MW	EPFR for Bias Setting Pre-Perturbation Average	-43.3890	MW		
Pre Ramping Units MW	229.25	MW	EPFR for Bias Setting Post-Perturbation Average	114.0486	MW		
Pre Transferred Frequency Response MW	-4.21	MW	EPFR for Bias Setting Delta	157.4376	MW		
Pre Contingent BA Lost Generation MW	15.00	MW	Primary Frequency Response Delivery of Bias	87.74%			
Sum of Pre Perturbation Adjustments	755.37	MW					
Post JOU Dynamic Schedules MW	335.00	MW	Pre-Perturbation BA Load	7651.305	MW		
Post Non-Conforming Load MW	213.08	MW	Post-Perturbation BA Load	7632.000	MW		
Post Pumped Hydro MW	3.55	MW	Pre to Post Perturbation BA Load Change	-19.305	MW		
Post Ramping Units MW	238.50	MW	Load Dampening Frequency Response	-12.630	MW/0.1 Hz		
Post Transferred Frequency Response MW	11.07	MW	Load Dampening % of Total BA Frequency Response	13.98%			
Post Contingent BA Lost Generation MW	0.00	MW					
Sum of Post Perturbation Adjustments	801.20	MW					
Net Total Adjustments MW	45.82	MW					

20 to 40 second Average Period Evaluation

Initial P.U. Performance for FRO	1.130	P.U.	
Initial P.U. Performance Adjusted for FRO	0.755	P.U.	

Pumped Hydro Load (-) Gen (+) MW	Ramping Units Gen (+) MW	Transferred Frequency Response Rec (-) Del (+) MW/0.1 Hz	Contingent BA Lost Generation Load (-) Gen (+) MW	BA Bias Setting MW/0.1 Hz	BA Load MW	EPFR MW	Expected Net Actual Interchange MW

T	Frequency Hz	Net Actual Interchange MW	JOU Dynamic Schedules Imp(-) Exp (+) MW	Non-Conforming Load (-) MW	Pumped Hydro Load (-) Gen (+) MW	Ramping Units Gen (+) MW	Transferred Frequency Response Rec (-) Del (+) MW/0.1 Hz	Contingent BA Lost Generation Load (-) Gen (+) MW	BA Bias Setting MW/0.1 Hz	BA Load MW	EPFR MW	Expected Net Actual Interchange MW
T-72 sec	2:26:14											
T-70 sec	2:26:16											
T-68 sec	2:26:18											
T-66 sec	2:26:20											
T-64 sec	2:26:22											
T-62 sec	2:26:24											
T-60 sec	2:26:26											
T-58 sec	2:26:28											
T-56 sec	2:26:30											
T-54 sec	2:26:32											
T-52 sec	2:26:34											
T-50 sec	2:26:36											
T-48 sec	2:26:38											
T-46 sec	2:26:40											
T-44 sec	2:26:42											
T-42 sec	2:26:44											
T-40 sec	2:26:46											
T-38 sec	2:26:48											
T-36 sec	2:26:50											

								T-34 sec	2:26:52										
								T-32 sec	2:26:54										
								T-30 sec	2:26:56										
								T-28 sec	2:26:58										
								T-26 sec	2:27:00										
								T-24 sec	2:27:02										
								T-22 sec	2:27:04										
								T-20 sec	2:27:06										
								T-18 sec	2:27:08										
0.000	229.250	10.000	15.000	-103.000	7651.305	-33.700		T-16 sec	2:27:10	60.042	3645.727	350.000	165.336	0.000	229.250	10.000	15.000	-103.000	7651.305	-33.700	
0.000	229.250	10.000	15.000	-103.000	7651.305	-33.700		T-14 sec	2:27:12	60.042	3645.727	350.000	165.336	0.000	229.250	10.000	15.000	-103.000	7651.305	-33.700	
0.000	229.250	10.000	15.000	-103.000	7651.305	-33.700		T-12 sec	2:27:14	60.042	3645.727	350.000	165.336	0.000	229.250	10.000	15.000	-103.000	7651.305	-33.700	
0.000	229.250	10.000	15.000	-103.000	7651.305	-33.700		T-10 sec	2:27:16	60.042	3645.727	350.000	165.336	0.000	229.250	10.000	15.000	-103.000	7651.305	-33.700	
0.000	229.250	10.000	15.000	-103.000	7651.305	-33.700		T-08 sec	2:27:18	60.042	3645.727	350.000	165.336	0.000	229.250	10.000	15.000	-103.000	7651.305	-33.700	
0.000	229.250	10.000	15.000	-103.000	7651.305	-33.700		T-06 sec	2:27:20	60.042	3645.727	350.000	165.336	0.000	229.250	10.000	15.000	-103.000	7651.305	-33.700	
0.000	229.250	10.000	15.000	-103.000	7651.305	-33.700		T-04 sec	2:27:22	60.042	3645.727	350.000	165.336	0.000	229.250	10.000	15.000	-103.000	7651.305	-33.700	
0.000	229.250	10.000	15.000	-103.000	7651.305	-33.700		T-02 sec	2:27:24	60.042	3645.727	350.000	165.336	0.000	229.250	10.000	15.000	-103.000	7651.305	-33.700	
								T+0 sec	2:27:26										
								T+02 sec	2:27:28										
								T+04 sec	2:27:30										
								T+06 sec	2:27:32										
								T+08 sec	2:27:34										
								T+10 sec	2:27:36										
								T+12 sec	2:27:38										
								T+14 sec	2:27:40										
								T+16 sec	2:27:42										
1.429	237.000	10.000	0.000	-103.000	7632.000	92.457	3814.960	T+18 sec	2:27:44										
1.429	237.000	10.000	0.000	-103.000	7632.000	92.457	3814.960	T+20 sec	2:27:46	59.889	3783.863	335.000	213.078	3.545	238.500	10.000	0.000	-103.000	7632.000	88.581	3813.831
1.429	237.000	10.000	0.000	-103.000	7632.000	92.457	3814.960	T+22 sec	2:27:48	59.889	3783.863	335.000	213.078	3.545	238.500	10.000	0.000	-103.000	7632.000	88.581	3813.831
1.429	237.000	10.000	0.000	-103.000	7632.000	92.457	3814.960	T+24 sec	2:27:50	59.889	3783.863	335.000	213.078	3.545	238.500	10.000	0.000	-103.000	7632.000	88.581	3813.831
1.429	237.000	10.000	0.000	-103.000	7632.000	92.457	3814.960	T+26 sec	2:27:52	59.889	3783.863	335.000	213.078	3.545	238.500	10.000	0.000	-103.000	7632.000	88.581	3813.831
1.429	237.000	10.000	0.000	-103.000	7632.000	92.457	3814.960	T+28 sec	2:27:54	59.889	3783.863	335.000	213.078	3.545	238.500	10.000	0.000	-103.000	7632.000	88.581	3813.831
1.429	237.000	10.000	0.000	-103.000	7632.000	92.457	3814.960	T+30 sec	2:27:56	59.889	3783.863	335.000	213.078	3.545	238.500	10.000	0.000	-103.000	7632.000	88.581	3813.831
								T+32 sec	2:27:58	59.889	3783.863	335.000	213.078	3.545	238.500	10.000	0.000	-103.000	7632.000	88.581	3813.831
								T+34 sec	2:28:00	59.889	3783.863	335.000	213.078	3.545	238.500	10.000	0.000	-103.000	7632.000	88.581	3813.831
								T+36 sec	2:28:02	59.889	3783.863	335.000	213.078	3.545	238.500	10.000	0.000	-103.000	7632.000	88.581	3813.831
								T+38 sec	2:28:04	59.889	3783.863	335.000	213.078	3.545	238.500	10.000	0.000	-103.000	7632.000	88.581	3813.831
								T+40 sec	2:28:06	59.889	3783.863	335.000	213.078	3.545	238.500	10.000	0.000	-103.000	7632.000	88.581	3813.831
								T+42 sec	2:28:08										
								T+44 sec	2:28:10										
								T+46 sec	2:28:12										
								T+48 sec	2:28:14										
								T+50 sec	2:28:16										
								T+52 sec	2:28:18										
								T+54 sec	2:28:20										
								T+56 sec	2:28:22										
								T+58 sec	2:28:24										
								T+60 sec	2:28:26										
								T+62 sec	2:28:28										
								T+64 sec	2:28:30										
								T+66 sec	2:28:32										
								T+68 sec	2:28:34										
								T+70 sec	2:28:36										
								T+72 sec	2:28:38										
								T+74 sec	2:28:40										
								T+76 sec	2:28:42										
								T+78 sec	2:28:44										
								T+80 sec	2:28:46										

Date:	Monday, October 12, 2009				
Time of T(0)	2:27:26				
Time of Frequency Recovery to 60 Hz or Pre-Perturbation Hz	2:32:54				
Value A Pre-Perturbation Average Frequency [T(-2) to T(-16)]	60.0421	Hz			
Value B Post-Perturbation Average Frequency [T(+18 to T(+52)]	59.8883	Hz			
Pre to Post Perturbation Delta Frequency Actual	-0.154	Hz			
Value A Pre-Perturbation Average Interchange MW [T(-2) to T(-16)]	3645.73	MW			
Value B Post-Perturbation Average Interchange MW [T(+18 to T(+52)]	3787.27	MW			
Pre to Post Perturbation Interchange Delta MW Actual	141.55	MW			
Net Total Adjustments	50.57	MW			
EPFR for FRO Pre-Perturbation Average	-33.70	MW			
EPFR for FRO Post-Perturbation Average	89.33	MW			
EPFR for FRO Delta	123.03	MW			
EPFR for FRO Adjusted	173.60	MW			
Pre JOU Dynamic Schedules MW	350.00	MW	Pre-Perturbation Bias Setting	-103.000	MW/0.1 Hz
Pre Non-Conforming Load MW	165.34	MW	Post-Perturbation Bias Setting	-103.000	MW/0.1 Hz
Pre Pumped Hydro MW	0.00	MW	EPFR for Bias Setting Pre-Perturbation Average	-43.3890	MW
Pre Ramping Units MW	229.25	MW	EPFR for Bias Setting Post-Perturbation Average	115.0166	MW
Pre Transferred Frequency Response MW	-4.21	MW	EPFR for Bias Setting Delta	158.4056	MW
Pre Contingent BA Lost Generation MW	15.00	MW	Primary Frequency Response Delivery of Bias	89.36%	
Sum of Pre Perturbation Adjustments	755.37	MW			
Post JOU Dynamic Schedules MW	335.00	MW	Pre-Perturbation BA Load	7651.305	MW
Post Non-Conforming Load MW	213.97	MW	Post-Perturbation BA Load	7632.000	MW
Post Pumped Hydro MW	6.06	MW	Pre to Post Perturbation BA Load Change	-19.305	MW
Post Ramping Units MW	239.75	MW	Load Dampening Frequency Response	-12.553	MW/0.1 Hz
Post Transferred Frequency Response MW	11.17	MW	Load Dampening % of Total BA Frequency Response	13.64%	
Post Contingent BA Lost Generation MW	0.00	MW			
Sum of Post Perturbation Adjustments	805.94	MW			
Net Total Adjustments MW	50.57	MW			

18 to 52 second Average Period Evaluation

Initial P.U. Performance for FRO	1.150	P.U.
Initial P.U. Performance Adjusted for FRO	0.739	P.U.

T	Frequency Hz	Net Actual Interchange MW	JOU Dynamic Schedules Imp(-) Exp (+) MW	Non-Conforming Load (-) MW	Pumped Hydro Load (-) Gen (+) MW	Ramping Units Gen (+) MW	Transferred Frequency Response Rec (-) Del (+) MW/0.1 Hz	Contingent BA Lost Generation Load (-) Gen (+) MW	BA Bias Setting MW/0.1 Hz	BA Load MW	EPFR MW	Expected Net Actual Interchange MW
T-72 sec	2:26:14											
T-70 sec	2:26:16											
T-68 sec	2:26:18											
T-66 sec	2:26:20											
T-64 sec	2:26:22											
T-62 sec	2:26:24											
T-60 sec	2:26:26											
T-58 sec	2:26:28											
T-56 sec	2:26:30											
T-54 sec	2:26:32											
T-52 sec	2:26:34											
T-50 sec	2:26:36											
T-48 sec	2:26:38											
T-46 sec	2:26:40											
T-44 sec	2:26:42											
T-42 sec	2:26:44											
T-40 sec	2:26:46											
T-38 sec	2:26:48											
T-36 sec	2:26:50											

Date:	Monday, October 12, 2009				
Time of T(0)	2:27:26				
Time of Frequency Recovery to 60 Hz or Pre-Perturbation Hz	2:32:54				
Value A Pre-Perturbation Average Frequency [T(-2) to T(-16)]	60.0421	Hz			
Value B Post-Perturbation Average Frequency [T(+20 to T(+52)]	59.8891	Hz			
Pre to Post Perturbation Delta Frequency Actual	-0.153	Hz			
Value A Pre-Perturbation Average Interchange MW [T(-2) to T(-16)]	3645.73	MW			
Value B Post-Perturbation Average Interchange MW [T(+20 to T(+52)]	3788.35	MW			
Pre to Post Perturbation Interchange Delta MW Actual	142.63	MW			
Net Total Adjustments	51.20	MW			
EPFR for FRO Pre-Perturbation Average	-33.70	MW			
EPFR for FRO Post-Perturbation Average	88.71	MW			
EPFR for FRO Delta	122.41	MW			
EPFR for FRO Adjusted	173.60	MW			
Pre JOU Dynamic Schedules MW	350.00	MW			
Pre Non-Conforming Load MW	165.34	MW			
Pre Pumped Hydro MW	0.00	MW			
Pre Ramping Units MW	229.25	MW			
Pre Transferred Frequency Response MW	-4.21	MW			
Pre Contingent BA Lost Generation MW	15.00	MW			
Sum of Pre Perturbation Adjustments	755.37	MW			
Post JOU Dynamic Schedules MW	335.00	MW			
Post Non-Conforming Load MW	214.13	MW			
Post Pumped Hydro MW	6.35	MW			
Post Ramping Units MW	240.00	MW			
Post Transferred Frequency Response MW	11.09	MW			
Post Contingent BA Lost Generation MW	0.00	MW			
Sum of Post Perturbation Adjustments	806.57	MW			
Net Total Adjustments MW	51.20	MW			

20 to 52 second Average Period Evaluation

Initial P.U. Performance for FRO	1.165	P.U.
Initial P.U. Performance Adjusted for FRO	0.747	P.U.

T	Frequency Hz	Net Actual Interchange MW	JOU Dynamic Schedules Imp(-) Exp (+) MW	Non-Conforming Load (-) MW	Pumped Hydro Load (-) Gen (+) MW	Ramping Units Gen (+) MW
T-72 sec	2:26:14					
T-70 sec	2:26:16					
T-68 sec	2:26:18					
T-66 sec	2:26:20					
T-64 sec	2:26:22					
T-62 sec	2:26:24					
T-60 sec	2:26:26					
T-58 sec	2:26:28					
T-56 sec	2:26:30					
T-54 sec	2:26:32					
T-52 sec	2:26:34					
T-50 sec	2:26:36					
T-48 sec	2:26:38					
T-46 sec	2:26:40					
T-44 sec	2:26:42					
T-42 sec	2:26:44					
T-40 sec	2:26:46					
T-38 sec	2:26:48					
T-36 sec	2:26:50					

T-34 sec	2:26:52												
T-32 sec	2:26:54												
T-30 sec	2:26:56												
T-28 sec	2:26:58												
T-26 sec	2:27:00												
T-24 sec	2:27:02												
T-22 sec	2:27:04												
T-20 sec	2:27:06												
T-18 sec	2:27:08												
T-16 sec	2:27:10	60.042	3645.727	350.000	165.336	0.000	229.250	10.000	15.000	-103.000	7651.305	-33.700	
T-14 sec	2:27:12	60.042	3645.727	350.000	165.336	0.000	229.250	10.000	15.000	-103.000	7651.305	-33.700	
T-12 sec	2:27:14	60.042	3645.727	350.000	165.336	0.000	229.250	10.000	15.000	-103.000	7651.305	-33.700	
T-10 sec	2:27:16	60.042	3645.727	350.000	165.336	0.000	229.250	10.000	15.000	-103.000	7651.305	-33.700	
T-08 sec	2:27:18	60.042	3645.727	350.000	165.336	0.000	229.250	10.000	15.000	-103.000	7651.305	-33.700	
T-06 sec	2:27:20	60.042	3645.727	350.000	165.336	0.000	229.250	10.000	15.000	-103.000	7651.305	-33.700	
T-04 sec	2:27:22	60.042	3645.727	350.000	165.336	0.000	229.250	10.000	15.000	-103.000	7651.305	-33.700	
T-02 sec	2:27:24	60.042	3645.727	350.000	165.336	0.000	229.250	10.000	15.000	-103.000	7651.305	-33.700	
T+0 sec	2:27:26												
T+02 sec	2:27:28												
T+04 sec	2:27:30												
T+06 sec	2:27:32												
T+08 sec	2:27:34												
T+10 sec	2:27:36												
T+12 sec	2:27:38												
T+14 sec	2:27:40												
T+16 sec	2:27:42												
T+18 sec	2:27:44	59.888	3787.272	335.000	213.968	6.056	239.750	10.000	0.000	-103.000	7632.000	89.333	3819.328
T+20 sec	2:27:46	59.888	3787.272	335.000	213.968	6.056	239.750	10.000	0.000	-103.000	7632.000	89.333	3819.328
T+22 sec	2:27:48	59.888	3787.272	335.000	213.968	6.056	239.750	10.000	0.000	-103.000	7632.000	89.333	3819.328
T+24 sec	2:27:50	59.888	3787.272	335.000	213.968	6.056	239.750	10.000	0.000	-103.000	7632.000	89.333	3819.328
T+26 sec	2:27:52	59.888	3787.272	335.000	213.968	6.056	239.750	10.000	0.000	-103.000	7632.000	89.333	3819.328
T+28 sec	2:27:54	59.888	3787.272	335.000	213.968	6.056	239.750	10.000	0.000	-103.000	7632.000	89.333	3819.328
T+30 sec	2:27:56	59.888	3787.272	335.000	213.968	6.056	239.750	10.000	0.000	-103.000	7632.000	89.333	3819.328
T+32 sec	2:27:58	59.888	3787.272	335.000	213.968	6.056	239.750	10.000	0.000	-103.000	7632.000	89.333	3819.328
T+34 sec	2:28:00	59.888	3787.272	335.000	213.968	6.056	239.750	10.000	0.000	-103.000	7632.000	89.333	3819.328
T+36 sec	2:28:02	59.888	3787.272	335.000	213.968	6.056	239.750	10.000	0.000	-103.000	7632.000	89.333	3819.328
T+38 sec	2:28:04	59.888	3787.272	335.000	213.968	6.056	239.750	10.000	0.000	-103.000	7632.000	89.333	3819.328
T+40 sec	2:28:06	59.888	3787.272	335.000	213.968	6.056	239.750	10.000	0.000	-103.000	7632.000	89.333	3819.328
T+42 sec	2:28:08	59.888	3787.272	335.000	213.968	6.056	239.750	10.000	0.000	-103.000	7632.000	89.333	3819.328
T+44 sec	2:28:10	59.888	3787.272	335.000	213.968	6.056	239.750	10.000	0.000	-103.000	7632.000	89.333	3819.328
T+46 sec	2:28:12	59.888	3787.272	335.000	213.968	6.056	239.750	10.000	0.000	-103.000	7632.000	89.333	3819.328
T+48 sec	2:28:14	59.888	3787.272	335.000	213.968	6.056	239.750	10.000	0.000	-103.000	7632.000	89.333	3819.328
T+50 sec	2:28:16	59.888	3787.272	335.000	213.968	6.056	239.750	10.000	0.000	-103.000	7632.000	89.333	3819.328
T+52 sec	2:28:18	59.888	3787.272	335.000	213.968	6.056	239.750	10.000	0.000	-103.000	7632.000	89.333	3819.328
T+54 sec	2:28:20												
T+56 sec	2:28:22												
T+58 sec	2:28:24												
T+60 sec	2:28:26												
T+62 sec	2:28:28												
T+64 sec	2:28:30												
T+66 sec	2:28:32												
T+68 sec	2:28:34												
T+70 sec	2:28:36												
T+72 sec	2:28:38												
T+74 sec	2:28:40												
T+76 sec	2:28:42												
T+78 sec	2:28:44												
T+80 sec	2:28:46												

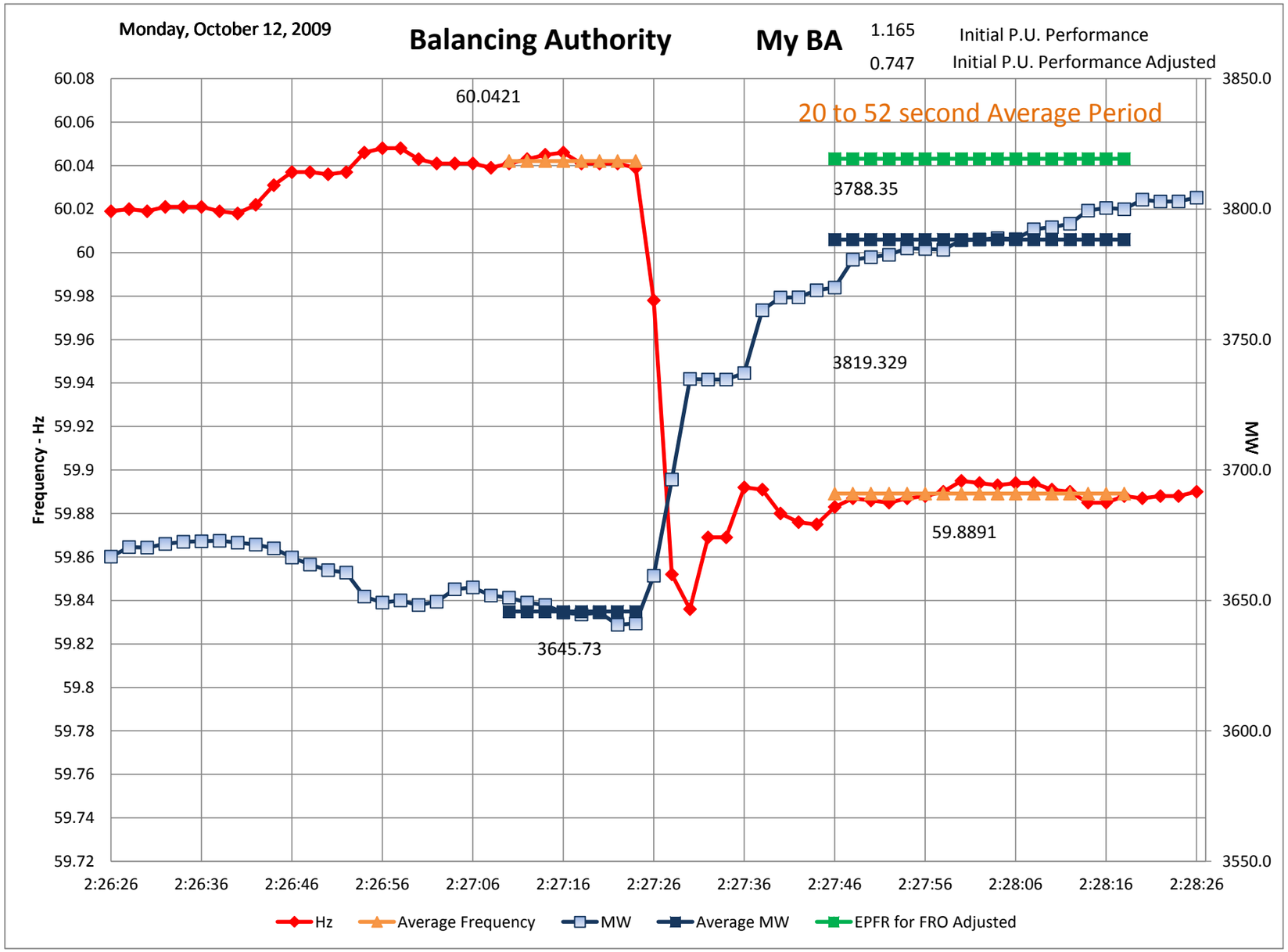
T-34 sec	2:26:52						
T-32 sec	2:26:54						
T-30 sec	2:26:56						
T-28 sec	2:26:58						
T-26 sec	2:27:00						
T-24 sec	2:27:02						
T-22 sec	2:27:04						
T-20 sec	2:27:06						
T-18 sec	2:27:08						
T-16 sec	2:27:10	60.042	3645.727	350.000	165.336	0.000	229.250
T-14 sec	2:27:12	60.042	3645.727	350.000	165.336	0.000	229.250
T-12 sec	2:27:14	60.042	3645.727	350.000	165.336	0.000	229.250
T-10 sec	2:27:16	60.042	3645.727	350.000	165.336	0.000	229.250
T-08 sec	2:27:18	60.042	3645.727	350.000	165.336	0.000	229.250
T-06 sec	2:27:20	60.042	3645.727	350.000	165.336	0.000	229.250
T-04 sec	2:27:22	60.042	3645.727	350.000	165.336	0.000	229.250
T-02 sec	2:27:24	60.042	3645.727	350.000	165.336	0.000	229.250
T+0 sec	2:27:26						
T+02 sec	2:27:28						
T+04 sec	2:27:30						
T+06 sec	2:27:32						
T+08 sec	2:27:34						
T+10 sec	2:27:36						
T+12 sec	2:27:38						
T+14 sec	2:27:40						
T+16 sec	2:27:42						
T+18 sec	2:27:44						
T+20 sec	2:27:46	59.889	3788.355	335.000	214.128	6.353	240.000
T+22 sec	2:27:48	59.889	3788.355	335.000	214.128	6.353	240.000
T+24 sec	2:27:50	59.889	3788.355	335.000	214.128	6.353	240.000
T+26 sec	2:27:52	59.889	3788.355	335.000	214.128	6.353	240.000
T+28 sec	2:27:54	59.889	3788.355	335.000	214.128	6.353	240.000
T+30 sec	2:27:56	59.889	3788.355	335.000	214.128	6.353	240.000
T+32 sec	2:27:58	59.889	3788.355	335.000	214.128	6.353	240.000
T+34 sec	2:28:00	59.889	3788.355	335.000	214.128	6.353	240.000
T+36 sec	2:28:02	59.889	3788.355	335.000	214.128	6.353	240.000
T+38 sec	2:28:04	59.889	3788.355	335.000	214.128	6.353	240.000
T+40 sec	2:28:06	59.889	3788.355	335.000	214.128	6.353	240.000
T+42 sec	2:28:08	59.889	3788.355	335.000	214.128	6.353	240.000
T+44 sec	2:28:10	59.889	3788.355	335.000	214.128	6.353	240.000
T+46 sec	2:28:12	59.889	3788.355	335.000	214.128	6.353	240.000
T+48 sec	2:28:14	59.889	3788.355	335.000	214.128	6.353	240.000
T+50 sec	2:28:16	59.889	3788.355	335.000	214.128	6.353	240.000
T+52 sec	2:28:18	59.889	3788.355	335.000	214.128	6.353	240.000
T+54 sec	2:28:20						
T+56 sec	2:28:22						
T+58 sec	2:28:24						
T+60 sec	2:28:26						
T+62 sec	2:28:28						
T+64 sec	2:28:30						
T+66 sec	2:28:32						
T+68 sec	2:28:34						
T+70 sec	2:28:36						
T+72 sec	2:28:38						
T+74 sec	2:28:40						
T+76 sec	2:28:42						
T+78 sec	2:28:44						
T+80 sec	2:28:46						

Pre-Perturbation Bias Setting	-103.000	MW/0.1 Hz
Post-Perturbation Bias Setting	-103.000	MW/0.1 Hz
EPFR for Bias Setting Pre-Perturbation Average	-43.3890	MW
EPFR for Bias Setting Post-Perturbation Average	114.2087	MW
EPFR for Bias Setting Delta	157.5977	MW
Primary Frequency Response Delivery of Bias	90.50%	

Pre-Perturbation BA Load	7651.305	MW
Post-Perturbation BA Load	7632.000	MW
Pre to Post Perturbation BA Load Change	-19.305	MW
Load Dampening Frequency Response	-12.617	MW/0.1 Hz
Load Dampening % of Total BA Frequency Response	13.54%	

Transferred Frequency Response Rec (-) Del (+) MW/0.1 Hz	Contingent BA Lost Generation Load (-) Gen (+) MW	BA Bias Setting MW/0.1 Hz	BA Load MW	EPFR MW	Expected Net Actual Interchange MW

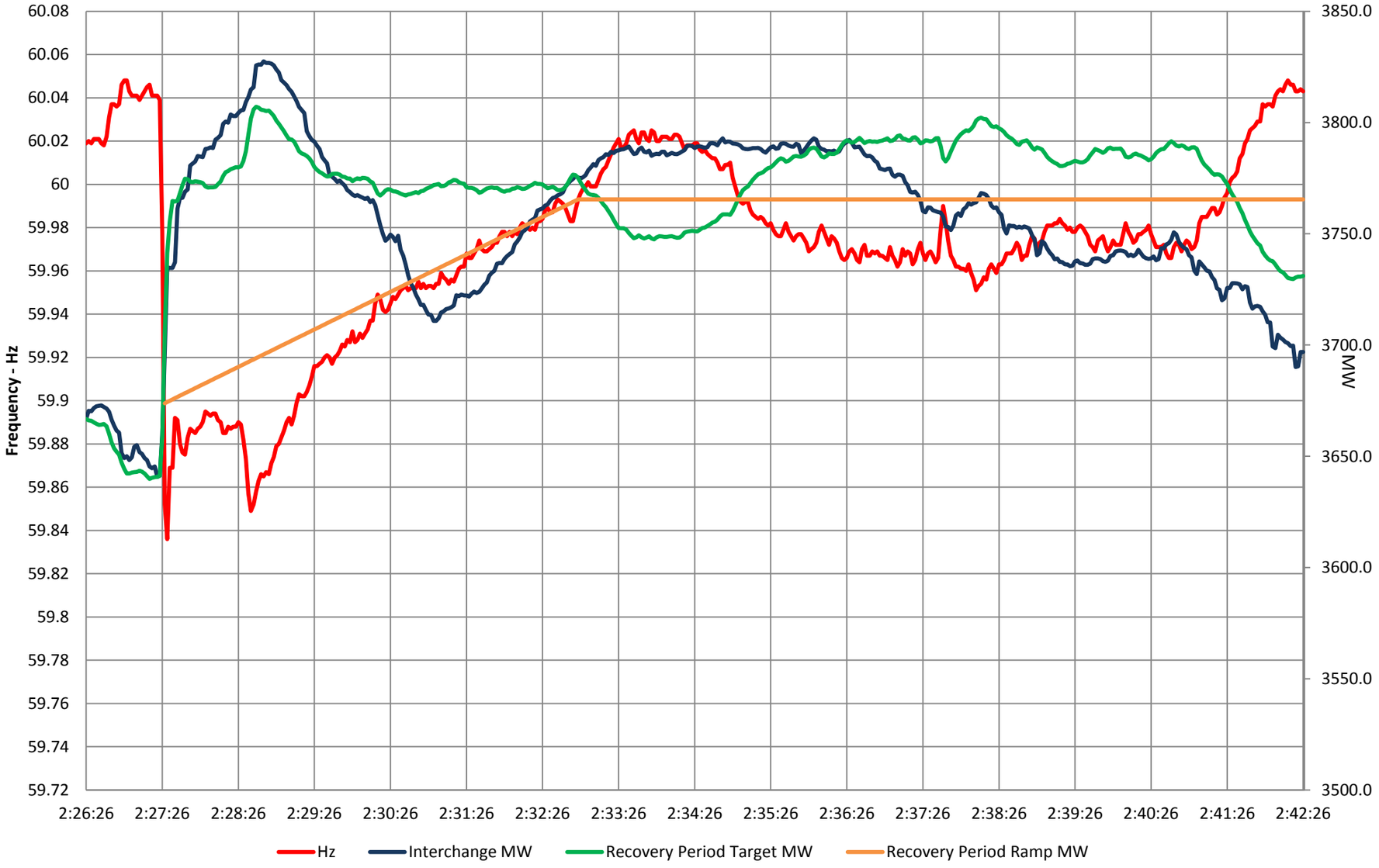
10.000	15.000	-103.000	7651.305	-33.700	
10.000	15.000	-103.000	7651.305	-33.700	
10.000	15.000	-103.000	7651.305	-33.700	
10.000	15.000	-103.000	7651.305	-33.700	
10.000	15.000	-103.000	7651.305	-33.700	
10.000	15.000	-103.000	7651.305	-33.700	
10.000	15.000	-103.000	7651.305	-33.700	
10.000	15.000	-103.000	7651.305	-33.700	
10.000	0.000	-103.000	7632.000	88.706	3819.329
10.000	0.000	-103.000	7632.000	88.706	3819.329
10.000	0.000	-103.000	7632.000	88.706	3819.329
10.000	0.000	-103.000	7632.000	88.706	3819.329
10.000	0.000	-103.000	7632.000	88.706	3819.329
10.000	0.000	-103.000	7632.000	88.706	3819.329
10.000	0.000	-103.000	7632.000	88.706	3819.329
10.000	0.000	-103.000	7632.000	88.706	3819.329
10.000	0.000	-103.000	7632.000	88.706	3819.329
10.000	0.000	-103.000	7632.000	88.706	3819.329
10.000	0.000	-103.000	7632.000	88.706	3819.329
10.000	0.000	-103.000	7632.000	88.706	3819.329
10.000	0.000	-103.000	7632.000	88.706	3819.329
10.000	0.000	-103.000	7632.000	88.706	3819.329
10.000	0.000	-103.000	7632.000	88.706	3819.329
10.000	0.000	-103.000	7632.000	88.706	3819.329
10.000	0.000	-103.000	7632.000	88.706	3819.329


Monday, October 12, 2009
Balancing Authority
My BA
1.165
Initial P.U. Performance
0.747
Initial P.U. Performance Adjusted
60.0421
20 to 52 second Average Period
3788.35
3819.329
59.8891
3645.73
Frequency - Hz
MW
60.08
60.06
60.04
60.02
60
59.98
59.96
59.94
59.92
59.9
59.88
59.86
59.84
59.82
59.8
59.78
59.76
59.74
59.72
3850.0
3800.0
3750.0
3700.0
3650.0
3600.0
3550.0
2:26:26
2:26:36
2:26:46
2:26:56
2:27:06
2:27:16
2:27:26
2:27:36
2:27:46
2:27:56
2:28:06
2:28:16
2:28:26
Hz
Average Frequency
MW
Average MW
EPFR for FRO Adjusted

Monday, October 12, 2009

My BA

0.923 Sustained P.U. Performance



Interconnection Performance

Date	A Point Time	FPointA Hz	A Value Hz	t(0) Time	C Value Hz
Monday, October 12, 2009	2:27:24	60.0390	60.0421	2:27:26	59.8360

Value B 12 to 24 sec Average Frequency	FR B 12 to 24 sec Average MW	Value B 18 to 30 sec Average Frequency	FR B 18 to 30 sec Average MW	Value B 20 to 40 sec Average Frequency	FR B 20 to 40 sec Average MW	Value B 18 to 52 sec Average Frequency	FR B 18 to 52 sec Average MW	Value B 20 to 52 sec Average Frequency	FR B 20 to 52 sec Average MW
59.8825716	-397.19961	59.8844288	-401.66999	59.8891177	-414.40454	59.8883334	-411.99633	59.8891177	-413.95153

Value A Data BA Performance

Frequency Hz	Net Actual Interchange MW	JOU Dynamic Schedules Imp(-) Exp (+) MW	Non-Conforming Load Load (-) MW	Pumped Hydro Load (-) Gen (+) MW	Ramping Units Gen (+) MW	Transferred Frequency Response Rec (-) Del (+) MW	Contingent BA Lost Generation Load (-) Gen (+) MW	BA Bias Setting MW/0.1 Hz	BA Load MW	Bias Setting EPFR MW
60.042125	3645.73	350.00	165.34	0.00	229.25	-4.21	15.00	-103	7651.305	-43.389

Value B 12 to 24 second Average Period Evaluation

Frequency Hz	Net Actual Interchange MW	JOU Dynamic Schedules Imp(-) Exp (+) MW	Non-Conforming Load Load (-) MW	Pumped Hydro Load (-) Gen (+) MW	Ramping Units Gen (+) MW	Transferred Frequency Response Rec (-) Del (+) MW
59.882572	3770.65	335.00	212.14	0.86	235.50	11.74

Value B 18 to 30 second Average Period Evaluation

Contingent BA Lost Generation Load (-) Gen (+) MW	Initial Performance Adjusted P.U.	Initial Performance Unadjusted P.U.	Sustained Performance P.U.	BA Bias Setting MW/0.1 Hz	BA Load MW	Bias Setting EPFR MW	Frequency Hz	Net Actual Interchange MW	JOU Dynamic Schedules Imp(-) Exp (+) MW	Non-Conforming Load Load (-) MW	Pumped Hydro Load (-) Gen (+) MW	Ramping Units Gen (+) MW	Transferred Frequency Response Rec (-) Del (+) MW/0.1 Hz	Contingent BA Lost Generation Load (-) Gen (+) MW	Initial Performance Adjusted P.U.
0.00	0.666	0.979	0.923	-103	7632	120.9512	59.884429	3779.03	335.00	213.46	1.43	237.00	11.56	0.00	0.715

Value B 20 to 40 second Average Period Evaluation

Initial Performance Unadjusted P.U.	Sustained Performance P.U.	BA Bias Setting MW	BA Load MW	Bias Setting EPFR MW	Frequency Hz	Net Actual Interchange MW	JOU Dynamic Schedules Imp(-) Exp (+) MW	Non-Conforming Load Load (-) MW	Pumped Hydro Load (-) Gen (+) MW	Ramping Units Gen (+) MW	Transferred Frequency Response Rec (-) Del (+) MW/0.1 Hz	Contingent BA Lost Generation Load (-) Gen (+) MW	Initial Performance Adjusted P.U.	Initial Performance Unadjusted P.U.	Sustained Performance P.U.
1.057	0.923	-103	7632	119.0383	59.889273	3783.86	335.00	213.08	3.55	238.50	11.07	0.00	0.755	1.130	0.923

Value B 18 to 52 second Average Period Evaluation Value B

BA Bias Setting MW	BA Load MW	Bias Setting EPFR MW	Frequency Hz	Net Actual Interchange MW	JOU Dynamic Schedules Imp(-) Exp (+) MW	Non-Conforming Load Load (-) MW	Pumped Hydro Load (-) Gen (+) MW	Ramping Units Gen (+) MW	Transferred Frequency Response Rec (-) Del (+) MW	Contingent BA Lost Generation Load (-) Gen (+) MW	Initial Performance Adjusted P.U.	Initial Performance Unadjusted P.U.	Sustained Performance P.U.	BA Bias Setting MW/0.1 Hz	BA Load MW	Bias Setting EPFR MW	Frequency Hz
-103	7632	114.0486	59.888333	3787.27	335.00	213.97	6.06	239.75	11.17	0.00	0.739	1.150	0.923	-103	7632	115.0166	59.889118

20 to 52 second Average Period Evaluation

Net Actual Interchange MW	JOU Dynamic Schedules Imp(-) Exp (+) MW	Non-Conforming Load Load (-) MW	Pumped Hydro Load (-) Gen (+) MW	Ramping Units Gen (+) MW	Transferred Frequency Response Rec (-) Del (+) MW	Contingent BA Lost Generation Load (-) Gen (+) MW	Initial Performance Adjusted P.U.	Initial Performance Unadjusted P.U.	Sustained Performance P.U.	BA Bias Setting MW/0.1 Hz	BA Load MW	Bias Setting EPFR MW
3788.35	335.00	165.34	6.35	240.00	11.09	0.00	0.747	1.165	0.923	-103	7632	114.2087

Steps	To be completed for each event evaluated.
1	Set-up Data collection in exact same order as the "Data" sheet of this work book. Data should be in this order: Column A: Date and Time in this format, mm/dd/yy HH:MM:SS Column B: Frequency Hz Column C: Net Actual Interchange Column D: Joint Owned Unit dynamic schedule Column E: Non Conforming Load Column F: Pumped Hydro Column G: Ramping units Column H: Transferred Frequency Response Column I: Contingent BA Lost load or generation Column J: BA Bias Setting Column K: BA Load
2	Note: Columns D, E, F, G and H are optional data. If you choose not to use these, leave the columns blank. Do not delete the columns. Use the sign (+/-) convention defined in FRS Form 1.
3	Data compression must be turned off for each data point. Quality data will give you quality results in the evaluation.
4	Data must be at 3 second sample rate for the full 25 minute minimum collection period that starts a minimum of two (2) minutes before the event begins and includes a minimum of 15 minutes after the beginning of the event. The spreadsheet will work with up to 60 minutes of data. Be sure "Data" worksheet is clear of any old data. If using PI historian as your data source, use "PasteSpecial/Values" to enter data into the spreadsheet. Do not include historian data collection formulas in the data. The data must be numbers not text.
5	Once data is in place in the "Data" worksheet, determine when the beginning of the event occurred. Scroll through the "Data" worksheet column B data of frequency and observe when frequency moves from the normal, pre-event frequency. This will usually be a single change in frequency of 0.008 to 0.010 Hz more or less. Note the row number in the worksheet that this change occurs. In this sample data spreadsheet this occurs in row 313 of the data.
6	Edit cell "C8" of the "Entry Data" worksheet, change the formula in the cell "C8" to reference the row number identified in step 5 above. In the sample data of this workbook this formula is: "=Data!A313" If the correct row is selected, the "Graph 20 to 52s" worksheet will indicate the first change in frequency of the event on the center vertical grid line of the graph (Red Trend).
7	Determine the end of the event to be evaluated. Use the same rules that are used for DCS only look at frequency instead of ACE. Scroll down the frequency data in column B of the "Data" worksheet until frequency reaches 60 Hz or the pre-disturbance value. Note the row number in the worksheet that this occurs. In this sample data spreadsheet this occurs in row 427.
8	Edit cell "C11" of the "Entry Data" worksheet, change the formula in the cell "C11" to reference the row number identified in step 7 above. In the sample data of this workbook this formula is: "=Data!A427"
9	In cell "R41" of the "Evaluation" spreadsheet, enter the MW value of the unit(s) that tripped (from the Master Event List). This is only necessary for the "Interconnection" evaluation if you're interested. It is not necessary to do this for the BA evaluation but it will provide a comparison of the BA frequency response as compared to the Interconnection frequency response.
10	Use the "copy" button provided to copy the evaluation and event specific data for the "FRS Form 1" of this field trial. This data is summarized in the correct order on worksheet "Form 1 Summary Data" of this workbook. Use PasteSpecial/Values when pasting the data into FRS Form 1 on the appropriate event row.

Steps	To be completed once at the initial setup of the evaluation spreadsheet for your BA.
A	Enter the Balancing Authority name as you want it to appear on the graphs in cell "B1" of the "Entry Data" worksheet. For example: "NYISO".
B	Enter your Balancing Authorities Frequency Response Obligation in cell "B2" of the "Entry Data" worksheet. For example: -80 MW/0.1 Hz (This value could change annually)
C	For informational and educational purposes, a "Sustained" performance evaluation is provided in the "Evaluation" worksheet and in the "Sustained" Graph. This evaluation uses a Time Constant (TC) to model the frequency response of your BA. The time constant is located in cell "L13" of the "Evaluation" spreadsheet and should be edited for the types of generators in your BA. Presently this time constant is set at 0.35. The higher the value of the time constant, the faster the delivery of frequency response is expected. Setting the TC to 1.0 effectively turns off the delay and instantaneous frequency response will be modeled. Do not set higher than 1.0. This time constant is only used in the "Sustained" evaluation and is not used for the Field Trial evaluation of performance to the FRO. A typical setting for this time constant is 0.08 to 0.15 for hydro units, 0.10 to 0.20 for large steam turbines and 0.20 to 0.40 for combustion turbines. By observing the slope of your "Interchange Actual" on the "Sustained" Graph, adjust the time constant until the initial slope of the "Target" is similar. When set appropriately, the "Target" trend on the "Sustained" graph will model what Interchange Actual should have done during the event recovery period based on your minimum FRO.

Note: For ease of use, only the necessary worksheets are displayed. If you are interested in viewing graphs and other hidden worksheets, select the "tab" at the bottom, right click, select unhide and select the worksheet you wish to unhide.

Time (T)	Hz	Net Actual Interchange MW	JOU Dynamic Schedules Imp(-) Exp (+) MW	Non-Conforming Load Load (-) MW	Pumped Hydro Load (-) Gen (+) MW	Ramping Units Gen (+) MW	Transferred Frequency Response Rec (-) Del (+) MW/0.1 Hz	Contingent BA Lost Generation Load (-) Gen (+) MW	BA Bias Setting MW/0.1 Hz	BA Load MW
10/12/09 02:12:00	59.981	3669.878	350	351.361511	0	0	10	15	-103	7500
10/12/09 02:12:03	59.98	3671.7	350	351.361511	0	0.5	10	15	-103	7500.33
10/12/09 02:12:06	59.982	3670.949	350	351.361511	0	1	10	15	-103	7500.66
10/12/09 02:12:09	59.981	3671.548	350	357.94751	0	1.5	10	15	-103	7500.99
10/12/09 02:12:12	59.981	3672.31	350	357.94751	0	2	10	15	-103	7501.32
10/12/09 02:12:15	59.982	3672.174	350	357.94751	0	2.5	10	15	-103	7501.65
10/12/09 02:12:18	59.979	3672.276	350	357.94751	0	3	10	15	-103	7501.98
10/12/09 02:12:21	59.98	3674.508	350	357.94751	0	3.5	10	15	-103	7502.31
10/12/09 02:12:24	59.983	3673.844	350	360.234741	0	4	10	15	-103	7502.64
10/12/09 02:12:27	59.986	3672.106	350	360.234741	0	4.5	10	15	-103	7502.97
10/12/09 02:12:30	59.98	3669.33	350	360.234741	0	5	10	15	-103	7503.3
10/12/09 02:12:33	59.976	3671.5	350	360.234741	0	5.5	10	15	-103	7503.63
10/12/09 02:12:36	59.979	3673.56	350	360.234741	0	6	10	15	-103	7503.96
10/12/09 02:12:39	59.981	3673.834	350	346.525879	0	6.5	10	15	-103	7504.29
10/12/09 02:12:42	59.987	3671.887	350	346.525879	0	7	10	15	-103	7504.62
10/12/09 02:12:45	59.99	3671.22	350	346.525879	0	7.5	10	15	-103	7504.95
10/12/09 02:12:48	59.994	3671.56	350	346.525879	0	8	10	15	-103	7505.28
10/12/09 02:12:51	59.995	3670.772	350	346.525879	0	8.5	10	15	-103	7505.61
10/12/09 02:12:54	59.995	3668.362	350	296.443359	0	9	10	15	-103	7505.94
10/12/09 02:12:57	59.995	3668.245	350	296.443359	0	9.5	10	15	-103	7506.27
10/12/09 02:13:00	59.994	3669.291	350	296.443359	0	10	10	15	-103	7506.6
10/12/09 02:13:03	59.994	3671.254	350	296.443359	0	10.5	10	15	-103	7506.93
10/12/09 02:13:06	59.997	3670.683	350	296.443359	0	11	10	15	-103	7507.26
10/12/09 02:13:09	60.001	3670.212	350	341.061157	0	11.5	10	15	-103	7507.59
10/12/09 02:13:12	60.001	3670.712	350	341.061157	0	12	10	15	-103	7507.92
10/12/09 02:13:15	60.003	3671.184	350	341.061157	0	12.5	10	15	-103	7508.25
10/12/09 02:13:18	60.005	3671.227	350	341.061157	0	13	10	15	-103	7508.58
10/12/09 02:13:21	60.003	3670.19	350	341.061157	0	13.5	10	15	-103	7508.91
10/12/09 02:13:24	60.001	3671.092	350	322.826294	0	14	10	15	-103	7509.24
10/12/09 02:13:27	60.003	3670.67	350	322.826294	0	14.5	10	15	-103	7509.57
10/12/09 02:13:30	60.005	3669.899	350	322.826294	0	15	10	15	-103	7509.9
10/12/09 02:13:33	60.001	3670.199	350	322.826294	0	15.5	10	15	-103	7510.23
10/12/09 02:13:36	60.001	3671.628	350	322.826294	0	16	10	15	-103	7510.56
10/12/09 02:13:39	60.004	3671.968	350	321.544403	0	16.5	10	15	-103	7510.89
10/12/09 02:13:42	60.004	3671.444	350	321.544403	0	17	10	15	-103	7511.22
10/12/09 02:13:45	60.004	3671.875	350	321.544403	0	17.5	10	15	-103	7511.55
10/12/09 02:13:48	60.003	3671.066	350	321.544403	0	18	10	15	-103	7511.88
10/12/09 02:13:51	60.002	3673.235	350	321.544403	0	18.5	10	15	-103	7512.21
10/12/09 02:13:54	60.001	3673.498	350	362.136261	0	19	10	15	-103	7512.54
10/12/09 02:13:57	59.999	3672.75	350	362.136261	0	19.5	10	15	-103	7512.87
10/12/09 02:14:00	59.997	3673.186	350	362.136261	0	20	10	15	-103	7513.2

10/12/09 02:14:03	59.998	3673.576	350	362.136261	0	20.5	10	15	-103	7513.53
10/12/09 02:14:06	59.995	3673.365	350	362.136261	0	21	10	15	-103	7513.86
10/12/09 02:14:09	59.993	3672.093	350	336.311798	0	21.5	10	15	-103	7514.19
10/12/09 02:14:12	59.996	3671.998	350	336.311798	0	22	10	15	-103	7514.52
10/12/09 02:14:15	59.999	3671.073	350	336.311798	0	22.5	10	15	-103	7514.85
10/12/09 02:14:18	60.005	3670.957	350	336.311798	0	23	10	15	-103	7515.18
10/12/09 02:14:21	60.007	3670.893	350	336.311798	0	23.5	10	15	-103	7515.51
10/12/09 02:14:24	60.005	3670.162	350	316.443054	0	24	10	15	-103	7515.84
10/12/09 02:14:27	60.002	3670.62	350	316.443054	0	24.5	10	15	-103	7516.17
10/12/09 02:14:30	59.997	3672.713	350	316.443054	0	25	10	15	-103	7516.5
10/12/09 02:14:33	59.999	3671.07	350	316.443054	0	25.5	10	15	-103	7516.83
10/12/09 02:14:36	60.007	3670.826	350	316.443054	0	26	10	15	-103	7517.16
10/12/09 02:14:39	60.01	3671.809	350	325.464294	0	26.5	10	15	-103	7517.49
10/12/09 02:14:42	60.009	3673.363	350	325.464294	0	27	10	15	-103	7517.82
10/12/09 02:14:45	60.003	3673.255	350	325.464294	0	27.5	10	15	-103	7518.15
10/12/09 02:14:48	59.995	3674.415	350	325.464294	0	28	10	15	-103	7518.48
10/12/09 02:14:51	59.994	3674.755	350	325.464294	0	28.5	10	15	-103	7518.81
10/12/09 02:14:54	60	3674.29	350	336.614166	0	29	10	15	-103	7519.14
10/12/09 02:14:57	60.001	3675.157	350	336.614166	0	29.5	10	15	-103	7519.47
10/12/09 02:15:00	59.998	3675.166	350	336.614166	0	30	10	15	-103	7519.8
10/12/09 02:15:03	59.995	3674.442	350	336.614166	0	30.5	10	15	-103	7520.13
10/12/09 02:15:06	59.986	3674.906	350	336.614166	0	31	10	15	-103	7520.46
10/12/09 02:15:09	59.986	3676.714	350	316.726166	0	31.5	10	15	-103	7520.79
10/12/09 02:15:12	59.988	3677.791	350	316.726166	0	32	10	15	-103	7521.12
10/12/09 02:15:15	59.989	3675.543	350	316.726166	0	32.5	10	15	-103	7521.45
10/12/09 02:15:18	59.987	3676.593	350	316.726166	0	33	10	15	-103	7521.78
10/12/09 02:15:21	59.985	3677.223	350	316.726166	0	33.5	10	15	-103	7522.11
10/12/09 02:15:24	59.983	3677.067	350	320.195526	0	34	10	15	-103	7522.44
10/12/09 02:15:27	59.982	3678.455	350	320.195526	0	34.5	10	15	-103	7522.77
10/12/09 02:15:30	59.984	3679.228	350	320.195526	0	35	10	15	-103	7523.1
10/12/09 02:15:33	59.985	3679.059	350	320.195526	0	35.5	10	15	-103	7523.43
10/12/09 02:15:36	59.987	3677.627	350	320.195526	0	36	10	15	-103	7523.76
10/12/09 02:15:39	59.99	3676.409	350	341.86615	0	36.5	10	15	-103	7524.09
10/12/09 02:15:42	59.987	3677.528	350	341.86615	0	37	10	15	-103	7524.42
10/12/09 02:15:45	59.983	3676.915	350	341.86615	0	37.5	10	15	-103	7524.75
10/12/09 02:15:48	59.979	3678.086	350	341.86615	0	38	10	15	-103	7525.08
10/12/09 02:15:51	59.983	3680.163	350	341.86615	0	38.5	10	15	-103	7525.41
10/12/09 02:15:54	59.986	3679.213	350	348.597839	0	39	10	15	-103	7525.74
10/12/09 02:15:57	59.988	3677.653	350	348.597839	0	39.5	10	15	-103	7526.07
10/12/09 02:16:00	59.983	3677.678	350	348.597839	0	40	10	15	-103	7526.4
10/12/09 02:16:03	59.978	3679.279	350	348.597839	0	40.5	10	15	-103	7526.73
10/12/09 02:16:06	59.979	3678.729	350	348.597839	0	41	10	15	-103	7527.06
10/12/09 02:16:09	59.989	3680.287	350	329.085022	0	41.5	10	15	-103	7527.39
10/12/09 02:16:12	59.988	3679.026	350	329.085022	0	42	10	15	-103	7527.72
10/12/09 02:16:15	59.983	3678.489	350	329.085022	0	42.5	10	15	-103	7528.05
10/12/09 02:16:18	59.991	3678.72	350	329.085022	0	43	10	15	-103	7528.38

10/12/09 02:16:21	59.989	3678.971	350	329.085022	0	43.5	10	15	-103	7528.71
10/12/09 02:16:24	59.993	3679.39	350	342.418243	0	44	10	15	-103	7529.04
10/12/09 02:16:27	59.995	3678.33	350	342.418243	0	44.5	10	15	-103	7529.37
10/12/09 02:16:30	59.998	3678.49	350	342.418243	0	45	10	15	-103	7529.7
10/12/09 02:16:33	59.998	3676.763	350	342.418243	0	45.5	10	15	-103	7530.03
10/12/09 02:16:36	59.999	3678.951	350	342.418243	0	46	10	15	-103	7530.36
10/12/09 02:16:39	59.995	3679.148	350	338.794647	0	46.5	10	15	-103	7530.69
10/12/09 02:16:42	59.992	3679.903	350	338.794647	0	47	10	15	-103	7531.02
10/12/09 02:16:45	59.995	3678.997	350	338.794647	0	47.5	10	15	-103	7531.35
10/12/09 02:16:48	60.001	3677.86	350	338.794647	0	48	10	15	-103	7531.68
10/12/09 02:16:51	60.003	3678.267	350	338.794647	0	48.5	10	15	-103	7532.01
10/12/09 02:16:54	60.009	3677.686	350	335.931	0	49	10	15	-103	7532.34
10/12/09 02:16:57	60.009	3678.364	350	335.931	0	49.5	10	15	-103	7532.67
10/12/09 02:17:00	60.012	3679.209	350	335.931	0	50	10	15	-103	7533
10/12/09 02:17:03	60.011	3678.653	350	335.931	0	50.5	10	15	-103	7533.33
10/12/09 02:17:06	60.008	3679.057	350	335.931	0	51	10	15	-103	7533.66
10/12/09 02:17:09	60.007	3680.604	350	339.712402	0	51.5	10	15	-103	7533.99
10/12/09 02:17:12	60.012	3679.806	350	339.712402	0	52	10	15	-103	7534.32
10/12/09 02:17:15	60.013	3680.263	350	339.712402	0	52.5	10	15	-103	7534.65
10/12/09 02:17:18	60.01	3679.851	350	339.712402	0	53	10	15	-103	7534.98
10/12/09 02:17:21	60.007	3679.946	350	339.712402	0	53.5	10	15	-103	7535.31
10/12/09 02:17:24	60.009	3679.44	350	332.024658	0	54	10	15	-103	7535.64
10/12/09 02:17:27	60.006	3679.517	350	332.024658	0	54.5	10	15	-103	7535.97
10/12/09 02:17:30	60.009	3679.888	350	332.024658	0	55	10	15	-103	7536.3
10/12/09 02:17:33	60.009	3679.06	350	332.024658	0	55.5	10	15	-103	7536.63
10/12/09 02:17:36	60.009	3679.261	350	332.024658	0	56	10	15	-103	7536.96
10/12/09 02:17:39	60.009	3679.025	350	330.759033	0	56.5	10	15	-103	7537.29
10/12/09 02:17:42	60.004	3679.152	350	330.759033	0	57	10	15	-103	7537.62
10/12/09 02:17:45	60.001	3678.295	350	330.759033	0	57.5	10	15	-103	7537.95
10/12/09 02:17:48	59.993	3678.249	350	330.759033	0	58	10	15	-103	7538.28
10/12/09 02:17:51	59.991	3677.83	350	330.759033	0	58.5	10	15	-103	7538.61
10/12/09 02:17:54	59.992	3677.955	350	323.419952	0	59	10	15	-103	7538.94
10/12/09 02:17:57	59.994	3676.666	350	323.419952	0	59.5	10	15	-103	7539.27
10/12/09 02:18:00	59.994	3677.093	350	323.419952	0	60	10	15	-103	7539.6
10/12/09 02:18:03	59.995	3676.401	350	323.419952	0	60.5	10	15	-103	7539.93
10/12/09 02:18:06	59.99	3678.516	350	323.419952	0	61	10	15	-103	7540.26
10/12/09 02:18:09	59.99	3680.197	350	342.350922	0	61.5	10	15	-103	7540.59
10/12/09 02:18:12	59.983	3678.743	350	342.350922	0	62	10	15	-103	7540.92
10/12/09 02:18:15	59.977	3677.921	350	342.350922	0	62.5	10	15	-103	7541.25
10/12/09 02:18:18	59.989	3680.254	350	342.350922	0	63	10	15	-103	7541.58
10/12/09 02:18:21	59.995	3681.329	350	342.350922	0	63.5	10	15	-103	7541.91
10/12/09 02:18:24	59.994	3678.656	350	345.081818	0	64	10	15	-103	7542.24
10/12/09 02:18:27	59.989	3677.78	350	345.081818	0	64.5	10	15	-103	7542.57
10/12/09 02:18:30	59.986	3678.427	350	345.081818	0	65	10	15	-103	7542.9
10/12/09 02:18:33	59.984	3678.278	350	345.081818	0	65.5	10	15	-103	7543.23
10/12/09 02:18:36	59.985	3677.822	350	345.081818	0	66	10	15	-103	7543.56

10/12/09 02:18:39	59.986	3677.397	350	346.537384	0	66.5	10	15	-103	7543.89
10/12/09 02:18:42	59.986	3677.917	350	346.537384	0	67	10	15	-103	7544.22
10/12/09 02:18:45	59.98	3678.617	350	346.537384	0	67.5	10	15	-103	7544.55
10/12/09 02:18:48	59.981	3678.963	350	346.537384	0	68	10	15	-103	7544.88
10/12/09 02:18:51	59.989	3680.737	350	346.537384	0	68.5	10	15	-103	7545.21
10/12/09 02:18:54	60.007	3680.045	350	342.905762	0	69	10	15	-103	7545.54
10/12/09 02:18:57	60.007	3674.076	350	342.905762	0	69.5	10	15	-103	7545.87
10/12/09 02:19:00	59.986	3676.222	350	342.905762	0	70	10	15	-103	7546.2
10/12/09 02:19:03	59.981	3677.497	350	342.905762	0	70.5	10	15	-103	7546.53
10/12/09 02:19:06	59.974	3677.49	350	342.905762	0	71	10	15	-103	7546.86
10/12/09 02:19:09	59.976	3675.437	350	340.094391	0	71.5	10	15	-103	7547.19
10/12/09 02:19:12	59.974	3680.451	350	340.094391	0	72	10	15	-103	7547.52
10/12/09 02:19:15	59.977	3683.829	350	340.094391	0	72.5	10	15	-103	7547.85
10/12/09 02:19:18	59.979	3682.843	350	340.094391	0	73	10	15	-103	7548.18
10/12/09 02:19:21	59.982	3680.566	350	340.094391	0	73.5	10	15	-103	7548.51
10/12/09 02:19:24	59.987	3678.229	350	342.771179	0	74	10	15	-103	7548.84
10/12/09 02:19:27	59.988	3675.759	350	342.771179	0	74.5	10	15	-103	7549.17
10/12/09 02:19:30	59.987	3671.942	350	342.771179	0	75	10	15	-103	7549.5
10/12/09 02:19:33	59.987	3670.476	350	342.771179	0	75.5	10	15	-103	7549.83
10/12/09 02:19:36	59.985	3670.129	350	342.771179	0	76	10	15	-103	7550.16
10/12/09 02:19:39	59.984	3672.048	350	342.909912	0	76.5	10	15	-103	7550.49
10/12/09 02:19:42	59.983	3671.576	350	342.909912	0	77	10	15	-103	7550.82
10/12/09 02:19:45	59.989	3672.414	350	342.909912	0	77.5	10	15	-103	7551.15
10/12/09 02:19:48	59.988	3671.882	350	342.909912	0	78	10	15	-103	7551.48
10/12/09 02:19:51	59.984	3671.336	350	342.909912	0	78.5	10	15	-103	7551.81
10/12/09 02:19:54	59.983	3670.726	350	343.286011	0	79	10	15	-103	7552.14
10/12/09 02:19:57	59.981	3671.364	350	343.286011	0	79.5	10	15	-103	7552.47
10/12/09 02:20:00	59.983	3671.401	350	343.286011	0	80	10	15	-103	7552.8
10/12/09 02:20:03	59.986	3672.181	350	343.286011	0	80.5	10	15	-103	7553.13
10/12/09 02:20:06	59.987	3670.296	350	343.286011	0	81	10	15	-103	7553.46
10/12/09 02:20:09	59.985	3668.59	350	331.852966	0	81.5	10	15	-103	7553.79
10/12/09 02:20:12	59.98	3669.908	350	331.852966	0	82	10	15	-103	7554.12
10/12/09 02:20:15	59.983	3670.263	350	331.852966	0	82.5	10	15	-103	7554.45
10/12/09 02:20:18	59.979	3669.382	350	331.852966	0	83	10	15	-103	7554.78
10/12/09 02:20:21	59.979	3670.438	350	331.852966	0	83.5	10	15	-103	7555.11
10/12/09 02:20:24	59.981	3671.403	350	329.98822	0	84	10	15	-103	7555.44
10/12/09 02:20:27	59.98	3672.372	350	329.98822	0	84.5	10	15	-103	7555.77
10/12/09 02:20:30	59.981	3671.947	350	329.98822	0	85	10	15	-103	7556.1
10/12/09 02:20:33	59.98	3670.705	350	329.98822	0	85.5	10	15	-103	7556.43
10/12/09 02:20:36	59.977	3670.137	350	329.98822	0	86	10	15	-103	7556.76
10/12/09 02:20:39	59.979	3672.391	350	255.444168	0	86.5	10	15	-103	7557.09
10/12/09 02:20:42	59.979	3672.558	350	255.444168	0	87	10	15	-103	7557.42
10/12/09 02:20:45	59.976	3672.626	350	255.444168	0	87.5	10	15	-103	7557.75
10/12/09 02:20:48	59.972	3671.8	350	255.444168	0	88	10	15	-103	7558.08
10/12/09 02:20:51	59.971	3673.874	350	255.444168	0	88.5	10	15	-103	7558.41
10/12/09 02:20:54	59.973	3676.263	350	254.838303	0	89	10	15	-103	7558.74

10/12/09 02:20:57	59.973	3676.87	350	254.838303	0	89.5	10	15	-103	7559.07
10/12/09 02:21:00	59.971	3676.543	350	254.838303	0	90	10	15	-103	7559.4
10/12/09 02:21:03	59.975	3675.752	350	254.838303	0	90.5	10	15	-103	7559.73
10/12/09 02:21:06	59.977	3675.256	350	254.838303	0	91	10	15	-103	7560.06
10/12/09 02:21:09	59.975	3671.277	350	257.146973	0	91.5	10	15	-103	7560.39
10/12/09 02:21:12	59.98	3671.593	350	257.146973	0	92	10	15	-103	7560.72
10/12/09 02:21:15	59.979	3669.963	350	257.146973	0	92.5	10	15	-103	7561.05
10/12/09 02:21:18	59.982	3669.54	350	257.146973	0	93	10	15	-103	7561.38
10/12/09 02:21:21	59.982	3668.706	350	257.146973	0	93.5	10	15	-103	7561.71
10/12/09 02:21:24	59.982	3667.677	350	262.289368	0	94	10	15	-103	7562.04
10/12/09 02:21:27	59.981	3666.599	350	262.289368	0	94.5	10	15	-103	7562.37
10/12/09 02:21:30	59.984	3666.911	350	262.289368	0	95	10	15	-103	7562.7
10/12/09 02:21:33	59.985	3666.405	350	262.289368	0	95.5	10	15	-103	7563.03
10/12/09 02:21:36	59.989	3667.456	350	262.289368	0	96	10	15	-103	7563.36
10/12/09 02:21:39	59.993	3665.262	350	256.647949	0	96.5	10	15	-103	7563.69
10/12/09 02:21:42	59.998	3664.031	350	256.647949	0	97	10	15	-103	7564.02
10/12/09 02:21:45	59.998	3663.229	350	256.647949	0	97.5	10	15	-103	7564.35
10/12/09 02:21:48	60.007	3662.055	350	256.647949	0	98	10	15	-103	7564.68
10/12/09 02:21:51	60.01	3662.076	350	256.647949	0	98.5	10	15	-103	7565.01
10/12/09 02:21:54	60.014	3662.224	350	256.307251	0	99	10	15	-103	7565.34
10/12/09 02:21:57	60.013	3663.794	350	256.307251	0	99.5	10	15	-103	7565.67
10/12/09 02:22:00	60.008	3664.139	350	256.307251	0	100	10	15	-103	7566
10/12/09 02:22:03	60.01	3664.159	350	256.307251	0	100.5	10	15	-103	7566.33
10/12/09 02:22:06	60.019	3663.265	350	256.307251	0	101	10	15	-103	7566.66
10/12/09 02:22:09	60.023	3661.929	350	249.086395	0	101.5	10	15	-103	7566.99
10/12/09 02:22:12	60.02	3661.512	350	249.086395	0	102	10	15	-103	7567.32
10/12/09 02:22:15	60.021	3658.661	350	249.086395	0	102.5	10	15	-103	7567.65
10/12/09 02:22:18	60.02	3656.785	350	249.086395	0	103	10	15	-103	7567.98
10/12/09 02:22:21	60.019	3658.126	350	249.086395	0	103.5	10	15	-103	7568.31
10/12/09 02:22:24	60.022	3657.71	350	253.742477	0	104	10	15	-103	7568.64
10/12/09 02:22:27	60.025	3660.228	350	253.742477	0	104.5	10	15	-103	7568.97
10/12/09 02:22:30	60.026	3659.224	350	253.742477	0	105	10	15	-103	7569.3
10/12/09 02:22:33	60.02	3658.669	350	253.742477	0	105.5	10	15	-103	7569.63
10/12/09 02:22:36	60.018	3658.155	350	253.742477	0	106	10	15	-103	7569.96
10/12/09 02:22:39	60.018	3659.778	350	257.421204	0	106.5	10	15	-103	7570.29
10/12/09 02:22:42	60.019	3660.82	350	257.421204	0	107	10	15	-103	7570.62
10/12/09 02:22:45	60.019	3662.387	350	257.421204	0	107.5	10	15	-103	7570.95
10/12/09 02:22:48	60.022	3662.079	350	257.421204	0	108	10	15	-103	7571.28
10/12/09 02:22:51	60.022	3662.678	350	257.421204	0	108.5	10	15	-103	7571.61
10/12/09 02:22:54	60.02	3663.577	350	261.73822	0	109	10	15	-103	7571.94
10/12/09 02:22:57	60.02	3662.959	350	261.73822	0	109.5	10	15	-103	7572.27
10/12/09 02:23:00	60.02	3662.552	350	261.73822	0	110	10	15	-103	7572.6
10/12/09 02:23:03	60.02	3663.601	350	261.73822	0	110.5	10	15	-103	7572.93
10/12/09 02:23:06	60.021	3663.91	350	261.73822	0	111	10	15	-103	7573.26
10/12/09 02:23:09	60.018	3662.791	350	271.875977	0	111.5	10	15	-103	7573.59
10/12/09 02:23:12	60.014	3663.396	350	271.875977	0	112	10	15	-103	7573.92

10/12/09 02:23:15	60.014	3664.315	350	271.875977	0	112.5	10	15	-103	7574.25
10/12/09 02:23:18	60.013	3665.313	350	271.875977	0	113	10	15	-103	7574.58
10/12/09 02:23:21	60.01	3666.141	350	271.875977	0	113.5	10	15	-103	7574.91
10/12/09 02:23:24	60.011	3666.726	350	262.073486	0	114	10	15	-103	7575.24
10/12/09 02:23:27	60.011	3667.545	350	262.073486	0	114.5	10	15	-103	7575.57
10/12/09 02:23:30	60.012	3666.688	350	262.073486	0	115	10	15	-103	7575.9
10/12/09 02:23:33	60.009	3666.71	350	262.073486	0	115.5	10	15	-103	7576.23
10/12/09 02:23:36	60.009	3667.696	350	262.073486	0	116	10	15	-103	7576.56
10/12/09 02:23:39	60.009	3667.043	350	260.36441	0	116.5	10	15	-103	7576.89
10/12/09 02:23:42	60.002	3666.624	350	260.36441	0	117	10	15	-103	7577.22
10/12/09 02:23:45	59.999	3665.88	350	260.36441	0	117.5	10	15	-103	7577.55
10/12/09 02:23:48	59.995	3665.403	350	260.36441	0	118	10	15	-103	7577.88
10/12/09 02:23:51	59.997	3665.68	350	260.36441	0	118.5	10	15	-103	7578.21
10/12/09 02:23:54	59.998	3665.352	350	352.644379	0	119	10	15	-103	7578.54
10/12/09 02:23:57	59.998	3665.065	350	352.644379	0	119.5	10	15	-103	7578.87
10/12/09 02:24:00	59.995	3666.133	350	352.644379	0	120	10	15	-103	7579.2
10/12/09 02:24:03	59.995	3666.735	350	352.644379	0	120.5	10	15	-103	7579.53
10/12/09 02:24:06	59.993	3667.084	350	352.644379	0	121	10	15	-103	7579.86
10/12/09 02:24:09	59.988	3667.337	350	354.89566	0	121.5	10	15	-103	7580.19
10/12/09 02:24:12	59.982	3667.853	350	354.89566	0	122	10	15	-103	7580.52
10/12/09 02:24:15	59.982	3668.691	350	354.89566	0	122.5	10	15	-103	7580.85
10/12/09 02:24:18	59.982	3669.399	350	354.89566	0	123	10	15	-103	7581.18
10/12/09 02:24:21	59.984	3671.228	350	354.89566	0	123.5	10	15	-103	7581.51
10/12/09 02:24:24	59.978	3670.25	350	340.46936	0	124	10	15	-103	7581.84
10/12/09 02:24:27	59.978	3671.549	350	340.46936	0	124.5	10	15	-103	7582.17
10/12/09 02:24:30	59.975	3673.243	350	340.46936	0	125	10	15	-103	7582.5
10/12/09 02:24:33	59.974	3675.824	350	340.46936	0	125.5	10	15	-103	7582.83
10/12/09 02:24:36	59.979	3676.418	350	340.46936	0	126	10	15	-103	7583.16
10/12/09 02:24:39	59.98	3674.637	350	337.642914	0	126.5	10	15	-103	7583.49
10/12/09 02:24:42	59.98	3675.329	350	337.642914	0	127	10	15	-103	7583.82
10/12/09 02:24:45	59.984	3674.768	350	337.642914	0	127.5	10	15	-103	7584.15
10/12/09 02:24:48	59.988	3674.399	350	337.642914	0	128	10	15	-103	7584.48
10/12/09 02:24:51	59.988	3673.04	350	337.642914	0	128.5	10	15	-103	7584.81
10/12/09 02:24:54	59.992	3672.442	350	284.36084	0	129	10	15	-103	7585.14
10/12/09 02:24:57	59.991	3671.68	350	284.36084	0	129.5	10	15	-103	7585.47
10/12/09 02:25:00	59.991	3671.493	350	284.36084	0	130	10	15	-103	7585.8
10/12/09 02:25:03	59.993	3669.53	350	284.36084	0	130.5	10	15	-103	7586.13
10/12/09 02:25:06	59.996	3670.028	350	284.36084	0	131	10	15	-103	7586.46
10/12/09 02:25:09	60.002	3671.578	350	260.467987	0	131.5	10	15	-103	7586.79
10/12/09 02:25:12	60.003	3672.625	350	260.467987	0	132	10	15	-103	7587.12
10/12/09 02:25:15	60.004	3673.819	350	260.467987	0	132.5	10	15	-103	7587.45
10/12/09 02:25:18	60.004	3673.25	350	260.467987	0	133	10	15	-103	7587.78
10/12/09 02:25:21	60.002	3673.496	350	260.467987	0	133.5	10	15	-103	7588.11
10/12/09 02:25:24	60.008	3672.418	350	253.141541	0	134	10	15	-103	7588.44
10/12/09 02:25:27	60.01	3672.217	350	253.141541	0	134.5	10	15	-103	7588.77
10/12/09 02:25:30	60.01	3672.261	350	253.141541	0	135	10	15	-103	7589.1

10/12/09 02:25:33	60.011	3673.603	350	253.141541	0	135.5	10	15	-103	7589.43
10/12/09 02:25:36	60.014	3673.553	350	253.141541	0	136	10	15	-103	7589.76
10/12/09 02:25:39	60.013	3674.537	350	251.929871	0	136.5	10	15	-103	7590.09
10/12/09 02:25:42	60.011	3673.813	350	251.929871	0	137	10	15	-103	7590.42
10/12/09 02:25:45	60.011	3672.563	350	251.929871	0	137.5	10	15	-103	7590.75
10/12/09 02:25:48	60.022	3673.068	350	251.929871	0	138	10	15	-103	7591.08
10/12/09 02:25:51	60.017	3672.52	350	251.929871	0	138.5	10	15	-103	7591.41
10/12/09 02:25:54	60.013	3671.25	350	250.674194	0	139	10	15	-103	7591.74
10/12/09 02:25:57	60.014	3672.989	350	250.674194	0	139.5	10	15	-103	7592.07
10/12/09 02:26:00	60.017	3672.982	350	250.674194	0	140	10	15	-103	7592.4
10/12/09 02:26:03	60.019	3671.952	350	250.674194	0	140.5	10	15	-103	7592.73
10/12/09 02:26:06	60.019	3671.193	350	250.674194	0	141	10	15	-103	7593.06
10/12/09 02:26:09	60.027	3671.189	350	253.631866	0	141.5	10	15	-103	7593.39
10/12/09 02:26:12	60.026	3668.611	350	253.631866	0	142	10	15	-103	7593.72
10/12/09 02:26:15	60.022	3664.495	350	253.631866	0	142.5	10	15	-103	7594.05
10/12/09 02:26:18	60.017	3666.062	350	253.631866	0	143	10	15	-103	7594.38
10/12/09 02:26:21	60.019	3666.787	350	253.631866	0	143.5	10	15	-103	7594.71
10/12/09 02:26:24	60.019	3670.454	350	246.957306	0	144	10	15	-103	7595.04
10/12/09 02:26:27	60.021	3671.668	350	246.957306	0	144.5	10	15	-103	7595.37
10/12/09 02:26:30	60.021	3672.493	350	246.957306	0	145	10	15	-103	7595.7
10/12/09 02:26:33	60.019	3672.857	350	246.957306	0	145.5	10	15	-103	7596.03
10/12/09 02:26:36	60.022	3672.164	350	246.957306	0	146	10	15	-103	7596.36
10/12/09 02:26:39	60.031	3669.983	350	254.541779	0	146.5	10	15	-103	7596.69
10/12/09 02:26:42	60.037	3666.467	350	254.541779	0	147	10	15	-103	7597.02
10/12/09 02:26:45	60.036	3661.599	350	254.541779	0	147.5	10	15	-103	7597.35
10/12/09 02:26:48	60.046	3660.672	350	254.541779	0	148	10	15	-103	7597.68
10/12/09 02:26:51	60.048	3649.19	350	165.101685	0	148.5	10	15	-103	7598.01
10/12/09 02:26:54	60.043	3650.025	350	165.101685	0	149	10	15	-103	7598.34
10/12/09 02:26:57	60.041	3649.512	350	165.101685	0	149.5	10	15	-103	7598.67
10/12/09 02:27:00	60.041	3654.294	350	165.101685	0	150	10	15	-103	7599
10/12/09 02:27:03	60.039	3651.874	350	165.101685	0	150.5	10	15	-103	7599.33
10/12/09 02:27:06	60.043	3651.059	350	165.476395	0	151	10	15	-103	7599.66
10/12/09 02:27:09	60.045	3648.236	350	165.476395	0	151.5	10	15	-103	7599.99
10/12/09 02:27:12	60.041	3645.387	350	165.476395	0	152	10	15	-103	7600.32
10/12/09 02:27:15	60.041	3645.446	350	165.476395	0	152.5	10	15	-103	7600.65
10/12/09 02:27:18	60.039	3640.682	350	165.476395	0	153	10	15	-103	7600.98
10/12/09 02:27:21	59.978	3659.465	350	206.459106	0	153.5	10	0	-103	7601.31
10/12/09 02:27:24	59.836	3696.362	350	206.459106	0	154	10	0	-103	7570
10/12/09 02:27:27	59.869	3734.673	335	206.459106	0	154.5	10	0	-103	7569
10/12/09 02:27:30	59.891	3737.157	335	206.459106	0	155	10	0	-103	7570
10/12/09 02:27:33	59.88	3766.113	335	206.459106	0	155.5	10	0	-103	7570
10/12/09 02:27:36	59.875	3766.194	335	211.256042	0	156	10	0	-103	7570
10/12/09 02:27:39	59.883	3769.925	335	211.256042	1	156.5	10	0	-103	7570
10/12/09 02:27:42	59.886	3780.621	335	211.256042	1	157	10	0	-103	7570
10/12/09 02:27:45	59.885	3782.5	335	211.256042	1	157.5	10	0	-103	7570
10/12/09 02:27:48	59.888	3784.962	335	211.256042	1	158	10	0	-103	7570

10/12/09 02:27:51	59.89	3784.419	335	214.346695	1	158.5	10	0	-103	7570
10/12/09 02:27:54	59.894	3788.072	335	214.346695	1	159	10	0	-103	7570
10/12/09 02:27:57	59.893	3788.868	335	214.346695	1	159.5	10	0	-103	7570
10/12/09 02:28:00	59.894	3788.472	335	214.346695	2	160	10	0	-103	7570
10/12/09 02:28:03	59.891	3793.074	335	214.346695	3	160.5	10	0	-103	7570
10/12/09 02:28:06	59.885	3794.374	335	212.172699	4	161	10	0	-103	7570
10/12/09 02:28:09	59.885	3800.427	335	212.172699	5	161.5	10	0	-103	7570
10/12/09 02:28:12	59.887	3799.959	335	212.172699	6	162	10	0	-103	7570
10/12/09 02:28:15	59.888	3802.925	335	212.172699	7	162.5	10	0	-103	7570
10/12/09 02:28:18	59.89	3802.951	335	212.172699	8	163	10	0	-103	7570
10/12/09 02:28:21	59.889	3805.496	335	215.598175	9	163.5	10	0	-103	7570
10/12/09 02:28:24	59.873	3805.617	335	215.598175	10	164	10	0	-103	7568
10/12/09 02:28:27	59.857	3811.503	335	215.598175	11	164.5	10	0	-103	7565
10/12/09 02:28:30	59.852	3814.862	335	215.598175	12	165	10	0	-103	7560
10/12/09 02:28:33	59.858	3825.643	335	215.598175	13	165.5	10	0	-103	7563
10/12/09 02:28:36	59.866	3826.053	335	218.327255	14	166	10	0	-103	7564
10/12/09 02:28:39	59.865	3827.524	335	218.327255	15	166.5	10	0	-103	7566
10/12/09 02:28:42	59.866	3826.753	335	218.327255	16	167	10	0	-103	7570
10/12/09 02:28:45	59.871	3826.454	335	218.327255	16	167.5	10	0	-103	7570
10/12/09 02:28:48	59.879	3825.713	335	218.327255	16	168	10	0	-103	7570
10/12/09 02:28:51	59.88	3822.505	335	217.379425	16	168.5	10	0	-103	7570
10/12/09 02:28:54	59.886	3819.081	335	217.379425	16	169	10	0	-103	7570
10/12/09 02:28:57	59.89	3816.815	335	217.379425	16	169.5	10	0	-103	7569
10/12/09 02:29:00	59.889	3815.01	335	217.379425	16	170	10	0	-103	7575
10/12/09 02:29:03	59.893	3811.838	335	217.379425	16	170.5	10	0	-103	7573
10/12/09 02:29:06	59.903	3809.652	335	214.830353	16	171	10	0	-103	7571
10/12/09 02:29:09	59.902	3805.593	335	214.830353	16	171.5	10	0	-103	7573
10/12/09 02:29:12	59.904	3804.188	335	214.830353	16	172	10	0	-103	7575
10/12/09 02:29:15	59.907	3793.975	335	214.830353	16	172.5	10	0	-103	7577
10/12/09 02:29:18	59.916	3792.169	335	214.830353	16	173	10	0	-103	7577
10/12/09 02:29:21	59.916	3789.534	335	227.655914	16	173.5	10	0	-103	7578
10/12/09 02:29:24	59.918	3788.132	335	227.655914	16	174	10	0	-103	7579
10/12/09 02:29:27	59.92	3783.028	335	227.655914	16	174.5	10	0	-103	7580
10/12/09 02:29:30	59.92	3781.701	335	227.655914	16	175	10	0	-103	7581
10/12/09 02:29:33	59.917	3775.635	335	227.655914	16	175.5	10	0	-103	7585
10/12/09 02:29:36	59.921	3774.604	335	225.018082	16	176	10	0	-103	7588
10/12/09 02:29:39	59.923	3773.958	335	225.018082	16	176.5	10	0	-103	7589
10/12/09 02:29:42	59.925	3772.722	335	225.018082	0	177	10	0	-103	7589
10/12/09 02:29:45	59.928	3769.63	335	225.018082	0	177.5	10	0	-103	7590
10/12/09 02:29:48	59.932	3768.707	335	225.018082	0	178	10	0	-103	7590
10/12/09 02:29:51	59.927	3767.021	335	228.365158	0	178.5	10	0	-103	7590
10/12/09 02:29:54	59.931	3767.408	335	228.365158	0	179	10	0	-103	7591
10/12/09 02:29:57	59.929	3766.259	335	228.365158	0	179.5	10	0	-103	7591
10/12/09 02:30:00	59.931	3765.672	335	228.365158	0	180	10	0	-103	7591
10/12/09 02:30:03	59.937	3766.123	335	228.365158	0	180.5	10	0	-103	7592
10/12/09 02:30:06	59.945	3765.105	335	234.075333	0	181	10	0	-103	7592

10/12/09 02:30:09	59.949	3758.387	335	234.075333	0	181.5	10	0	-103	7593
10/12/09 02:30:12	59.942	3753.922	335	234.075333	0	182	10	0	-103	7594
10/12/09 02:30:15	59.941	3746.889	335	234.075333	0	182.5	10	0	-103	7595
10/12/09 02:30:18	59.945	3747.875	335	234.075333	0	183	10	0	-103	7655
10/12/09 02:30:21	59.948	3748.661	335	228.798157	0	183.5	10	0	-103	7656
10/12/09 02:30:24	59.949	3746.706	335	228.798157	0	184	10	0	-103	7656
10/12/09 02:30:27	59.951	3742.741	335	228.798157	0	184.5	10	0	-103	7657
10/12/09 02:30:30	59.953	3740.259	335	228.798157	0	185	10	0	-103	7657
10/12/09 02:30:33	59.951	3731.382	335	228.798157	0	185.5	10	0	-103	7658
10/12/09 02:30:36	59.952	3727.838	335	229.466965	0	186	10	0	-103	7658
10/12/09 02:30:39	59.952	3722.649	335	249.33757	0	186.5	10	0	-103	7659
10/12/09 02:30:42	59.952	3720.578	335	249.33757	0	187	10	0	-103	7659
10/12/09 02:30:45	59.954	3718.142	335	249.33757	0	187.5	10	0	-103	7659
10/12/09 02:30:48	59.953	3715.753	335	249.33757	0	188	10	0	-103	7660
10/12/09 02:30:51	59.953	3713.484	335	249.33757	0	188.5	10	0	-103	7660
10/12/09 02:30:54	59.954	3710.848	335	258.278168	0	189	10	0	-103	7661
10/12/09 02:30:57	59.954	3712.092	335	258.278168	0	189.5	10	0	-103	7661
10/12/09 02:31:00	59.957	3714.623	335	258.278168	0	190	10	0	-103	7625.4
10/12/09 02:31:03	59.956	3716.168	335	258.278168	0	190.5	10	0	-103	7625.73
10/12/09 02:31:06	59.956	3716.461	335	258.278168	0	191	10	0	-103	7626.06
10/12/09 02:31:09	59.955	3717.759	335	258.406372	0	191.5	10	0	-103	7626.39
10/12/09 02:31:12	59.961	3722.361	335	258.406372	0	192	10	0	-103	7626.72
10/12/09 02:31:15	59.962	3722.658	335	258.406372	0	192.5	10	0	-103	7627.05
10/12/09 02:31:18	59.968	3722.267	335	258.406372	0	193	10	0	-103	7627.38
10/12/09 02:31:21	59.966	3721.787	335	258.406372	0	193.5	10	0	-103	7627.71
10/12/09 02:31:24	59.968	3723.091	335	260.538879	0	194	10	0	-103	7628.04
10/12/09 02:31:27	59.97	3723.435	335	260.538879	0	194.5	10	0	-103	7628.37
10/12/09 02:31:30	59.97	3723.893	335	260.538879	0	195	10	0	-103	7628.7
10/12/09 02:31:33	59.969	3727.121	335	260.538879	0	195.5	10	0	-103	7629.03
10/12/09 02:31:36	59.97	3728.053	335	260.538879	0	196	10	0	-103	7629.36
10/12/09 02:31:39	59.971	3732.53	335	257.88208	0	196.5	10	0	-103	7629.69
10/12/09 02:31:42	59.973	3733.327	335	257.88208	0	197	10	0	-103	7630.02
10/12/09 02:31:45	59.976	3736.907	335	257.88208	0	197.5	10	0	-103	7630.35
10/12/09 02:31:48	59.978	3736.822	335	257.88208	0	198	10	0	-103	7630.68
10/12/09 02:31:51	59.976	3739.944	335	257.88208	0	198.5	10	0	-103	7631.01
10/12/09 02:31:54	59.976	3740.877	335	258.588654	0	199	10	0	-103	7631.34
10/12/09 02:31:57	59.978	3745.234	335	258.588654	0	199.5	10	0	-103	7631.67
10/12/09 02:32:00	59.98	3746.608	335	258.588654	0	200	10	0	-103	7632
10/12/09 02:32:03	59.982	3750.716	335	258.588654	0	200.5	10	0	-103	7632.33
10/12/09 02:32:06	59.98	3751.558	335	258.588654	0	201	10	0	-103	7632.66
10/12/09 02:32:09	59.979	3755.599	335	261.906158	0	201.5	10	0	-103	7632.99
10/12/09 02:32:12	59.979	3756.407	335	261.906158	0	202	10	0	-103	7633.32
10/12/09 02:32:15	59.983	3760.405	335	261.906158	0	202.5	10	0	-103	7633.65
10/12/09 02:32:18	59.984	3760.982	335	261.906158	0	203	10	0	-103	7633.98
10/12/09 02:32:21	59.988	3762.737	335	261.906158	0	203.5	10	0	-103	7634.31
10/12/09 02:32:24	59.987	3763.212	335	256.747803	0	204	10	0	-103	7634.64

10/12/09 02:32:27	59.987	3766.085	335	256.747803	0	204.5	10	0	-103	7634.97
10/12/09 02:32:30	59.993	3766.433	335	256.747803	0	205	10	0	-103	7635.3
10/12/09 02:32:33	59.992	3767.792	335	256.747803	0	205.5	10	0	-103	7635.63
10/12/09 02:32:36	59.989	3768.634	335	256.747803	0	206	10	0	-103	7635.96
10/12/09 02:32:39	59.986	3772.445	335	167.431976	0	206.5	10	0	-103	7636.29
10/12/09 02:32:42	59.983	3773.695	335	167.431976	0	207	10	0	-103	7636.62
10/12/09 02:32:45	59.988	3775.841	335	167.431976	0	207.5	10	0	-103	7636.95
10/12/09 02:32:48	59.996	3775.363	335	167.431976	0	208	10	0	-103	7637.28
10/12/09 02:32:51	59.998	3775.492	335	167.431976	0	208.5	10	0	-103	7637.61
10/12/09 02:32:54	60.001	3776.42	335	164.973404	0	209	10	0	-103	7637.94
10/12/09 02:32:57	59.999	3779.692	335	164.973404	0	209.5	10	0	-103	7638.27
10/12/09 02:33:00	59.999	3781.256	335	164.973404	0	210	10	0	-103	7638.6
10/12/09 02:33:03	60.002	3783.092	335	164.973404	0	210.5	10	0	-103	7638.93
10/12/09 02:33:06	60.007	3783.896	335	164.973404	0	211	10	0	-103	7639.26
10/12/09 02:33:09	60.008	3785.768	335	157.628082	0	211.5	10	0	-103	7639.59
10/12/09 02:33:12	60.014	3785.463	335	157.628082	0	212	10	0	-103	7639.92
10/12/09 02:33:15	60.017	3786.304	335	157.628082	0	212.5	10	0	-103	7640.25
10/12/09 02:33:18	60.021	3787.259	335	157.628082	0	213	10	0	-103	7640.58
10/12/09 02:33:21	60.017	3787.955	335	157.628082	0	213.5	10	0	-103	7640.91
10/12/09 02:33:24	60.019	3788.03	335	155.531708	0	214	10	0	-103	7641.24
10/12/09 02:33:27	60.023	3789.216	335	155.531708	0	214.5	10	0	-103	7641.57
10/12/09 02:33:30	60.025	3787.537	335	155.531708	0	215	10	0	-103	7641.9
10/12/09 02:33:33	60.021	3786.077	335	155.531708	0	215.5	10	0	-103	7642.23
10/12/09 02:33:36	60.024	3787.93	335	155.531708	0	216	10	0	-103	7642.56
10/12/09 02:33:39	60.024	3786.875	335	160.447235	0	216.5	10	0	-103	7642.89
10/12/09 02:33:42	60.02	3786.55	335	160.447235	0	217	10	0	-103	7643.22
10/12/09 02:33:45	60.025	3785.018	335	160.447235	0	217.5	10	0	-103	7643.55
10/12/09 02:33:48	60.02	3785.614	335	160.447235	0	218	10	0	-103	7643.88
10/12/09 02:33:51	60.02	3785.804	335	160.447235	0	218.5	10	0	-103	7644.21
10/12/09 02:33:54	60.022	3786.864	335	163.958603	0	219	10	0	-103	7644.54
10/12/09 02:33:57	60.022	3785.254	335	163.958603	0	219.5	10	0	-103	7644.87
10/12/09 02:34:00	60.021	3785.726	335	163.958603	0	220	10	0	-103	7645.2
10/12/09 02:34:03	60.023	3785.821	335	163.958603	0	220.5	10	0	-103	7645.53
10/12/09 02:34:06	60.022	3785.798	335	163.958603	0	221	10	0	-103	7645.86
10/12/09 02:34:09	60.019	3786.939	335	166.072449	0	221.5	10	0	-103	7646.19
10/12/09 02:34:12	60.018	3787.627	335	166.072449	0	222	10	0	-103	7646.52
10/12/09 02:34:15	60.018	3789.673	335	166.072449	0	222.5	10	0	-103	7646.85
10/12/09 02:34:18	60.019	3789.404	335	166.072449	0	223	10	0	-103	7647.18
10/12/09 02:34:21	60.019	3789.183	335	166.072449	0	223.5	10	0	-103	7647.51
10/12/09 02:34:24	60.015	3789.369	335	163.766586	0	224	10	0	-103	7647.84
10/12/09 02:34:27	60.016	3788.665	335	163.766586	0	224.5	10	0	-103	7648.17
10/12/09 02:34:30	60.013	3788.933	335	163.766586	0	225	10	0	-103	7648.5
10/12/09 02:34:33	60.012	3790.805	335	163.766586	0	225.5	10	0	-103	7648.83
10/12/09 02:34:36	60.01	3790.411	335	163.766586	0	226	10	0	-103	7649.16
10/12/09 02:34:39	60.007	3791.54	335	165.101685	0	226.5	10	0	-103	7649.49
10/12/09 02:34:42	60.009	3792.945	335	165.101685	0	227	10	0	-103	7649.82

10/12/09 02:34:45	60.009	3791.443	335	165.101685	0	227.5	10	0	-103	7650.15
10/12/09 02:34:48	60.003	3791.426	335	165.101685	0	228	10	0	-103	7650.48
10/12/09 02:34:51	59.999	3790.457	335	165.101685	0	228.5	10	0	-103	7650.81
10/12/09 02:34:54	59.992	3790.216	335	165.476395	0	229	10	0	-103	7651.14
10/12/09 02:34:57	59.991	3788.457	335	165.476395	0	229.5	10	0	-103	7651.47
10/12/09 02:35:00	59.992	3788.105	335	165.476395	0	230	10	0	-103	7651.8
10/12/09 02:35:03	59.988	3788.189	335	165.476395	0	230.5	10	0	-103	7652.13
10/12/09 02:35:06	59.985	3788.497	335	165.476395	0	231	10	0	-103	7652.46
10/12/09 02:35:09	59.984	3788.571	335	206.459106	0	231.5	10	0	-103	7652.79
10/12/09 02:35:12	59.984	3788.101	335	206.459106	0	232	10	0	-103	7616
10/12/09 02:35:15	59.982	3786.453	335	206.459106	0	232.5	10	0	-103	7626
10/12/09 02:35:18	59.982	3787.732	335	206.459106	0	233	10	0	-103	7632
10/12/09 02:35:21	59.979	3789.285	335	206.459106	0	233.5	10	0	-103	7632
10/12/09 02:35:24	59.976	3788.256	335	211.256042	0	234	10	0	-103	7632
10/12/09 02:35:27	59.976	3790.467	335	211.256042	1	234.5	10	0	-103	7632
10/12/09 02:35:30	59.982	3790.665	335	211.256042	1	235	10	0	-103	7632
10/12/09 02:35:33	59.978	3789.674	335	211.256042	1	235.5	10	0	-103	7632
10/12/09 02:35:36	59.974	3789.267	335	211.256042	1	236	10	0	-103	7632
10/12/09 02:35:39	59.976	3790.43	335	214.346695	1	236.5	10	0	-103	7632
10/12/09 02:35:42	59.977	3789.914	335	214.346695	1	237	10	0	-103	7632
10/12/09 02:35:45	59.975	3787.442	335	214.346695	1	237.5	10	0	-103	7632
10/12/09 02:35:48	59.969	3788.963	335	214.346695	2	238	10	0	-103	7632
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10/12/09 02:35:54	59.973	3792.911	335	212.172699	4	239	10	0	-103	7632
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10/12/09 02:36:00	59.978	3788.08	335	212.172699	6	240	10	0	-103	7632
10/12/09 02:36:03	59.975	3787.135	335	212.172699	7	240.5	10	0	-103	7632
10/12/09 02:36:06	59.976	3787.164	335	212.172699	8	241	10	0	-103	7632
10/12/09 02:36:09	59.975	3787.405	335	215.598175	9	241.5	10	0	-103	7632
10/12/09 02:36:12	59.969	3786.487	335	215.598175	10	242	10	0	-103	7632
10/12/09 02:36:15	59.966	3789.214	335	215.598175	11	242.5	10	0	-103	7632
10/12/09 02:36:18	59.966	3790.512	335	215.598175	12	243	10	0	-103	7632
10/12/09 02:36:21	59.969	3792.218	335	215.598175	13	243.5	10	0	-103	7632
10/12/09 02:36:24	59.968	3790.959	335	218.327255	14	244	10	0	-103	7632
10/12/09 02:36:27	59.965	3789.026	335	218.327255	15	244.5	10	0	-103	7632
10/12/09 02:36:30	59.97	3789.167	335	218.327255	16	245	10	0	-103	7632
10/12/09 02:36:33	59.972	3785.69	335	218.327255	16	245.5	10	0	-103	7632
10/12/09 02:36:36	59.967	3784.831	335	218.327255	16	246	10	0	-103	7632
10/12/09 02:36:39	59.969	3784.32	335	217.379425	16	246.5	10	0	-103	7632
10/12/09 02:36:42	59.969	3782.809	335	217.379425	16	247	10	0	-103	7632
10/12/09 02:36:45	59.967	3779.352	335	217.379425	16	247.5	10	0	-103	7631
10/12/09 02:36:48	59.966	3779.056	335	217.379425	16	248	10	0	-103	7625
10/12/09 02:36:51	59.965	3779.212	335	217.379425	16	248.5	10	0	-103	7623
10/12/09 02:36:54	59.967	3779.335	335	214.830353	16	249	10	0	-103	7621
10/12/09 02:36:57	59.965	3775.647	335	214.830353	16	249.5	10	0	-103	7623
10/12/09 02:37:00	59.964	3776.597	335	214.830353	16	250	10	0	-103	7625

10/12/09 02:37:03	59.97	3776.023	335	214.830353	16	250.5	10	0	-103	7627
10/12/09 02:37:06	59.969	3773.17	335	214.830353	16	251	10	0	-103	7628
10/12/09 02:37:09	59.968	3768.793	335	227.655914	16	251.5	10	0	-103	7628
10/12/09 02:37:12	59.965	3768.503	335	227.655914	16	252	10	0	-103	7629
10/12/09 02:37:15	59.97	3767.366	335	227.655914	16	252.5	10	0	-103	7630
10/12/09 02:37:18	59.968	3764.786	335	227.655914	16	253	10	0	-103	7631
10/12/09 02:37:21	59.965	3759.592	335	227.655914	16	253.5	10	0	-103	7635
10/12/09 02:37:24	59.969	3761.894	335	225.018082	16	254	10	0	-103	7638
10/12/09 02:37:27	59.967	3760.583	335	225.018082	16	254.5	10	0	-103	7639
10/12/09 02:37:30	59.966	3760.157	335	225.018082	16	255	10	0	-103	7642
10/12/09 02:37:33	59.979	3759.495	335	225.018082	16	255.5	10	0	-103	7644
10/12/09 02:37:36	59.983	3757.773	335	225.018082	16	256	10	0	-103	7645
10/12/09 02:37:39	59.974	3753.087	335	228.365158	16	256.5	10	0	-103	7647
10/12/09 02:37:42	59.965	3751.637	335	228.365158	16	257	10	0	-103	7648
10/12/09 02:37:45	59.962	3758.225	335	228.365158	16	257.5	10	0	-103	7649
10/12/09 02:37:48	59.961	3759.25	335	228.365158	16	258	10	0	-103	7650
10/12/09 02:37:51	59.961	3760.965	335	228.365158	16	258.5	10	0	-103	7651
10/12/09 02:37:54	59.963	3762.022	335	234.075333	16	259	10	0	-103	7652
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10/12/09 02:38:00	59.951	3763.858	335	234.075333	16	260	10	0	-103	7654
10/12/09 02:38:03	59.953	3766.127	335	234.075333	16	260.5	10	0	-103	7655
10/12/09 02:38:06	59.957	3768.339	335	234.075333	16	261	10	0	-103	7655
10/12/09 02:38:09	59.956	3767.438	335	228.798157	16	261.5	10	0	-103	7656
10/12/09 02:38:12	59.963	3765.606	335	228.798157	16	262	10	0	-103	7656
10/12/09 02:38:15	59.961	3761.57	335	228.798157	16	262.5	10	0	-103	7657
10/12/09 02:38:18	59.963	3761.92	335	228.798157	16	263	10	0	-103	7657
10/12/09 02:38:21	59.963	3758.522	335	228.798157	16	263.5	10	0	-103	7658
10/12/09 02:38:24	59.968	3752.429	335	229.466965	16	264	10	0	-103	7658
10/12/09 02:38:27	59.968	3753.83	335	229.466965	16	264.5	10	0	-103	7659
10/12/09 02:38:30	59.97	3753.51	335	229.466965	16	265	10	0	-103	7659
10/12/09 02:38:33	59.973	3752.741	335	229.466965	16	265.5	10	0	-103	7659
10/12/09 02:38:36	59.965	3753.178	335	229.466965	16	266	10	0	-103	7660
10/12/09 02:38:39	59.967	3753.291	335	228.980164	16	266.5	10	0	-103	7660
10/12/09 02:38:42	59.972	3752.872	335	228.980164	16	267	10	0	-103	7661
10/12/09 02:38:45	59.976	3749.398	335	228.980164	16	267.5	10	0	-103	7661
10/12/09 02:38:48	59.969	3747.476	335	228.980164	16	268	10	0	-103	7662
10/12/09 02:38:51	59.973	3741.285	335	228.980164	16	268.5	10	0	-103	7662
10/12/09 02:38:54	59.978	3746.651	335	219.975555	16	269	10	0	-103	7663
10/12/09 02:38:57	59.981	3743.351	335	219.975555	16	269.5	10	0	-103	7663
10/12/09 02:39:00	59.981	3741.618	335	219.975555	16	270	10	0	-103	7664
10/12/09 02:39:03	59.982	3738.484	335	219.975555	16	270.5	10	0	-103	7664
10/12/09 02:39:06	59.984	3738.901	335	219.975555	16	271	10	0	-103	7665
10/12/09 02:39:09	59.982	3737.273	335	229.089249	16	271.5	10	0	-103	7666
10/12/09 02:39:12	59.979	3736.308	335	229.089249	16	272	10	0	-103	7666
10/12/09 02:39:15	59.98	3735.448	335	229.089249	16	272.5	10	0	-103	7667
10/12/09 02:39:18	59.978	3735.65	335	229.089249	16	273	10	0	-103	7668

10/12/09 02:39:21	59.98	3738.012	335	229.089249	16	273.5	10	0	-103	7668
10/12/09 02:39:24	59.98	3736.748	335	229.663269	16	274	10	0	-103	7669
10/12/09 02:39:27	59.978	3736.067	335	229.663269	16	274.5	10	0	-103	7669
10/12/09 02:39:30	59.972	3736.094	335	229.663269	16	275	10	0	-103	7670
10/12/09 02:39:33	59.971	3738.571	335	229.663269	16	275.5	10	0	-103	7670
10/12/09 02:39:36	59.974	3738.875	335	229.663269	16	276	10	0	-103	7671
10/12/09 02:39:39	59.975	3738.647	335	229.233856	16	276.5	10	0	-103	7671
10/12/09 02:39:42	59.972	3737.684	335	229.233856	16	277	10	0	-103	7672
10/12/09 02:39:45	59.969	3737.892	335	229.233856	16	277.5	10	0	-103	7673
10/12/09 02:39:48	59.974	3740.017	335	229.233856	16	278	10	0	-103	7673
10/12/09 02:39:51	59.972	3742.053	350	229.233856	16	278.5	10	0	-103	7673
10/12/09 02:39:54	59.972	3742.424	350	231.409882	16	279	10	0	-103	7673
10/12/09 02:39:57	59.977	3742.245	350	231.409882	16	279.5	10	0	-103	7673
10/12/09 02:40:00	59.978	3741.723	350	231.409882	16	280	10	0	-103	7673
10/12/09 02:40:03	59.976	3740.629	350	231.409882	16	280.5	10	0	-103	7673
10/12/09 02:40:06	59.974	3739.964	350	231.409882	16	281	10	0	-103	7673
10/12/09 02:40:09	59.977	3742.833	350	218.622284	16	281.5	10	0	-103	7673
10/12/09 02:40:12	59.978	3741.268	350	218.622284	16	282	10	0	-103	7673
10/12/09 02:40:15	59.979	3738.966	350	218.622284	16	282.5	10	0	-103	7673
10/12/09 02:40:18	59.977	3738.706	350	218.622284	16	283	10	0	-103	7673
10/12/09 02:40:21	59.974	3739.86	350	218.622284	16	283.5	10	0	-103	7673
10/12/09 02:40:24	59.971	3738.102	350	213.535858	16	284	10	0	-103	7673
10/12/09 02:40:27	59.971	3743.507	350	213.535858	16	284.5	10	0	-103	7673
10/12/09 02:40:30	59.968	3743.419	350	213.535858	16	285	10	0	-103	7673
10/12/09 02:40:33	59.966	3745.744	350	213.535858	16	285.5	10	0	-103	7674
10/12/09 02:40:36	59.971	3747.34	350	213.535858	16	286	10	0	-103	7675
10/12/09 02:40:39	59.973	3749.75	350	225.651855	16	286.5	10	0	-103	7676
10/12/09 02:40:42	59.969	3746.217	350	225.651855	16	287	10	0	-103	7677
10/12/09 02:40:45	59.972	3743.745	350	225.651855	16	287.5	10	0	-103	7678
10/12/09 02:40:48	59.973	3743.149	350	225.651855	16	288	10	0	-103	7679
10/12/09 02:40:51	59.97	3739.453	350	225.651855	16	288.5	10	0	-103	7680
10/12/09 02:40:54	59.974	3733.376	350	212.573639	16	289	10	0	-103	7681
10/12/09 02:40:57	59.982	3737.583	350	212.573639	16	289.5	10	0	-103	7682
10/12/09 02:41:00	59.985	3736.229	350	212.573639	16	290	10	0	-103	7684
10/12/09 02:41:03	59.985	3733.434	350	212.573639	16	290.5	10	0	-103	7685
10/12/09 02:41:06	59.989	3733.115	350	212.573639	16	291	10	0	-103	7687
10/12/09 02:41:09	59.989	3729.18	350	219.897293	16	291.5	10	0	-103	7689
10/12/09 02:41:12	59.987	3725.459	350	219.897293	16	292	10	0	-103	7690
10/12/09 02:41:15	59.99	3720.108	350	219.897293	16	292.5	10	0	-103	7692
10/12/09 02:41:18	59.996	3720.938	350	219.897293	16	293	10	0	-103	7692
10/12/09 02:41:21	60.001	3725.677	350	219.897293	16	293.5	10	0	-103	7693
10/12/09 02:41:24	60.004	3727.754	350	231.1754	16	294	10	0	-103	7693
10/12/09 02:41:27	60.006	3727.683	350	231.1754	16	294.5	10	0	-103	7694
10/12/09 02:41:30	60.014	3727.231	350	231.1754	16	295	10	0	-103	7694
10/12/09 02:41:33	60.019	3726.446	350	231.1754	16	295.5	10	0	-103	7695
10/12/09 02:41:36	60.025	3726.016	350	231.1754	16	296	10	0	-103	7695

10/12/09 02:41:39	60.026	3716.375	350	226.634125	16	296.5	10	0	-103	7695
10/12/09 02:41:42	60.029	3717.333	350	226.634125	16	297	10	0	-103	7696
10/12/09 02:41:45	60.029	3717.142	350	226.634125	16	297.5	10	0	-103	7696
10/12/09 02:41:48	60.036	3715.166	350	226.634125	16	298	10	0	-103	7697
10/12/09 02:41:51	60.037	3710.283	350	226.634125	16	298.5	10	0	-103	7697
10/12/09 02:41:54	60.036	3710.158	350	227.255066	16	299	10	0	-103	7697
10/12/09 02:41:57	60.041	3698.591	350	227.255066	16	299.5	10	0	-103	7698
10/12/09 02:42:00	60.044	3704.591	350	227.255066	16	300	10	0	-103	7698
10/12/09 02:42:03	60.043	3702.482	350	227.255066	16	300.5	10	0	-103	7698.33
10/12/09 02:42:06	60.048	3701.316	350	227.255066	16	301	10	0	-103	7698.66
10/12/09 02:42:09	60.046	3699.529	350	229.290222	16	301.5	10	0	-103	7698.99
10/12/09 02:42:12	60.043	3699.726	350	229.290222	16	302	10	0	-103	7699.32
10/12/09 02:42:15	60.043	3690.477	350	229.290222	16	302.5	10	0	-103	7699.65
10/12/09 02:42:18	60.043	3696.865	350	229.290222	16	303	10	0	-103	7699.98
10/12/09 02:42:21	60.043	3696.182	350	229.290222	16	303.5	10	0	-103	7700.31
10/12/09 02:42:24	60.04	3696.541	350	221.461365	16	304	10	0	-103	7700.64
10/12/09 02:42:27	60.041	3698.686	350	221.461365	16	304.5	10	0	-103	7700.97
10/12/09 02:42:30	60.039	3699.631	350	221.461365	16	305	10	0	-103	7701.3
10/12/09 02:42:33	60.036	3699.712	350	221.461365	16	305.5	10	0	-103	7701.63
10/12/09 02:42:36	60.033	3700.106	350	221.461365	16	306	10	0	-103	7701.96
10/12/09 02:42:39	60.034	3701.122	350	241.274368	16	306.5	10	0	-103	7702.29
10/12/09 02:42:42	60.037	3701.865	350	241.274368	16	307	10	0	-103	7702.62
10/12/09 02:42:45	60.035	3701.998	350	241.274368	16	307.5	10	0	-103	7702.95
10/12/09 02:42:48	60.033	3702.913	350	241.274368	16	308	10	0	-103	7703.28
10/12/09 02:42:51	60.036	3705.522	350	241.274368	16	308.5	10	0	-103	7703.61
10/12/09 02:42:54	60.034	3704.967	350	243.071854	16	309	10	0	-103	7703.94
10/12/09 02:42:57	60.032	3702.771	350	243.071854	16	309.5	10	0	-103	7704.27
10/12/09 02:43:00	60.034	3703.706	350	243.071854	16	310	10	0	-103	7704.6
10/12/09 02:43:03	60.033	3705.435	350	243.071854	16	310.5	10	0	-103	7704.93
10/12/09 02:43:06	60.035	3704.36	350	243.071854	16	311	10	0	-103	7705.26
10/12/09 02:43:09	60.035	3702.204	350	241.670212	16	311.5	10	0	-103	7705.59
10/12/09 02:43:12	60.039	3701.942	350	241.670212	16	312	10	0	-103	7705.92
10/12/09 02:43:15	60.037	3703.318	350	241.670212	16	312.5	10	0	-103	7706.25
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10/12/09 02:43:21	60.034	3703.269	350	241.670212	16	313.5	10	0	-103	7706.91
10/12/09 02:43:24	60.037	3703.844	350	228.149307	16	314	10	0	-103	7707.24
10/12/09 02:43:27	60.037	3702.518	350	228.149307	16	314.5	10	0	-103	7707.57
10/12/09 02:43:30	60.038	3702.28	350	228.149307	16	315	10	0	-103	7707.9
10/12/09 02:43:33	60.04	3692.178	350	228.149307	16	315.5	10	0	-103	7708.23
10/12/09 02:43:36	60.045	3700.276	350	228.149307	16	316	10	0	-103	7708.56
10/12/09 02:43:39	60.045	3697.729	350	235.128983	16	316.5	10	0	-103	7708.89
10/12/09 02:43:42	60.043	3696.916	350	235.128983	16	317	10	0	-103	7709.22
10/12/09 02:43:45	60.04	3697.346	350	235.128983	16	317.5	10	0	-103	7709.55
10/12/09 02:43:48	60.046	3698.429	350	235.128983	16	318	10	0	-103	7709.88
10/12/09 02:43:51	60.042	3693.584	350	235.128983	16	318.5	10	0	-103	7710.21
10/12/09 02:43:54	60.039	3693.241	350	246.433136	16	319	10	0	-103	7710.54

10/12/09 02:43:57	60.039	3699.364	350	246.433136	16	319.5	10	0	-103	7710.87
10/12/09 02:44:00	60.037	3701.791	350	246.433136	16	320	10	0	-103	7711.2
10/12/09 02:44:03	60.034	3700.753	350	246.433136	16	320.5	10	0	-103	7711.53
10/12/09 02:44:06	60.032	3702.148	350	246.433136	16	321	10	0	-103	7711.86
10/12/09 02:44:09	60.031	3707.521	350	236.553543	16	321.5	10	0	-103	7712.19
10/12/09 02:44:12	60.027	3707.287	350	236.553543	16	322	10	0	-103	7712.52
10/12/09 02:44:15	60.031	3707.34	350	236.553543	16	322.5	10	0	-103	7712.85
10/12/09 02:44:18	60.031	3707.917	350	236.553543	16	323	10	0	-103	7713.18
10/12/09 02:44:21	60.031	3706.857	350	236.553543	16	323.5	10	0	-103	7713.51
10/12/09 02:44:24	60.039	3707.615	350	230.297562	16	324	10	0	-103	7713.84
10/12/09 02:44:27	60.039	3703.746	350	230.297562	16	324.5	10	0	-103	7714.17
10/12/09 02:44:30	60.037	3701.582	350	230.297562	16	325	10	0	-103	7714.5
10/12/09 02:44:33	60.035	3701.208	350	230.297562	16	325.5	10	0	-103	7714.83
10/12/09 02:44:36	60.04	3702.212	350	230.297562	16	326	10	0	-103	7715.16
10/12/09 02:44:39	60.042	3700.397	350	231.175537	16	326.5	10	0	-103	7715.49
10/12/09 02:44:42	60.036	3699.69	350	231.175537	16	327	10	0	-103	7715.82
10/12/09 02:44:45	60.04	3700.827	350	231.175537	16	327.5	10	0	-103	7716.15
10/12/09 02:44:48	60.045	3700.662	350	231.175537	16	328	10	0	-103	7716.48
10/12/09 02:44:51	60.048	3695.688	350	231.175537	16	328.5	10	0	-103	7716.81
10/12/09 02:44:54	60.044	3695.819	350	225.61763	16	329	10	0	-103	7717.14
10/12/09 02:44:57	60.044	3694.799	350	225.61763	16	329.5	10	0	-103	7717.47
10/12/09 02:45:00	60.044	3696.897	350	225.61763	16	330	10	0	-103	7717.8
10/12/09 02:45:03	60.04	3696.023	350	225.61763	16	330.5	10	0	-103	7718.13
10/12/09 02:45:06	60.045	3698.424	350	225.61763	16	331	10	0	-103	7718.46
10/12/09 02:45:09	60.044	3700.177	350	230.734421	16	331.5	10	0	-103	7718.79
10/12/09 02:45:12	60.039	3699.806	350	230.734421	16	332	10	0	-103	7719.12
10/12/09 02:45:15	60.042	3697.681	350	230.734421	16	332.5	10	0	-103	7719.45
10/12/09 02:45:18	60.041	3698.507	350	230.734421	16	333	10	0	-103	7719.78
10/12/09 02:45:21	60.038	3698.466	350	230.734421	16	333.5	10	0	-103	7720.11
10/12/09 02:45:24	60.037	3699.077	350	234.847107	16	334	10	0	-103	7720.44
10/12/09 02:45:27	60.039	3701.592	350	234.847107	16	334.5	10	0	-103	7720.77
10/12/09 02:45:30	60.04	3700.902	350	234.847107	16	335	10	0	-103	7721.1
10/12/09 02:45:33	60.039	3700.27	350	234.847107	16	335.5	10	0	-103	7721.43
10/12/09 02:45:36	60.038	3701.139	350	234.847107	16	336	10	0	-103	7721.76
10/12/09 02:45:39	60.039	3700.264	350	228.960922	16	336.5	10	0	-103	7722.09
10/12/09 02:45:42	60.037	3699.458	350	228.960922	16	337	10	0	-103	7722.42
10/12/09 02:45:45	60.037	3700.458	350	228.960922	16	337.5	10	0	-103	7722.75
10/12/09 02:45:48	60.039	3699.505	350	228.960922	16	338	10	0	-103	7723.08
10/12/09 02:45:51	60.038	3699.216	350	228.960922	16	338.5	10	0	-103	7723.41
10/12/09 02:45:54	60.035	3699.4	350	231.177917	16	339	10	0	-103	7723.74
10/12/09 02:45:57	60.033	3702.173	350	231.177917	16	339.5	10	0	-103	7724.07
10/12/09 02:46:00	60.03	3702.968	350	231.177917	16	340	10	0	-103	7724.4
10/12/09 02:46:03	60.032	3704.952	350	231.177917	16	340.5	10	0	-103	7724.73
10/12/09 02:46:06	60.037	3705.775	350	231.177917	16	341	10	0	-103	7725.06
10/12/09 02:46:09	60.042	3703.744	350	236.489288	16	341.5	10	0	-103	7725.39
10/12/09 02:46:12	60.036	3701.981	350	236.489288	16	342	10	0	-103	7725.72

10/12/09 02:46:15	60.031	3700.747	350	236.489288	16	342.5	10	0	-103	7726.05
10/12/09 02:46:18	60.031	3702.213	350	236.489288	16	343	10	0	-103	7726.38
10/12/09 02:46:21	60.034	3705.514	350	236.489288	16	343.5	10	0	-103	7726.71
10/12/09 02:46:24	60.032	3704.449	350	245.038925	16	344	10	0	-103	7727.04
10/12/09 02:46:27	60.038	3703.62	350	245.038925	16	344.5	10	0	-103	7727.37
10/12/09 02:46:30	60.044	3702.795	350	245.038925	16	345	10	0	-103	7727.7
10/12/09 02:46:33	60.042	3697.38	350	245.038925	16	345.5	10	0	-103	7728.03
10/12/09 02:46:36	60.04	3696.25	350	245.038925	16	346	10	0	-103	7728.36
10/12/09 02:46:39	60.04	3693.518	350	223.605682	16	346.5	10	0	-103	7728.69
10/12/09 02:46:42	60.043	3693.577	350	223.605682	16	347	10	0	-103	7729.02
10/12/09 02:46:45	60.041	3695.186	350	223.605682	16	347.5	10	0	-103	7729.35
10/12/09 02:46:48	60.038	3693.786	350	223.605682	16	348	10	0	-103	7729.68
10/12/09 02:46:51	60.043	3694.926	350	223.605682	16	348.5	10	0	-103	7730.01
10/12/09 02:46:54	60.042	3694.938	350	231.119354	16	349	10	0	-103	7730.34
10/12/09 02:46:57	60.036	3691.33	350	231.119354	16	349.5	10	0	-103	7730.67
10/12/09 02:47:00	60.041	3692.686	350	231.119354	16	350	10	0	-103	7731
10/12/09 02:47:03	60.042	3693.39	350	231.119354	16	350.5	10	0	-103	7731.33
10/12/09 02:47:06	60.043	3692.357	350	231.119354	16	351	10	0	-103	7731.66
10/12/09 02:47:09	60.036	3690.836	350	237.20665	16	351.5	10	0	-103	7731.99
10/12/09 02:47:12	60.039	3692.042	350	237.20665	16	352	10	0	-103	7732.32
10/12/09 02:47:15	60.037	3694.117	350	237.20665	16	352.5	10	0	-103	7732.65
10/12/09 02:47:18	60.035	3695.258	350	237.20665	16	353	10	0	-103	7732.98
10/12/09 02:47:21	60.035	3695.949	350	237.20665	16	353.5	10	0	-103	7733.31
10/12/09 02:47:24	60.036	3695.491	350	240.516373	16	354	10	0	-103	7733.64
10/12/09 02:47:27	60.03	3696.486	350	240.516373	16	354.5	10	0	-103	7733.97
10/12/09 02:47:30	60.03	3697.336	350	240.516373	16	355	10	0	-103	7734.3
10/12/09 02:47:33	60.031	3699.357	350	240.516373	16	355.5	10	0	-103	7734.63
10/12/09 02:47:36	60.032	3699.251	350	240.516373	16	356	10	0	-103	7734.96
10/12/09 02:47:39	60.031	3699.105	350	237.566055	16	356.5	10	0	-103	7735.29
10/12/09 02:47:42	60.032	3699.126	350	237.566055	16	357	10	0	-103	7735.62
10/12/09 02:47:45	60.032	3698.136	350	237.566055	16	357.5	10	0	-103	7735.95
10/12/09 02:47:48	60.037	3698.277	350	237.566055	16	358	10	0	-103	7736.28
10/12/09 02:47:51	60.04	3695.94	350	237.566055	16	358.5	10	0	-103	7736.61
10/12/09 02:47:54	60.042	3693.736	350	231.581421	16	359	10	0	-103	7736.94
10/12/09 02:47:57	60.036	3691.759	350	231.581421	16	359.5	10	0	-103	7737.27
10/12/09 02:48:00	60.041	3691.919	350	231.581421	16	360	10	0	-103	7737.6
10/12/09 02:48:03	60.04	3691.582	350	231.581421	16	360.5	10	0	-103	7737.93
10/12/09 02:48:06	60.036	3692.374	350	231.581421	16	361	10	0	-103	7738.26
10/12/09 02:48:09	60.038	3694.71	350	235.850845	16	361.5	10	0	-103	7738.59
10/12/09 02:48:12	60.041	3694.331	350	235.850845	16	362	10	0	-103	7738.92
10/12/09 02:48:15	60.04	3693.617	350	235.850845	16	362.5	10	0	-103	7739.25
10/12/09 02:48:18	60.033	3694.324	350	235.850845	16	363	10	0	-103	7739.58
10/12/09 02:48:21	60.034	3694.66	350	235.850845	16	363.5	10	0	-103	7739.91
10/12/09 02:48:24	60.04	3693.748	350	233.559982	16	364	10	0	-103	7740.24
10/12/09 02:48:27	60.041	3691.445	350	233.559982	16	364.5	10	0	-103	7740.57
10/12/09 02:48:30	60.037	3691.012	350	233.559982	16	365	10	0	-103	7740.9

10/12/09 02:48:33	60.036	3693.077	350	233.559982	16	365.5	10	0	-103	7741.23
10/12/09 02:48:36	60.038	3693.727	350	233.559982	16	366	10	0	-103	7741.56
10/12/09 02:48:39	60.039	3692.641	350	219.009995	16	366.5	10	0	-103	7741.89
10/12/09 02:48:42	60.034	3688.159	350	219.009995	16	367	10	0	-103	7742.22
10/12/09 02:48:45	60.033	3688.208	350	219.009995	16	367.5	10	0	-103	7742.55
10/12/09 02:48:48	60.034	3690.092	350	219.009995	16	368	10	0	-103	7742.88
10/12/09 02:48:51	60.029	3693.321	350	219.009995	16	368.5	10	0	-103	7743.21
10/12/09 02:48:54	60.031	3694.593	350	205.338913	16	369	10	0	-103	7743.54
10/12/09 02:48:57	60.03	3694.609	350	205.338913	16	369.5	10	0	-103	7743.87
10/12/09 02:49:00	60.026	3693.412	350	205.338913	16	370	10	0	-103	7744.2
10/12/09 02:49:03	60.022	3696.026	350	205.338913	16	370.5	10	0	-103	7744.53
10/12/09 02:49:06	60.024	3698.012	350	205.338913	16	371	10	0	-103	7744.86
10/12/09 02:49:09	60.023	3699.414	350	236.285355	16	371.5	10	0	-103	7745.19
10/12/09 02:49:12	60.021	3698.935	350	236.285355	16	372	10	0	-103	7745.52
10/12/09 02:49:15	60.023	3700.544	350	236.285355	16	372.5	10	0	-103	7745.85
10/12/09 02:49:18	60.026	3700.486	350	236.285355	16	373	10	0	-103	7746.18
10/12/09 02:49:21	60.026	3697.961	350	236.285355	16	373.5	10	0	-103	7746.51
10/12/09 02:49:24	60.024	3699.914	350	223.015732	16	374	10	0	-103	7746.84
10/12/09 02:49:27	60.024	3701.301	350	223.015732	16	374.5	10	0	-103	7747.17
10/12/09 02:49:30	60.023	3701.45	350	223.015732	16	375	10	0	-103	7747.5
10/12/09 02:49:33	60.023	3701.094	350	223.015732	16	375.5	10	0	-103	7747.83
10/12/09 02:49:36	60.026	3701.702	350	223.015732	16	376	10	0	-103	7748.16
10/12/09 02:49:39	60.029	3701.965	350	223.015732	16	376.5	10	0	-103	7748.49
10/12/09 02:49:42	60.024	3700.269	350	223.015732	16	377	10	0	-103	7748.82
10/12/09 02:49:45	60.021	3701.09	350	223.015732	16	377.5	10	0	-103	7749.15
10/12/09 02:49:48	60.025	3701.268	350	223.015732	16	378	10	0	-103	7749.48
10/12/09 02:49:51	60.025	3700.587	350	223.015732	16	378.5	10	0	-103	7749.81
10/12/09 02:49:54	60.026	3700.532	350	223.015732	16	379	10	0	-103	7750.14
10/12/09 02:49:57	60.024	3700.295	350	223.015732	16	379.5	10	0	-103	7750.47
10/12/09 02:50:00	60.023	3700.277	350	223.015732	16	380	10	0	-103	7750.8
10/12/09 02:50:03	60.026	3700.863	350	223.015732	16	380.5	10	0	-103	7751.13
10/12/09 02:50:06	60.02	3700.26	350	223.015732	16	381	10	0	-103	7751.46
10/12/09 02:50:09	60.02	3699.926	350	223.015732	16	381.5	10	0	-103	7751.79
10/12/09 02:50:12	60.015	3700.965	350	223.015732	16	382	10	0	-103	7752.12
10/12/09 02:50:15	60.016	3703.516	350	223.015732	16	382.5	10	0	-103	7752.45
10/12/09 02:50:18	60.015	3703.824	350	223.015732	16	383	10	0	-103	7752.78
10/12/09 02:50:21	60.015	3703.689	350	223.015732	16	383.5	10	0	-103	7753.11
10/12/09 02:50:24	60.017	3703.003	350	223.015732	16	384	10	0	-103	7753.44
10/12/09 02:50:27	60.012	3703	350	223.015732	16	384.5	10	0	-103	7753.77
10/12/09 02:50:30	60.008	3703.167	350	223.015732	16	385	10	0	-103	7754.1
10/12/09 02:50:33	60.002	3703.616	350	223.015732	16	385.5	10	0	-103	7754.43
10/12/09 02:50:36	59.999	3703.775	350	223.015732	16	386	10	0	-103	7754.76
10/12/09 02:50:39	60.002	3701.534	350	223.015732	16	386.5	10	0	-103	7755.09
10/12/09 02:50:42	60.004	3700.617	350	223.015732	16	387	10	0	-103	7755.42
10/12/09 02:50:45	60.001	3700.625	350	223.015732	16	387.5	10	0	-103	7755.75
10/12/09 02:50:48	59.993	3701.389	350	223.015732	16	388	10	0	-103	7756.08

10/12/09 02:50:51	59.992	3700.671	350	223.015732	16	388.5	10	0	-103	7756.41
10/12/09 02:50:54	59.987	3700.826	350	223.015732	16	389	10	0	-103	7756.74
10/12/09 02:50:57	59.985	3700.7	350	223.015732	16	389.5	10	0	-103	7757.07
10/12/09 02:51:00	59.986	3699.854	350	223.015732	16	390	10	0	-103	7757.4
10/12/09 02:51:03	59.984	3700.342	350	223.015732	16	390.5	10	0	-103	7757.73
10/12/09 02:51:06	59.98	3700.77	350	223.015732	16	391	10	0	-103	7758.06
10/12/09 02:51:09	59.977	3701.625	350	223.015732	16	391.5	10	0	-103	7758.39
10/12/09 02:51:12	59.976	3703.166	350	223.015732	16	392	10	0	-103	7758.72
10/12/09 02:51:15	59.972	3704.785	350	223.015732	16	392.5	10	0	-103	7759.05
10/12/09 02:51:18	59.977	3705.811	350	223.015732	16	393	10	0	-103	7759.38
10/12/09 02:51:21	59.975	3706.688	350	223.015732	16	393.5	10	0	-103	7759.71
10/12/09 02:51:24	59.971	3706.543	350	223.015732	16	394	10	0	-103	7760.04
10/12/09 02:51:27	59.971	3707.027	350	223.015732	16	394.5	10	0	-103	7760.37
10/12/09 02:51:30	59.979	3710.118	350	223.015732	16	395	10	0	-103	7760.7
10/12/09 02:51:33	59.98	3708.701	350	223.015732	16	395.5	10	0	-103	7761.03
10/12/09 02:51:36	59.982	3708.018	350	223.015732	16	396	10	0	-103	7761.36
10/12/09 02:51:39	59.982	3706.343	350	223.015732	16	396.5	10	0	-103	7761.69
10/12/09 02:51:42	59.981	3706.125	350	223.015732	16	397	10	0	-103	7762.02
10/12/09 02:51:45	59.979	3706.119	350	223.015732	16	397.5	10	0	-103	7762.35
10/12/09 02:51:48	59.976	3706.19	350	223.015732	16	398	10	0	-103	7762.68
10/12/09 02:51:51	59.978	3709.409	350	223.015732	16	398.5	10	0	-103	7763.01
10/12/09 02:51:54	59.976	3708.971	350	223.015732	16	399	10	0	-103	7763.34
10/12/09 02:51:57	59.978	3708.071	350	223.015732	16	399.5	10	0	-103	7763.67
10/12/09 02:52:00	59.971	3707.24	350	223.015732	16	400	10	0	-103	7764
10/12/09 02:52:03	59.97	3709.961	350	223.015732	16	400.5	10	0	-103	7764.33
10/12/09 02:52:06	59.971	3711.75	350	223.015732	16	401	10	0	-103	7764.66
10/12/09 02:52:09	59.99	3710.695	350	223.015732	16	401.5	10	0	-103	7764.99
10/12/09 02:52:12	59.999	3707.867	350	223.015732	16	402	10	0	-103	7765.32
10/12/09 02:52:15	59.999	3705.639	350	223.015732	16	402.5	10	0	-103	7765.65
10/12/09 02:52:18	59.999	3703.787	350	223.015732	16	403	10	0	-103	7765.98
10/12/09 02:52:21	60.003	3702.071	350	223.015732	16	403.5	10	0	-103	7766.31
10/12/09 02:52:24	60.005	3699.51	350	223.015732	16	404	10	0	-103	7766.64
10/12/09 02:52:27	60.01	3698.137	350	223.015732	16	404.5	10	0	-103	7766.97
10/12/09 02:52:30	60.02	3697.882	350	223.015732	16	405	10	0	-103	7767.3
10/12/09 02:52:33	60.022	3698.604	350	223.015732	16	405.5	10	0	-103	7767.63
10/12/09 02:52:36	60.025	3697.868	350	223.015732	16	406	10	0	-103	7767.96
10/12/09 02:52:39	60.025	3693.912	350	223.015732	16	406.5	10	0	-103	7768.29
10/12/09 02:52:42	60.023	3693.418	350	223.015732	16	407	10	0	-103	7768.62
10/12/09 02:52:45	60.029	3688.021	350	223.015732	16	407.5	10	0	-103	7768.95
10/12/09 02:52:48	60.029	3689.143	350	223.015732	16	408	10	0	-103	7769.28
10/12/09 02:52:51	60.028	3687.878	350	223.015732	16	408.5	10	0	-103	7769.61
10/12/09 02:52:54	60.031	3687.026	350	223.015732	16	409	10	0	-103	7769.94
10/12/09 02:52:57	60.032	3685.276	350	223.015732	16	409.5	10	0	-103	7770.27
10/12/09 02:53:00	60.033	3685.576	350	223.015732	16	410	10	0	-103	7770.6
10/12/09 02:53:03	60.03	3685.985	350	223.015732	16	410.5	10	0	-103	7770.93
10/12/09 02:53:06	60.021	3687.159	350	223.015732	16	411	10	0	-103	7771.26

10/12/09 02:53:09	60.019	3688.997	350	223.015732	16	411.5	10	0	-103	7771.59
10/12/09 02:53:12	60.017	3690.426	350	223.015732	16	412	10	0	-103	7771.92
10/12/09 02:53:15	60.017	3692.715	350	223.015732	16	412.5	10	0	-103	7772.25
10/12/09 02:53:18	60.015	3692.578	350	223.015732	16	413	10	0	-103	7772.58
10/12/09 02:53:21	60.015	3693.173	350	223.015732	16	413.5	10	0	-103	7772.91
10/12/09 02:53:24	60.009	3693.249	350	223.015732	16	414	10	0	-103	7773.24
10/12/09 02:53:27	60.008	3695.124	350	223.015732	16	414.5	10	0	-103	7773.57
10/12/09 02:53:30	60.005	3694.681	350	223.015732	16	415	10	0	-103	7773.9
10/12/09 02:53:33	60.005	3694.199	350	223.015732	16	415.5	10	0	-103	7774.23
10/12/09 02:53:36	59.999	3693.75	350	223.015732	16	416	10	0	-103	7774.56
10/12/09 02:53:39	59.997	3692.806	350	223.015732	16	416.5	10	0	-103	7774.89
10/12/09 02:53:42	60	3691.15	350	223.015732	16	417	10	0	-103	7775.22
10/12/09 02:53:45	59.998	3691.077	350	223.015732	16	417.5	10	0	-103	7775.55
10/12/09 02:53:48	59.994	3690.588	350	223.015732	16	418	10	0	-103	7775.88
10/12/09 02:53:51	59.992	3688.483	350	223.015732	16	418.5	10	0	-103	7776.21
10/12/09 02:53:54	59.988	3689.445	350	223.015732	16	419	10	0	-103	7776.54
10/12/09 02:53:57	59.985	3689.525	350	223.015732	16	419.5	10	0	-103	7776.87
10/12/09 02:54:00	59.988	3689.736	350	223.015732	16	420	10	0	-103	7777.2
10/12/09 02:54:03	59.988	3688.24	350	223.015732	16	420.5	10	0	-103	7777.53
10/12/09 02:54:06	59.983	3687.494	350	223.015732	16	421	10	0	-103	7777.86
10/12/09 02:54:09	59.983	3686.707	350	223.015732	16	421.5	10	0	-103	7778.19
10/12/09 02:54:12	59.986	3685.66	350	223.015732	16	422	10	0	-103	7778.52
10/12/09 02:54:15	59.987	3684.333	350	223.015732	16	422.5	10	0	-103	7778.85
10/12/09 02:54:18	59.986	3683.911	350	223.015732	16	423	10	0	-103	7779.18
10/12/09 02:54:21	59.985	3684.208	350	223.015732	16	423.5	10	0	-103	7779.51
10/12/09 02:54:24	59.983	3683.811	350	223.015732	16	424	10	0	-103	7779.84
10/12/09 02:54:27	59.982	3684.258	350	223.015732	16	424.5	10	0	-103	7780.17
10/12/09 02:54:30	59.98	3684.884	350	223.015732	16	425	10	0	-103	7780.5
10/12/09 02:54:33	59.978	3685.654	350	223.015732	16	425.5	10	0	-103	7780.83
10/12/09 02:54:36	59.975	3685.087	350	223.015732	16	426	10	0	-103	7781.16
10/12/09 02:54:39	59.973	3685.196	350	223.015732	16	426.5	10	0	-103	7781.49
10/12/09 02:54:42	59.976	3687.412	350	223.015732	16	427	10	0	-103	7781.82
10/12/09 02:54:45	59.976	3688.599	350	223.015732	16	427.5	10	0	-103	7782.15
10/12/09 02:54:48	59.982	3687.848	350	223.015732	16	428	10	0	-103	7782.48
10/12/09 02:54:51	59.979	3685.782	350	223.015732	16	428.5	10	0	-103	7782.81
10/12/09 02:54:54	59.977	3684.89	350	223.015732	16	429	10	0	-103	7783.14
10/12/09 02:54:57	59.977	3684.549	350	223.015732	16	429.5	10	0	-103	7783.47
10/12/09 02:55:00	59.978	3684.093	350	223.015732	16	430	10	0	-103	7783.8
10/12/09 02:55:03	59.978	3682.814	350	223.015732	16	430.5	10	0	-103	7784.13
10/12/09 02:55:06	59.983	3682.318	350	223.015732	16	431	10	0	-103	7784.46
10/12/09 02:55:09	59.981	3682.647	350	223.015732	16	431.5	10	0	-103	7784.79
10/12/09 02:55:12	59.978	3682.855	350	223.015732	16	432	10	0	-103	7785.12
10/12/09 02:55:15	59.979	3684.052	350	223.015732	16	432.5	10	0	-103	7785.45
10/12/09 02:55:18	59.979	3684.318	350	223.015732	16	433	10	0	-103	7785.78
10/12/09 02:55:21	59.983	3686.629	350	223.015732	16	433.5	10	0	-103	7786.11
10/12/09 02:55:24	59.99	3685.286	350	223.015732	16	434	10	0	-103	7786.44

10/12/09 02:55:27	59.992	3682.416	350	223.015732	16	434.5	10	0	-103	7786.77
10/12/09 02:55:30	59.99	3681.403	350	223.015732	16	435	10	0	-103	7787.1
10/12/09 02:55:33	59.988	3679.436	350	223.015732	16	435.5	10	0	-103	7787.43
10/12/09 02:55:36	59.99	3671.761	350	223.015732	16	436	10	0	-103	7787.76
10/12/09 02:55:39	59.993	3670.159	350	223.015732	16	436.5	10	0	-103	7788.09
10/12/09 02:55:42	59.993	3679	350	223.015732	16	437	10	0	-103	7788.42
10/12/09 02:55:45	59.994	3681.799	350	223.015732	16	437.5	10	0	-103	7788.75
10/12/09 02:55:48	59.993	3682.7	350	223.015732	16	438	10	0	-103	7789.08
10/12/09 02:55:51	59.989	3685.03	350	223.015732	16	438.5	10	0	-103	7789.41
10/12/09 02:55:54	59.986	3684.878	350	223.015732	16	439	10	0	-103	7789.74
10/12/09 02:55:57	59.985	3684.478	350	223.015732	16	439.5	10	0	-103	7790.07
10/12/09 02:56:00	59.987	3685.584	350	223.015732	16	440	10	0	-103	7790.4
10/12/09 02:56:03	59.986	3684.587	350	223.015732	16	440.5	10	0	-103	7790.73
10/12/09 02:56:06	59.985	3684.976	350	223.015732	16	441	10	0	-103	7791.06
10/12/09 02:56:09	59.982	3684.872	350	223.015732	16	441.5	10	0	-103	7791.39
10/12/09 02:56:12	59.982	3684.245	350	223.015732	16	442	10	0	-103	7791.72
10/12/09 02:56:15	59.987	3685.589	350	223.015732	16	442.5	10	0	-103	7792.05
10/12/09 02:56:18	59.997	3683.736	350	223.015732	16	443	10	0	-103	7792.38
10/12/09 02:56:21	60	3682.234	350	223.015732	16	443.5	10	0	-103	7792.71
10/12/09 02:56:24	60.003	3682.138	350	223.015732	16	444	10	0	-103	7793.04
10/12/09 02:56:27	60.003	3681.689	350	223.015732	16	444.5	10	0	-103	7793.37
10/12/09 02:56:30	60.003	3681.458	350	223.015732	16	445	10	0	-103	7793.7
10/12/09 02:56:33	60.002	3681.013	350	223.015732	16	445.5	10	0	-103	7794.03
10/12/09 02:56:36	60.004	3680.167	350	223.015732	16	446	10	0	-103	7794.36
10/12/09 02:56:39	60.005	3679.429	350	223.015732	16	446.5	10	0	-103	7794.69
10/12/09 02:56:42	60.009	3679.669	350	223.015732	16	447	10	0	-103	7795.02
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10/12/09 02:56:48	60.021	3676.796	350	223.015732	16	448	10	0	-103	7795.68
10/12/09 02:56:51	60.022	3674.798	350	223.015732	16	448.5	10	0	-103	7796.01
10/12/09 02:56:54	60.02	3673.906	350	223.015732	16	449	10	0	-103	7796.34
10/12/09 02:56:57	60.018	3670.51	350	223.015732	16	449.5	10	0	-103	7796.67
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10/12/09 02:57:09	60.019	3676.437								
10/12/09 02:57:12	60.018	3677.185								
10/12/09 02:57:15	60.017	3678.828								
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10/12/09 02:57:36	60.016	3674.669								
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10/12/09 02:58:27	60.025	3668.637
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10/12/09 02:58:33	60.023	3670.735
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10/12/09 02:58:39	60.02	3672.683
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10/12/09 03:01:12	59.974	3705.662
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10/12/09 03:01:18	59.977	3707.514
10/12/09 03:01:21	59.979	3706.446
10/12/09 03:01:24	59.983	3706.335
10/12/09 03:01:27	59.985	3705.943
10/12/09 03:01:30	59.98	3704.127
10/12/09 03:01:33	59.979	3705.974
10/12/09 03:01:36	59.987	3705.968
10/12/09 03:01:39	59.986	3704.683
10/12/09 03:01:42	59.98	3703.913
10/12/09 03:01:45	59.982	3704.988
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10/12/09 03:01:51	59.987	3703.741
10/12/09 03:01:54	59.992	3701.831
10/12/09 03:01:57	59.996	3700.07
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10/12/09 03:02:06	59.997	3700.541
10/12/09 03:02:09	59.996	3700.858
10/12/09 03:02:12	59.996	3700.549
10/12/09 03:02:15	59.998	3700.224
10/12/09 03:02:18	60.009	3699.5

10/12/09 03:02:21	60.01	3697.96
10/12/09 03:02:24	60.005	3699.409
10/12/09 03:02:27	60.004	3700.738
10/12/09 03:02:30	60.003	3701.11
10/12/09 03:02:33	60.001	3699.998
10/12/09 03:02:36	60.004	3700.22
10/12/09 03:02:39	60.007	3702.554
10/12/09 03:02:42	60.008	3702.276
10/12/09 03:02:45	60.008	3701.923
10/12/09 03:02:48	60.006	3702.943
10/12/09 03:02:51	60.006	3703.96
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10/12/09 03:05:03	60.015	3709.813
10/12/09 03:05:06	60.014	3709.817
10/12/09 03:05:09	60.016	3709.094
10/12/09 03:05:12	60.019	3709.642
10/12/09 03:05:15	60.016	3709.933
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10/12/09 03:06:21	60.012	3706.943
10/12/09 03:06:24	60.014	3708.527
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10/12/09 03:06:30	60.016	3706.991
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10/12/09 03:07:15	59.982	3710.419
10/12/09 03:07:18	59.98	3710.134
10/12/09 03:07:21	59.98	3710.024
10/12/09 03:07:24	59.98	3709.192
10/12/09 03:07:27	59.983	3709.399
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10/12/09 03:09:12	59.983	3712.303

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10/12/09 03:09:45	59.995	3714.714
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10/12/09 03:09:51	59.989	3715.791
10/12/09 03:09:54	59.996	3716.285
10/12/09 03:09:57	60	3714.46
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10/12/09 03:10:03	60.004	3712.851
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10/12/09 03:10:09	59.998	3718.292
10/12/09 03:10:12	59.996	3719.079
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10/12/09 03:10:42	60.01	3718.976
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10/12/09 03:10:48	60.015	3720.609
10/12/09 03:10:51	60.014	3721.239
10/12/09 03:10:54	60.009	3720.38
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10/12/09 03:11:15	60.01	3720.86
10/12/09 03:11:18	60.007	3721.645
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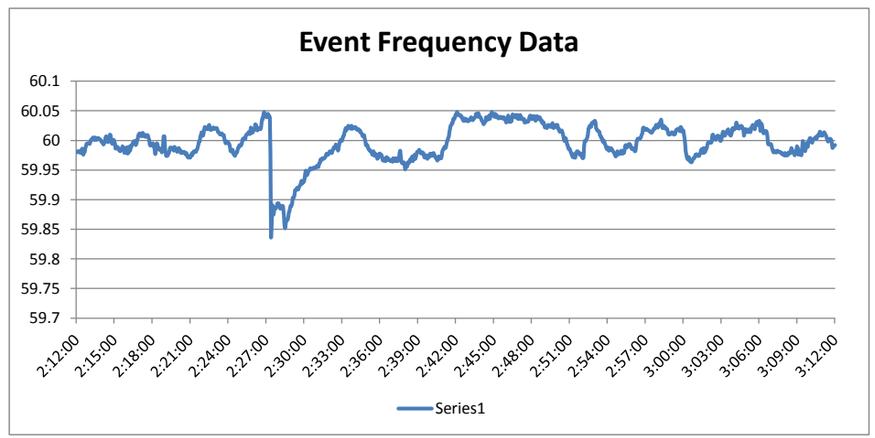
10/12/09 03:11:24	60	3724.656
10/12/09 03:11:27	59.998	3724.661
10/12/09 03:11:30	59.999	3723.696

10/12/09 03:11:33	60.002	3723.405
10/12/09 03:11:36	60.003	3721.879
10/12/09 03:11:39	59.999	3722.906
10/12/09 03:11:42	60.001	3724.142
10/12/09 03:11:45	59.995	3723.201
10/12/09 03:11:48	59.987	3723.639
10/12/09 03:11:51	59.988	3724.654
10/12/09 03:11:54	59.99	3725.361
10/12/09 03:11:57	59.992	3725.046
10/12/09 03:12:00	59.992	3723.693

Balancing Authority Name:	My BA
Balancing Authority Frequency Response Obligation (FRO from FRS Form 1)	-80

Note: See "Instruction" tab for more detailed instructions.

Step 1.	Copy and Paste Event Data into the appropriate cells of the "Data" worksheet. Maintain date and time format of mm/dd/yy hh:mm:ss.	
Step 2.	Determine Time of T(0) and edit formula in cell "C8" to reference the correct row of the "Data" worksheet. T(0) is the first change in frequency of about 0.010 Hz (10 mHz) which should be the first scan of frequency data of the event.	2:27:21
Step 3.	Time of Frequency Recovery to 60 Hz or Pre-Perturbation Hz	2:33:03
Step 4.	Enter MW output of generator or load that caused event (+ for gen loss, - for load loss) (Value from NERC Event List. If multiple units, enter total MW loss.) If MW loss value is not known, enter a default 1000 MW.	633 MW
Step 5.	Hit the big blue button to copy your data for pasting into FRS Form 1 "BA Event Data" worksheet. Copy Form 2 Data for Pasting into Form 1	
Step 6.	Paste data into "FRS Form 1" in the appropriate row on the "BA Event Data" worksheet.	



Step 7. Save this workbook using the following file name format:MyBA_yymmdd_hhmm_FRS_Form2.xlsm

09/10/12 Date yymmdd

2:27 Time hh:ss of T(0)

Where "MyBA" = your BA mnemonic

scan rate	2 seconds	Date:	Monday, October 12, 2009		Balancing Authority	My BA	
		Time of T(0)	2:27:21		Grid Nominal Frequency	60.000 Hz	
		Time of Frequency Recovery to 60 Hz or Pre-Perturbation Hz	2:33:03		Capacity @ Droop for Minimum Performance	2400.0 MW	
		Value A Pre-Perturbation Average Frequency [T(-2) to T(-16)]	60.0417	Hz	Droop Setting	5.00% 3.00000 Hz	
		Value B Post-Perturbation Average Frequency [T(+20 to T(+52)]	59.8887	Hz	Deadband Setting	0.000 Hz	
		Pre to Post Perturbation Delta Frequency Actual	-0.153	Hz	Hz Span	3.00000 Hz	
		Value A Pre-Perturbation Average Interchange MW [T(-2) to T(-16)]	3647.05	MW	Frequency Response Obligation (FRO)	-80 MW/0.1 Hz	
		Value B Post-Perturbation Average Interchange MW [T(+20 to T(+52)]	3787.78	MW			
		Pre to Post Perturbation Interchange Delta MW Actual	140.73	MW			
		Initial Performance Ramp Magnitude Adjustment	-12.59	MW			
		EPFR Pre-Perturbation Average	-33.40	MW			
		EPFR Post-Perturbation Average	89.04	MW			
		EPFR Delta	122.44	MW	TC (frequency response filter constant)	0.350 Time Constant for delayed delivery of PFR during Sustained Measure	

Low Hz	Delta Hz Event		
3764.20	Actual Interchange MW Average during frequency recovery period		
3776.17	Target Interchange MW Average during frequency recovery period		
3728.90	Interchange Average Ramp MW during frequency recovery period		
3645.45	Actual MW @ T(-4)		
101.48	Starting and Ending Difference in Interchange MW during frequency recovery pe		
0:05:42	Event Duration (h:mm:ss)		
No	Target MW Average minus MW @ T(-4) less than zero		
130.73	Interchange Target Relative Average Change - MW (Low Frequency Event)		
118.75	Interchange Actual Relative Average Change - MW (Low Frequency Event)		
No	Interchange Actual Average minus MW @ T(-4) less than zero		
Yes	Interchange Average MW minus MW @ T(-4) greater than zero		
Yes	Interchange Target MW Average minus MW @ T(-4) greater than zero		
29.25	Interchange Target Relative Average Change - MW (High Frequency Event)		
17.27	Interchange Actual Relative Average Change - MW (High Frequency Event)		
Up	Ramp Direction during frequency recovery period		

EPFR = Expected Primary Frequency Response

EPFR(Final)	109.84	MW		
MW Response in right direction for frequency delta	Yes			
Initial Response P.U. Performance	1.281	P.U.	0.908	P.U. Sustianed Response P.U. Performance

	T	Frequency Hz	Interchange MW	Value B 20 to 52 sec Average Frequency	Average MW	FRO (EPFR) Expected Primary Frequency Response	(TC) Delayed Delivery Frequency Response	Initial Measure Final Expected Primary Frequency Response	Average Ramp MW/scan	Recovery Period Target MW	Average Output During Recovery Period MW	Average Target During Recovery Period MW	Recovery Period Ramp MW	Average Ramp During Recovery Period MW	Generator Trip MW
T-72 sec	2:26:09	60.027	3671.189			-21.600	-7.560								
T-70 sec	2:26:11	60.027	3671.189			-21.600	-12.474								
T-68 sec	2:26:13	60.026	3668.611			-20.801	-15.389								633

T-66 sec	2:26:15	60.022	3664.495			-17.599	-16.162										
T-64 sec	2:26:17	60.022	3664.495			-17.599	-16.665										
T-62 sec	2:26:19	60.017	3666.062			-13.599	-15.592										
T-60 sec	2:26:21	60.019	3666.787			-15.201	-15.455		-0.310	3666.787							
T-58 sec	2:26:23	60.019	3666.787			-15.201	-15.366		-0.310	3666.567							
T-56 sec	2:26:25	60.019	3670.454			-15.201	-15.308		-0.310	3666.315							
T-54 sec	2:26:27	60.021	3671.668			-16.800	-15.830		-0.310	3665.483							
T-52 sec	2:26:29	60.021	3671.668			-16.800	-16.170		-0.310	3664.834							
T-50 sec	2:26:31	60.021	3672.493			-16.800	-16.390		-0.310	3664.304							
T-48 sec	2:26:33	60.019	3672.857			-15.201	-15.974		-0.310	3664.410							
T-46 sec	2:26:35	60.019	3672.857			-15.201	-15.703		-0.310	3664.371							
T-44 sec	2:26:37	60.022	3672.164			-17.599	-16.367		-0.310	3663.398							
T-42 sec	2:26:39	60.031	3669.983			-24.799	-19.318		-0.310	3660.137							
T-40 sec	2:26:41	60.031	3669.983			-24.799	-21.236		-0.310	3657.909							
T-38 sec	2:26:43	60.037	3666.467			-29.599	-24.163		-0.310	3654.672							
T-36 sec	2:26:45	60.036	3661.599			-28.799	-25.786		-0.310	3652.740							
T-34 sec	2:26:47	60.036	3661.599			-28.799	-26.841		-0.310	3651.375							
T-32 sec	2:26:49	60.046	3660.672			-36.801	-30.327		-0.310	3647.580							
T-30 sec	2:26:51	60.048	3649.190			-38.400	-33.153		-0.310	3644.444							
T-28 sec	2:26:53	60.048	3649.190			-38.400	-34.989		-0.310	3642.298							
T-26 sec	2:26:55	60.043	3650.025			-34.399	-34.783		-0.310	3642.194							
T-24 sec	2:26:57	60.041	3649.512			-32.800	-34.089		-0.310	3642.579							
T-22 sec	2:26:59	60.041	3649.512			-32.800	-33.638		-0.310	3642.720							
T-20 sec	2:27:01	60.041	3654.294			-32.800	-33.345		-0.310	3642.703							
T-18 sec	2:27:03	60.039	3651.874			-31.201	-32.594		-0.310	3643.144							
T-16 sec	2:27:05	60.039	3651.874	60.042	3647.046	-31.201	-32.107		-0.310	3643.322							
T-14 sec	2:27:07	60.043	3651.059	60.042	3647.046	-34.399	-32.909		-0.310	3642.210							
T-12 sec	2:27:09	60.045	3648.236	60.042	3647.046	-35.999	-33.990		-0.310	3640.819							
T-10 sec	2:27:11	60.045	3648.236	60.042	3647.046	-35.999	-34.693		-0.310	3639.806							
T-08 sec	2:27:13	60.041	3645.387	60.042	3647.046	-32.800	-34.031		-0.310	3640.159							
T-06 sec	2:27:15	60.041	3645.446	60.042	3647.046	-32.800	-33.600		-0.310	3640.280							
T-04 sec	2:27:17	60.041	3645.446	60.042	3647.046	-32.800	-33.320		-0.310	3640.250							
T-02 sec	2:27:19	60.039	3640.682	60.042	3647.046	-31.201	-32.579		-0.310	3640.682							
T+0 sec	2:27:21	59.978	3659.465			17.599	-15.016		0.000	3658.244							633
T+02 sec	2:27:23	59.978	3659.465			17.599	-3.601		0.593	3670.253	3659.465	3664.249	3678.456	3678.456			633
T+04 sec	2:27:25	59.836	3696.362			131.201	43.580		0.593	3718.028	3671.764	3682.175	3679.050	3678.753			633
T+06 sec	2:27:27	59.836	3696.362			131.201	74.247		0.593	3749.288	3677.914	3698.953	3679.643	3679.050			633
T+08 sec	2:27:29	59.869	3734.673			104.800	84.941		0.593	3760.575	3689.265	3711.278	3680.237	3679.346			633
T+10 sec	2:27:31	59.891	3737.157			87.201	85.732		0.593	3761.960	3697.247	3719.725	3680.830	3679.643			633
T+12 sec	2:27:33	59.891	3737.157			87.201	86.246		0.593	3763.067	3702.949	3725.917	3681.424	3679.940			633
T+14 sec	2:27:35	59.88	3766.113			95.999	89.660		0.593	3767.074	3710.844	3731.061	3682.017	3680.237			633
T+16 sec	2:27:37	59.875	3766.194			100.000	93.279		0.593	3771.287	3716.994	3735.531	3682.610	3680.533			633
T+18 sec	2:27:39	59.875	3766.194			100.000	95.631		0.593	3774.233	3721.914	3739.401	3683.204	3680.830			633
T+20 sec	2:27:41	59.883	3769.925	59.889	3787.775	93.600	94.920	3756.890	0.593	3774.116	3726.279	3742.557	3683.797	3681.127			633
T+22 sec	2:27:43	59.886	3780.621	59.889	3787.775	91.199	93.618	3756.890	0.593	3773.407	3730.807	3745.128	3684.391	3681.424			633
T+24 sec	2:27:45	59.886	3780.621	59.889	3787.775	91.199	92.771	3756.890	0.593	3773.153	3734.639	3747.284	3684.984	3681.720			633

T+26 sec	2:27:47	59.885	3782.500	59.889	3787.775	92.001	92.502	3756.890	0.593	3773.477	3738.058	3749.155	3685.578	3682.017	633
T+28 sec	2:27:49	59.888	3784.962	59.889	3787.775	89.600	91.486	3756.890	0.593	3773.055	3741.185	3750.748	3686.171	3682.314	633
T+30 sec	2:27:51	59.888	3784.962	59.889	3787.775	89.600	90.826	3756.890	0.593	3772.988	3743.921	3752.138	3686.765	3682.610	633
T+32 sec	2:27:53	59.89	3784.419	59.889	3787.775	88.000	89.837	3756.890	0.593	3772.593	3746.303	3753.341	3687.358	3682.907	633
T+34 sec	2:27:55	59.894	3788.072	59.889	3787.775	84.799	88.074	3756.890	0.593	3771.423	3748.623	3754.346	3687.952	3683.204	633
T+36 sec	2:27:57	59.894	3788.072	59.889	3787.775	84.799	86.928	3756.890	0.593	3770.870	3750.700	3755.215	3688.545	3683.501	633
T+38 sec	2:27:59	59.893	3788.868	59.889	3787.775	85.599	86.463	3756.890	0.593	3770.999	3752.608	3756.005	3689.138	3683.797	633
T+40 sec	2:28:01	59.894	3788.472	59.889	3787.775	84.799	85.880	3756.890	0.593	3771.010	3754.316	3756.719	3689.732	3684.094	633
T+42 sec	2:28:03	59.894	3788.472	59.889	3787.775	84.799	85.502	3756.890	0.593	3771.225	3755.868	3757.379	3690.325	3684.391	633
T+44 sec	2:28:05	59.891	3793.074	59.889	3787.775	87.201	86.097	3756.890	0.593	3772.413	3757.486	3758.032	3690.919	3684.688	633
T+46 sec	2:28:07	59.885	3794.374	59.889	3787.775	92.001	88.163	3756.890	0.593	3775.073	3759.023	3758.742	3691.512	3684.984	633
T+48 sec	2:28:09	59.885	3794.374	59.889	3787.775	92.001	89.507	3756.890	0.593	3777.010	3760.437	3759.473	3692.106	3685.281	633
T+50 sec	2:28:11	59.885	3800.427	59.889	3787.775	92.001	90.380	3756.890	0.593	3778.477	3761.975	3760.204	3692.699	3685.578	633
T+52 sec	2:28:13	59.887	3799.959	59.889	3787.775	90.399	90.387	3756.890	0.593	3779.077	3763.382	3760.903	3693.293	3685.874	633
T+54 sec	2:28:15	59.887	3799.959			90.399	90.391		0.593	3779.675	3764.688	3761.573	3693.886	3686.171	633
T+56 sec	2:28:17	59.888	3802.925			89.600	90.114		0.593	3779.991	3766.007	3762.208	3694.480	3686.468	633
T+58 sec	2:28:19	59.89	3802.951			88.000	89.374		0.593	3779.845	3767.238	3762.796	3695.073	3686.765	633
T+60 sec	2:28:21	59.89	3802.951			88.000	88.893		0.593	3779.958	3768.390	3763.350	3695.666	3687.061	633
T+62 sec	2:28:23	59.889	3805.496			88.800	88.861		0.593	3780.519	3769.550	3763.886	3696.260	3687.358	633
T+64 sec	2:28:25	59.873	3805.617			101.599	93.319		0.593	3785.570	3770.643	3764.544	3696.853	3687.655	633
T+66 sec	2:28:27	59.873	3805.617			101.599	96.217		0.593	3789.062	3771.672	3765.265	3697.447	3687.952	633
T+68 sec	2:28:29	59.857	3811.503			114.401	102.582		0.593	3796.020	3772.810	3766.143	3698.040	3688.248	633
T+70 sec	2:28:31	59.852	3814.862			118.399	108.118		0.593	3802.149	3773.978	3767.144	3698.634	3688.545	633
T+72 sec	2:28:33	59.852	3814.862			118.399	111.716		0.593	3806.341	3775.083	3768.203	3699.227	3688.842	633
T+74 sec	2:28:35	59.858	3825.643			113.599	112.375		0.593	3807.594	3776.413	3769.240	3699.821	3689.138	633
T+76 sec	2:28:37	59.866	3826.053			107.199	110.563		0.593	3806.375	3777.686	3770.192	3700.414	3689.435	633
T+78 sec	2:28:39	59.866	3826.053			107.199	109.386		0.593	3805.791	3778.895	3771.082	3701.008	3689.732	633
T+80 sec	2:28:41	59.865	3827.524			107.999	108.900		0.593	3805.899	3780.081	3771.931	3701.601	3690.029	633
	2:28:43	59.866	3826.753			107.199	108.305		0.593	3805.897	3781.193	3772.740	3702.195	3690.325	633
	2:28:45	59.866	3826.753			107.199	107.918		0.593	3806.104	3782.252	3773.516	3702.788	3690.622	633
	2:28:47	59.871	3826.454			103.201	106.267		0.593	3805.046	3783.257	3774.232	3703.381	3690.919	633
	2:28:49	59.879	3825.713			96.799	102.953		0.593	3802.326	3784.200	3774.856	3703.975	3691.216	633
	2:28:51	59.879	3825.713			96.799	100.799		0.593	3800.765	3785.103	3775.420	3704.568	3691.512	633
	2:28:53	59.88	3822.505			95.999	99.119		0.593	3799.679	3785.898	3775.936	3705.162	3691.809	633
	2:28:55	59.886	3819.081			91.199	96.347		0.593	3797.500	3786.590	3776.385	3705.755	3692.106	633
	2:28:57	59.886	3819.081			91.199	94.545		0.593	3796.292	3787.253	3776.791	3706.349	3692.402	633
	2:28:59	59.89	3816.815			88.000	92.254		0.593	3794.595	3787.844	3777.147	3706.942	3692.699	633
	2:29:01	59.889	3815.010			88.800	91.045		0.593	3793.979	3788.377	3777.477	3707.536	3692.996	633
	2:29:03	59.889	3815.010			88.800	90.260		0.593	3793.786	3788.889	3777.791	3708.129	3693.293	633
	2:29:05	59.893	3811.838			85.599	88.628		0.593	3792.749	3789.322	3778.073	3708.723	3693.589	633
	2:29:07	59.903	3809.652			77.600	84.768		0.593	3789.482	3789.698	3778.285	3709.316	3693.886	633
	2:29:09	59.903	3809.652			77.600	82.260		0.593	3787.567	3790.061	3778.453	3709.909	3694.183	633
	2:29:11	59.902	3805.593			78.400	80.909		0.593	3786.809	3790.339	3778.603	3710.503	3694.480	633
	2:29:13	59.904	3804.188			76.801	79.471		0.593	3785.965	3790.581	3778.732	3711.096	3694.776	633
	2:29:15	59.904	3804.188			76.801	78.536		0.593	3785.624	3790.816	3778.851	3711.690	3695.073	633

2:29:17	59.907	3793.975	74.399	77.088	0.593	3784.769	3790.870	3778.951	3712.283	3695.370	633
2:29:19	59.916	3792.169	67.200	73.627	0.593	3781.902	3790.891	3779.000	3712.877	3695.666	633
2:29:21	59.916	3792.169	67.200	71.378	0.593	3780.246	3790.912	3779.020	3713.470	3695.963	633
2:29:23	59.916	3789.534	67.200	69.915	0.593	3779.377	3790.890	3779.026	3714.064	3696.260	633
2:29:25	59.918	3788.132	65.601	68.405	0.593	3778.460	3790.846	3779.017	3714.657	3696.557	633
2:29:27	59.918	3788.132	65.601	67.424	0.593	3778.072	3790.804	3779.002	3715.251	3696.853	633
2:29:29	59.92	3783.028	64.001	66.226	0.593	3777.468	3790.684	3778.979	3715.844	3697.150	633
2:29:31	59.92	3781.701	64.001	65.447	0.593	3777.283	3790.548	3778.953	3716.437	3697.447	633
2:29:33	59.92	3781.701	64.001	64.941	0.593	3777.370	3790.416	3778.930	3717.031	3697.744	633
2:29:35	59.917	3775.635	66.400	65.452	0.593	3778.474	3790.199	3778.923	3717.624	3698.040	633
2:29:37	59.921	3774.604	63.199	64.663	0.593	3778.279	3789.973	3778.914	3718.218	3698.337	633
2:29:39	59.921	3774.604	63.199	64.151	0.593	3778.360	3789.753	3778.906	3718.811	3698.634	633
2:29:41	59.923	3773.958	61.600	63.258	0.593	3778.061	3789.531	3778.894	3719.405	3698.931	633
2:29:43	59.925	3772.722	60.001	62.118	0.593	3777.514	3789.297	3778.875	3719.998	3699.227	633
2:29:45	59.925	3772.722	60.001	61.377	0.593	3777.366	3789.070	3778.854	3720.592	3699.524	633
2:29:47	59.928	3769.630	57.599	60.055	0.593	3776.638	3788.807	3778.824	3721.185	3699.821	633
2:29:49	59.932	3768.707	54.401	58.076	0.593	3775.252	3788.539	3778.776	3721.779	3700.117	633
2:29:51	59.932	3768.707	54.401	56.789	0.593	3774.559	3788.278	3778.721	3722.372	3700.414	633
2:29:53	59.927	3767.021	58.401	57.354	0.593	3775.717	3788.002	3778.682	3722.965	3700.711	633
2:29:55	59.931	3767.408	55.200	56.600	0.593	3775.557	3787.738	3778.642	3723.559	3701.008	633
2:29:57	59.931	3767.408	55.200	56.110	0.593	3775.660	3787.481	3778.604	3724.152	3701.304	633
2:29:59	59.929	3766.259	56.799	56.351	0.593	3776.495	3787.216	3778.578	3724.746	3701.601	633
2:30:01	59.931	3765.672	55.200	55.948	0.593	3776.686	3786.950	3778.554	3725.339	3701.898	633
2:30:03	59.931	3765.672	55.200	55.687	0.593	3777.017	3786.690	3778.536	3725.933	3702.195	633
2:30:05	59.937	3766.123	50.400	53.836	0.593	3775.760	3786.443	3778.502	3726.526	3702.491	633
2:30:07	59.945	3765.105	44.000	50.394	0.593	3772.911	3786.188	3778.436	3727.120	3702.788	633
2:30:09	59.945	3765.105	44.000	48.156	0.593	3771.267	3785.940	3778.351	3727.713	3703.085	633
2:30:11	59.949	3758.387	40.799	45.581	0.593	3769.285	3785.620	3778.246	3728.307	3703.381	633
2:30:13	59.942	3753.922	46.399	45.867	0.593	3770.165	3785.256	3778.153	3728.900	3703.678	633
2:30:15	59.942	3753.922	46.399	46.053	0.593	3770.945	3784.900	3778.071	3729.494	3703.975	633
2:30:17	59.941	3746.889	47.198	46.454	0.593	3771.939	3784.473	3778.002	3730.087	3704.272	633
2:30:19	59.945	3747.875	44.000	45.595	0.593	3771.674	3784.066	3777.932	3730.680	3704.568	633
2:30:21	59.945	3747.875	44.000	45.037	0.593	3771.709	3783.668	3777.863	3731.274	3704.865	633
2:30:23	59.948	3748.661	41.599	43.834	0.593	3771.099	3783.288	3777.790	3731.867	3705.162	633
2:30:25	59.949	3746.706	40.799	42.771	0.593	3770.630	3782.894	3777.713	3732.461	3705.459	633
2:30:27	59.949	3746.706	40.799	42.081	0.593	3770.533	3782.509	3777.636	3733.054	3705.755	633
2:30:29	59.951	3742.741	39.200	41.073	0.593	3770.118	3782.091	3777.557	3733.648	3706.052	633
2:30:31	59.953	3740.259	37.601	39.857	0.593	3769.496	3781.655	3777.473	3734.241	3706.349	633
2:30:33	59.953	3740.259	37.601	39.068	0.593	3769.300	3781.228	3777.389	3734.835	3706.645	633
2:30:35	59.951	3731.382	39.200	39.114	0.593	3769.940	3780.720	3777.313	3735.428	3706.942	633
2:30:37	59.952	3727.838	38.400	38.864	0.593	3770.284	3780.185	3777.242	3736.022	3707.239	633
2:30:39	59.952	3727.838	38.400	38.702	0.593	3770.715	3779.662	3777.177	3736.615	3707.536	633
2:30:41	59.952	3722.649	38.400	38.596	0.593	3771.203	3779.098	3777.118	3737.208	3707.832	633
2:30:43	59.952	3720.578	38.400	38.528	0.593	3771.727	3778.524	3777.065	3737.802	3708.129	633
2:30:45	59.952	3720.578	38.400	38.483	0.593	3772.276	3777.961	3777.018	3738.395	3708.426	633
2:30:47	59.954	3718.142	36.801	37.894	0.593	3772.281	3777.386	3776.973	3738.989	3708.723	633

2:30:49	59.953	3715.753	37.601	37.792	0.593	3772.772	3776.799	3776.933	3739.582	3709.019	633
2:30:51	59.953	3715.753	37.601	37.725	0.593	3773.298	3776.223	3776.898	3740.176	3709.316	633
2:30:53	59.953	3713.484	37.601	37.681	0.593	3773.848	3775.637	3776.870	3740.769	3709.613	633
2:30:55	59.954	3710.848	36.801	37.373	0.593	3774.134	3775.037	3776.845	3741.363	3709.909	633
2:30:57	59.954	3710.848	36.801	37.173	0.593	3774.527	3774.448	3776.823	3741.956	3710.206	633
2:30:59	59.954	3712.092	36.801	37.043	0.593	3774.990	3773.881	3776.807	3742.550	3710.503	633
2:31:01	59.957	3714.623	34.399	36.118	0.593	3774.659	3773.347	3776.787	3743.143	3710.800	633
2:31:03	59.957	3714.623	34.399	35.516	0.593	3774.651	3772.823	3776.768	3743.736	3711.096	633
2:31:05	59.956	3716.168	35.199	35.405	0.593	3775.133	3772.322	3776.754	3744.330	3711.393	633
2:31:07	59.956	3716.461	35.199	35.333	0.593	3775.654	3771.832	3776.744	3744.923	3711.690	633
2:31:09	59.956	3716.461	35.199	35.286	0.593	3776.201	3771.350	3776.739	3745.517	3711.987	633
2:31:11	59.955	3717.759	35.999	35.535	0.593	3777.044	3770.888	3776.742	3746.110	3712.283	633
2:31:13	59.961	3722.361	31.201	34.018	0.593	3776.120	3770.473	3776.737	3746.704	3712.580	633
2:31:15	59.961	3722.361	31.201	33.032	0.593	3775.727	3770.066	3776.728	3747.297	3712.877	633
2:31:17	59.962	3722.658	30.399	32.111	0.593	3775.399	3769.667	3776.717	3747.891	3713.173	633
2:31:19	59.968	3722.267	25.601	29.832	0.593	3773.714	3769.272	3776.692	3748.484	3713.470	633
2:31:21	59.968	3722.267	25.601	28.351	0.593	3772.827	3768.884	3776.660	3749.078	3713.767	633
2:31:23	59.966	3721.787	27.200	27.949	0.593	3773.017	3768.498	3776.630	3749.671	3714.064	633
2:31:25	59.968	3723.091	25.601	27.127	0.593	3772.789	3768.129	3776.599	3750.265	3714.360	633
2:31:27	59.968	3723.091	25.601	26.593	0.593	3772.849	3767.765	3776.569	3750.858	3714.657	633
2:31:29	59.97	3723.435	23.999	25.685	0.593	3772.534	3767.411	3776.536	3751.451	3714.954	633
2:31:31	59.97	3723.893	23.999	25.095	0.593	3772.538	3767.065	3776.505	3752.045	3715.251	633
2:31:33	59.97	3723.893	23.999	24.711	0.593	3772.748	3766.725	3776.475	3752.638	3715.547	633
2:31:35	59.969	3727.121	24.799	24.742	0.593	3773.372	3766.416	3776.451	3753.232	3715.844	633
2:31:37	59.97	3728.053	23.999	24.482	0.593	3773.705	3766.119	3776.430	3753.825	3716.141	633
2:31:39	59.97	3728.053	23.999	24.313	0.593	3774.129	3765.826	3776.412	3754.419	3716.437	633
2:31:41	59.971	3732.530	23.199	23.923	0.593	3774.333	3765.572	3776.396	3755.012	3716.734	633
2:31:43	59.973	3733.327	21.600	23.110	0.593	3774.114	3765.327	3776.379	3755.606	3717.031	633
2:31:45	59.973	3733.327	21.600	22.582	0.593	3774.179	3765.087	3776.362	3756.199	3717.328	633
2:31:47	59.976	3736.907	19.199	21.398	0.593	3773.588	3764.876	3776.342	3756.793	3717.624	633
2:31:49	59.978	3736.822	17.599	20.068	0.593	3772.852	3764.669	3776.316	3757.386	3717.921	633
2:31:51	59.978	3736.822	17.599	19.204	0.593	3772.582	3764.464	3776.288	3757.979	3718.218	633
2:31:53	59.976	3739.944	19.199	19.202	0.593	3773.173	3764.285	3776.265	3758.573	3718.515	633
2:31:55	59.976	3740.877	19.199	19.201	0.593	3773.765	3764.115	3776.247	3759.166	3718.811	633
2:31:57	59.976	3740.877	19.199	19.200	0.593	3774.358	3763.948	3776.234	3759.760	3719.108	633
2:31:59	59.978	3745.234	17.599	18.640	0.593	3774.391	3763.814	3776.221	3760.353	3719.405	633
2:32:01	59.98	3746.608	16.000	17.716	0.593	3774.061	3763.692	3776.205	3760.947	3719.701	633
2:32:03	59.98	3746.608	16.000	17.116	0.593	3774.054	3763.572	3776.190	3761.540	3719.998	633
2:32:05	59.982	3750.716	14.401	16.166	0.593	3773.697	3763.482	3776.173	3762.134	3720.295	633
2:32:07	59.98	3751.558	16.000	16.108	0.593	3774.233	3763.399	3776.159	3762.727	3720.592	633
2:32:09	59.98	3751.558	16.000	16.070	0.593	3774.789	3763.318	3776.150	3763.321	3720.888	633
2:32:11	59.979	3755.599	16.800	16.326	0.593	3775.637	3763.265	3776.146	3763.914	3721.185	633
2:32:13	59.979	3756.407	16.800	16.492	0.593	3776.397	3763.218	3776.148	3764.507	3721.482	633
2:32:15	59.979	3756.407	16.800	16.600	0.593	3777.098	3763.172	3776.154	3765.101	3721.779	633
2:32:17	59.983	3760.405	13.599	15.549	0.593	3776.641	3763.154	3776.158	3765.694	3722.075	633
2:32:19	59.984	3760.982	12.799	14.587	0.593	3776.272	3763.139	3776.158	3766.288	3722.372	633

2:32:21	59.984	3760.982	12.799	13.961	0.593	3776.240	3763.125	3776.159	3766.881	3722.669	633
2:32:23	59.988	3762.737	9.601	12.435	0.593	3775.308	3763.122	3776.153	3767.475	3722.965	633
2:32:25	59.987	3763.212	10.400	11.723	0.593	3775.189	3763.123	3776.147	3768.068	3723.262	633
2:32:27	59.987	3763.212	10.400	11.260	0.593	3775.320	3763.123	3776.142	3768.662	3723.559	633
2:32:29	59.987	3766.085	10.400	10.959	0.593	3775.612	3763.143	3776.138	3769.255	3723.856	633
2:32:31	59.993	3766.433	5.600	9.083	0.593	3774.330	3763.164	3776.127	3769.849	3724.152	633
2:32:33	59.993	3766.433	5.600	7.864	0.593	3773.704	3763.184	3776.111	3770.442	3724.449	633
2:32:35	59.992	3767.792	6.400	7.352	0.593	3773.785	3763.214	3776.097	3771.035	3724.746	633
2:32:37	59.989	3768.634	8.801	7.859	0.593	3774.886	3763.248	3776.089	3771.629	3725.043	633
2:32:39	59.989	3768.634	8.801	8.189	0.593	3775.809	3763.281	3776.087	3772.222	3725.339	633
2:32:41	59.986	3772.445	11.200	9.243	0.593	3777.456	3763.338	3776.096	3772.816	3725.636	633
2:32:43	59.983	3773.695	13.599	10.767	0.593	3779.574	3763.402	3776.117	3773.409	3725.933	633
2:32:45	59.983	3773.695	13.599	11.758	0.593	3781.159	3763.465	3776.148	3774.003	3726.230	633
2:32:47	59.988	3775.841	9.601	11.003	0.593	3780.997	3763.541	3776.178	3774.596	3726.526	633
2:32:49	59.996	3775.363	3.201	8.273	0.593	3778.860	3763.612	3776.194	3775.190	3726.823	633
2:32:51	59.996	3775.363	3.201	6.498	0.593	3777.679	3763.683	3776.203	3775.783	3727.120	633
2:32:53	59.998	3775.492	1.599	4.783	0.593	3776.558	3763.754	3776.205	3776.377	3727.416	633
2:32:55	60.001	3776.420	-0.800	2.829	0.593	3775.197	3763.829	3776.199	3776.970	3727.713	633
2:32:57	60.001	3776.420	-0.800	1.559	0.593	3774.520	3763.904	3776.189	3777.564	3728.010	633
2:32:59	59.999	3779.692	0.800	1.293	0.593	3774.848	3763.997	3776.181	3778.157	3728.307	633
2:33:01	59.999	3781.256	0.800	1.120	0.593	3775.269	3764.098	3776.176	3778.750	3728.603	633
2:33:03	59.999	3781.256	0.800	1.008	0.593	3775.750	3764.197	3776.173	3779.344	3728.900	633
2:33:05	60.002	3783.092	-1.599	0.096	0.000	3774.837	3764.307	3776.166	3779.344	3729.193	633
2:33:07	60.007	3783.896	-5.600	-1.898	0.000	3772.844	3764.419	3776.147	3779.344	3729.483	633
2:33:09	60.007	3783.896	-5.600	-3.194	0.000	3771.548	3764.531	3776.120	3779.344	3729.770	633
2:33:11	60.008	3785.768	-6.400	-4.316	0.000	3770.426	3764.651	3776.088	3779.344	3730.053	633
2:33:13	60.014	3785.463	-11.200	-6.725	0.000	3768.017	3764.769	3776.042	3779.344	3730.333	633
2:33:15	60.014	3785.463	-11.200	-8.291	0.000	3766.450	3764.885	3775.988	3779.344	3730.610	633
2:33:17	60.017	3786.304	-13.599	-10.149	0.000	3764.593	3765.005	3775.925	3779.344	3730.884	633
2:33:19	60.021	3787.259	-16.800	-12.477	0.000	3762.265	3765.128	3775.849	3779.344	3731.155	633
2:33:21	60.021	3787.259	-16.800	-13.990	0.000	3760.752	3765.251	3775.765	3779.344	3731.422	633
2:33:23	60.017	3787.955	-13.599	-13.853	0.000	3760.889	3765.375	3775.684	3779.344	3731.687	633
2:33:25	60.019	3788.030	-15.201	-14.325	0.000	3760.417	3765.499	3775.600	3779.344	3731.949	633
2:33:27	60.019	3788.030	-15.201	-14.631	0.000	3760.110	3765.622	3775.516	3779.344	3732.208	633
2:33:29	60.023	3789.216	-18.399	-15.950	0.000	3758.792	3765.749	3775.426	3779.344	3732.464	633
2:33:31	60.025	3787.537	-20.001	-17.368	0.000	3757.374	3765.866	3775.329	3779.344	3732.717	633
2:33:33	60.025	3787.537	-20.001	-18.290	0.000	3756.452	3765.982	3775.228	3779.344	3732.968	633
2:33:35	60.021	3786.077	-16.800	-17.768	0.000	3756.974	3766.089	3775.131	3779.344	3733.216	633
2:33:37	60.024	3787.930	-19.199	-18.269	0.000	3756.473	3766.205	3775.032	3779.344	3733.461	633
2:33:39	60.024	3787.930	-19.199	-18.594	0.000	3756.147	3766.319	3774.932	3779.344	3733.704	633
2:33:41	60.024	3786.875	-19.199	-18.806	0.000	3755.936	3766.427	3774.833	3779.344	3733.944	633
2:33:43	60.02	3786.550	-16.000	-17.824	0.000	3756.918	3766.531	3774.740	3779.344	3734.182	633
2:33:45	60.02	3786.550	-16.000	-17.186	0.000	3757.556	3766.635	3774.651	3779.344	3734.417	633
2:33:47	60.025	3785.018	-20.001	-18.171	0.000	3756.571	3766.730	3774.557	3779.344	3734.650	633
2:33:49	60.02	3785.614	-16.000	-17.411	0.000	3757.330	3766.827	3774.469	3779.344	3734.881	633
2:33:51	60.02	3785.614	-16.000	-16.918	0.000	3757.824	3766.923	3774.384	3779.344	3735.109	633

2:33:53	60.02	3785.804	-16.000	-16.597	0.000	3758.145	3767.018	3774.302	3779.344	3735.334	633
2:33:55	60.022	3786.864	-17.599	-16.948	0.000	3757.794	3767.119	3774.218	3779.344	3735.558	633
2:33:57	60.022	3786.864	-17.599	-17.176	0.000	3757.566	3767.218	3774.135	3779.344	3735.779	633
2:33:59	60.022	3785.254	-17.599	-17.324	0.000	3757.418	3767.308	3774.051	3779.344	3735.998	633
2:34:01	60.021	3785.726	-16.800	-17.141	0.000	3757.601	3767.400	3773.969	3779.344	3736.214	633
2:34:03	60.021	3785.726	-16.800	-17.021	0.000	3757.720	3767.490	3773.889	3779.344	3736.429	633
2:34:05	60.023	3785.821	-18.399	-17.504	0.000	3757.238	3767.581	3773.807	3779.344	3736.641	633
2:34:07	60.022	3785.798	-17.599	-17.537	0.000	3757.205	3767.670	3773.725	3779.344	3736.852	633
2:34:09	60.022	3785.798	-17.599	-17.559	0.000	3757.183	3767.758	3773.645	3779.344	3737.060	633
2:34:11	60.019	3786.939	-15.201	-16.734	0.000	3758.008	3767.852	3773.569	3779.344	3737.266	633
2:34:13	60.018	3787.627	-14.401	-15.917	0.000	3758.824	3767.947	3773.498	3779.344	3737.471	633
2:34:15	60.018	3787.627	-14.401	-15.387	0.000	3759.355	3768.042	3773.430	3779.344	3737.673	633
2:34:17	60.018	3789.673	-14.401	-15.042	0.000	3759.700	3768.145	3773.364	3779.344	3737.873	633
2:34:19	60.019	3789.404	-15.201	-15.097	0.000	3759.644	3768.246	3773.299	3779.344	3738.072	633
2:34:21	60.019	3789.404	-15.201	-15.134	0.000	3759.608	3768.347	3773.234	3779.344	3738.268	633
2:34:23	60.019	3789.183	-15.201	-15.157	0.000	3759.585	3768.445	3773.169	3779.344	3738.463	633
2:34:25	60.015	3789.369	-12.000	-14.052	0.000	3760.690	3768.543	3773.111	3779.344	3738.656	633
2:34:27	60.015	3789.369	-12.000	-13.334	0.000	3761.408	3768.641	3773.056	3779.344	3738.847	633
2:34:29	60.016	3788.665	-12.799	-13.147	0.000	3761.595	3768.734	3773.003	3779.344	3739.036	633
2:34:31	60.013	3788.933	-10.400	-12.185	0.000	3762.556	3768.827	3772.954	3779.344	3739.223	633
2:34:33	60.013	3788.933	-10.400	-11.561	0.000	3763.181	3768.920	3772.909	3779.344	3739.409	633
2:34:35	60.012	3790.805	-9.601	-10.875	0.000	3763.867	3769.020	3772.868	3779.344	3739.593	633
2:34:37	60.01	3790.411	-7.999	-9.868	0.000	3764.874	3769.118	3772.831	3779.344	3739.776	633
2:34:39	60.01	3790.411	-7.999	-9.214	0.000	3765.528	3769.215	3772.798	3779.344	3739.956	633
2:34:41	60.007	3791.540	-5.600	-7.949	0.000	3766.793	3769.316	3772.771	3779.344	3740.135	633
2:34:43	60.009	3792.945	-7.199	-7.687	0.000	3767.055	3769.422	3772.745	3779.344	3740.313	633
2:34:45	60.009	3792.945	-7.199	-7.516	0.000	3767.226	3769.528	3772.721	3779.344	3740.489	633
2:34:47	60.009	3791.443	-7.199	-7.405	0.000	3767.337	3769.625	3772.696	3779.344	3740.663	633
2:34:49	60.003	3791.426	-2.399	-5.653	0.000	3769.089	3769.722	3772.680	3779.344	3740.835	633
2:34:51	60.003	3791.426	-2.399	-4.514	0.000	3770.228	3769.818	3772.670	3779.344	3741.007	633
2:34:53	59.999	3790.457	0.800	-2.654	0.000	3772.088	3769.909	3772.667	3779.344	3741.176	633
2:34:55	59.992	3790.216	6.400	0.515	0.000	3775.256	3769.998	3772.678	3779.344	3741.344	633
2:34:57	59.992	3790.216	6.400	2.574	0.000	3777.316	3770.087	3772.699	3779.344	3741.511	633
2:34:59	59.991	3788.457	7.199	4.193	0.000	3778.935	3770.167	3772.726	3779.344	3741.676	633
2:35:01	59.992	3788.105	6.400	4.965	0.000	3779.707	3770.244	3772.756	3779.344	3741.840	633
2:35:03	59.992	3788.105	6.400	5.467	0.000	3780.209	3770.321	3772.788	3779.344	3742.002	633
2:35:05	59.988	3788.189	9.601	6.914	0.000	3781.656	3770.398	3772.826	3779.344	3742.163	633
2:35:07	59.985	3788.497	12.000	8.694	0.000	3783.436	3770.475	3772.872	3779.344	3742.323	633
2:35:09	59.985	3788.497	12.000	9.851	0.000	3784.593	3770.552	3772.921	3779.344	3742.481	633
2:35:11	59.984	3788.571	12.799	10.883	0.000	3785.624	3770.628	3772.975	3779.344	3742.638	633
2:35:13	59.984	3788.101	12.799	11.553	0.000	3786.295	3770.702	3773.031	3779.344	3742.793	633
2:35:15	59.984	3788.101	12.799	11.989	0.000	3786.731	3770.775	3773.089	3779.344	3742.948	633
2:35:17	59.982	3786.453	14.401	12.834	0.000	3787.575	3770.841	3773.150	3779.344	3743.101	633
2:35:19	59.982	3787.732	14.401	13.382	0.000	3788.124	3770.911	3773.212	3779.344	3743.252	633
2:35:21	59.982	3787.732	14.401	13.739	0.000	3788.481	3770.981	3773.275	3779.344	3743.403	633
2:35:23	59.979	3789.285	16.800	14.810	0.000	3789.552	3771.056	3773.343	3779.344	3743.552	633

2:35:25	59.976	3788.256	19.199	16.346	0.000	3791.088	3771.127	3773.416	3779.344	3743.700	633
2:35:27	59.976	3788.256	19.199	17.345	0.000	3792.086	3771.197	3773.492	3779.344	3743.846	633
2:35:29	59.976	3790.467	19.199	17.993	0.000	3792.735	3771.276	3773.571	3779.344	3743.992	633
2:35:31	59.982	3790.665	14.401	16.736	0.000	3791.478	3771.355	3773.643	3779.344	3744.136	633
2:35:33	59.982	3790.665	14.401	15.919	0.000	3790.661	3771.433	3773.712	3779.344	3744.279	633
2:35:35	59.978	3789.674	17.599	16.507	0.000	3791.249	3771.507	3773.783	3779.344	3744.421	633
2:35:37	59.974	3789.267	20.801	18.010	0.000	3792.752	3771.578	3773.859	3779.344	3744.562	633
2:35:39	59.974	3789.267	20.801	18.987	0.000	3793.728	3771.649	3773.939	3779.344	3744.702	633
2:35:41	59.976	3790.430	19.199	19.061	0.000	3793.803	3771.724	3774.018	3779.344	3744.840	633
2:35:43	59.977	3789.914	18.399	18.829	0.000	3793.571	3771.796	3774.095	3779.344	3744.978	633
2:35:45	59.977	3789.914	18.399	18.679	0.000	3793.420	3771.867	3774.172	3779.344	3745.114	633
2:35:47	59.975	3787.442	20.001	19.142	0.000	3793.883	3771.929	3774.249	3779.344	3745.249	633
2:35:49	59.969	3788.963	24.799	21.122	0.000	3795.863	3771.996	3774.334	3779.344	3745.384	633
2:35:51	59.969	3788.963	24.799	22.408	0.000	3797.150	3772.062	3774.423	3779.344	3745.517	633
2:35:53	59.97	3791.877	23.999	22.965	0.000	3797.707	3772.139	3774.514	3779.344	3745.649	633
2:35:55	59.973	3792.911	21.600	22.487	0.000	3797.229	3772.219	3774.602	3779.344	3745.780	633
2:35:57	59.973	3792.911	21.600	22.177	0.000	3796.919	3772.299	3774.688	3779.344	3745.910	633
2:35:59	59.978	3789.125	17.599	20.575	0.000	3795.317	3772.364	3774.767	3779.344	3746.039	633
2:36:01	59.978	3788.080	17.599	19.533	0.000	3794.275	3772.424	3774.842	3779.344	3746.167	633
2:36:03	59.978	3788.080	17.599	18.857	0.000	3793.598	3772.484	3774.914	3779.344	3746.294	633
2:36:05	59.975	3787.135	20.001	19.257	0.000	3793.999	3772.540	3774.986	3779.344	3746.421	633
2:36:07	59.976	3787.164	19.199	19.237	0.000	3793.978	3772.595	3775.058	3779.344	3746.546	633
2:36:09	59.976	3787.164	19.199	19.223	0.000	3793.965	3772.650	3775.130	3779.344	3746.670	633
2:36:11	59.975	3787.405	20.001	19.496	0.000	3794.237	3772.706	3775.202	3779.344	3746.793	633
2:36:13	59.969	3786.487	24.799	21.352	0.000	3796.093	3772.757	3775.280	3779.344	3746.916	633
2:36:15	59.969	3786.487	24.799	22.558	0.000	3797.300	3772.808	3775.362	3779.344	3747.037	633
2:36:17	59.966	3789.214	27.200	24.183	0.000	3798.925	3772.869	3775.450	3779.344	3747.158	633
2:36:19	59.966	3790.512	27.200	25.239	0.000	3799.981	3772.935	3775.540	3779.344	3747.277	633
2:36:21	59.966	3790.512	27.200	25.925	0.000	3800.667	3773.000	3775.633	3779.344	3747.396	633
2:36:23	59.969	3792.218	24.799	25.531	0.000	3800.273	3773.070	3775.724	3779.344	3747.514	633
2:36:25	59.968	3790.959	25.601	25.556	0.000	3800.297	3773.136	3775.814	3779.344	3747.631	633
2:36:27	59.968	3790.959	25.601	25.572	0.000	3800.313	3773.201	3775.903	3779.344	3747.747	633
2:36:29	59.965	3789.026	28.000	26.421	0.000	3801.163	3773.258	3775.995	3779.344	3747.863	633
2:36:31	59.97	3789.167	23.999	25.574	0.000	3800.315	3773.316	3776.083	3779.344	3747.977	633
2:36:33	59.97	3789.167	23.999	25.023	0.000	3799.764	3773.373	3776.169	3779.344	3748.091	633
2:36:35	59.972	3785.690	22.400	24.105	0.000	3798.846	3773.418	3776.250	3779.344	3748.203	633
2:36:37	59.967	3784.831	26.401	24.908	0.000	3799.650	3773.458	3776.334	3779.344	3748.315	633
2:36:39	59.967	3784.831	26.401	25.431	0.000	3800.172	3773.499	3776.419	3779.344	3748.427	633
2:36:41	59.969	3784.320	24.799	25.209	0.000	3799.951	3773.538	3776.503	3779.344	3748.537	633
2:36:43	59.969	3782.809	24.799	25.066	0.000	3799.807	3773.570	3776.586	3779.344	3748.647	633
2:36:45	59.969	3782.809	24.799	24.972	0.000	3799.714	3773.603	3776.667	3779.344	3748.756	633
2:36:47	59.967	3779.352	26.401	25.472	0.000	3800.214	3773.623	3776.750	3779.344	3748.864	633
2:36:49	59.966	3779.056	27.200	26.077	0.000	3800.819	3773.642	3776.835	3779.344	3748.971	633
2:36:51	59.966	3779.056	27.200	26.470	0.000	3801.212	3773.661	3776.920	3779.344	3749.078	633
2:36:53	59.965	3779.212	28.000	27.006	0.000	3801.747	3773.681	3777.006	3779.344	3749.183	633
2:36:55	59.967	3779.335	26.401	26.794	0.000	3801.536	3773.700	3777.092	3779.344	3749.289	633

2:36:57	59.967	3779.335	26.401	26.656	0.000	3801.398	3773.720	3777.176	3779.344	3749.393	633
2:36:59	59.965	3775.647	28.000	27.127	0.000	3801.868	3773.726	3777.261	3779.344	3749.497	633
2:37:01	59.964	3776.597	28.799	27.712	0.000	3802.454	3773.736	3777.347	3779.344	3749.599	633
2:37:03	59.964	3776.597	28.799	28.093	0.000	3802.834	3773.746	3777.435	3779.344	3749.702	633
2:37:05	59.97	3776.023	23.999	26.660	0.000	3801.402	3773.754	3777.516	3779.344	3749.803	633
2:37:07	59.969	3773.170	24.799	26.008	0.000	3800.750	3773.752	3777.595	3779.344	3749.904	633
2:37:09	59.969	3773.170	24.799	25.585	0.000	3800.327	3773.750	3777.673	3779.344	3750.004	633
2:37:11	59.968	3768.793	25.601	25.591	0.000	3800.332	3773.733	3777.749	3779.344	3750.104	633
2:37:13	59.965	3768.503	28.000	26.434	0.000	3801.176	3773.716	3777.828	3779.344	3750.202	633
2:37:15	59.965	3768.503	28.000	26.982	0.000	3801.724	3773.698	3777.908	3779.344	3750.300	633
2:37:17	59.97	3767.366	23.999	25.938	0.000	3800.680	3773.677	3777.984	3779.344	3750.398	633
2:37:19	59.968	3764.786	25.601	25.820	0.000	3800.562	3773.647	3778.060	3779.344	3750.495	633
2:37:21	59.968	3764.786	25.601	25.743	0.000	3800.485	3773.618	3778.134	3779.344	3750.591	633
2:37:23	59.965	3759.592	28.000	26.533	0.000	3801.275	3773.571	3778.211	3779.344	3750.686	633
2:37:25	59.969	3761.894	24.799	25.926	0.000	3800.668	3773.533	3778.285	3779.344	3750.781	633
2:37:27	59.969	3761.894	24.799	25.531	0.000	3800.273	3773.495	3778.357	3779.344	3750.876	633
2:37:29	59.967	3760.583	26.401	25.836	0.000	3800.577	3773.452	3778.430	3779.344	3750.969	633
2:37:31	59.966	3760.157	27.200	26.313	0.000	3801.055	3773.409	3778.504	3779.344	3751.062	633
2:37:33	59.966	3760.157	27.200	26.624	0.000	3801.366	3773.366	3778.578	3779.344	3751.155	633
2:37:35	59.979	3759.495	16.800	23.185	0.000	3797.927	3773.321	3778.641	3779.344	3751.247	633
2:37:37	59.983	3757.773	13.599	19.830	0.000	3794.572	3773.270	3778.693	3779.344	3751.338	633
2:37:39	59.983	3757.773	13.599	17.649	0.000	3792.391	3773.220	3778.737	3779.344	3751.428	633
2:37:41	59.974	3753.087	20.801	18.752	0.000	3793.494	3773.155	3778.784	3779.344	3751.518	633
2:37:43	59.965	3751.637	28.000	21.989	0.000	3796.731	3773.087	3778.842	3779.344	3751.608	633
2:37:45	59.965	3751.637	28.000	24.093	0.000	3798.834	3773.018	3778.906	3779.344	3751.697	633
2:37:47	59.962	3758.225	30.399	26.300	0.000	3801.041	3772.971	3778.976	3779.344	3751.785	633
2:37:49	59.961	3759.250	31.201	28.015	0.000	3802.757	3772.927	3779.052	3779.344	3751.873	633
2:37:51	59.961	3759.250	31.201	29.130	0.000	3803.872	3772.884	3779.130	3779.344	3751.960	633
2:37:53	59.961	3760.965	31.201	29.855	0.000	3804.597	3772.846	3779.211	3779.344	3752.047	633
2:37:55	59.963	3762.022	29.599	29.765	0.000	3804.507	3772.812	3779.290	3779.344	3752.133	633
2:37:57	59.963	3762.022	29.599	29.707	0.000	3804.449	3772.779	3779.369	3779.344	3752.218	633
2:37:59	59.959	3763.100	32.800	30.790	0.000	3805.532	3772.748	3779.451	3779.344	3752.303	633
2:38:01	59.951	3763.858	39.200	33.733	0.000	3808.475	3772.721	3779.541	3779.344	3752.388	633
2:38:03	59.951	3763.858	39.200	35.647	0.000	3810.388	3772.693	3779.637	3779.344	3752.472	633
2:38:05	59.953	3766.127	37.601	36.331	0.000	3811.072	3772.673	3779.734	3779.344	3752.555	633
2:38:07	59.957	3768.339	34.399	35.655	0.000	3810.396	3772.659	3779.829	3779.344	3752.638	633
2:38:09	59.957	3768.339	34.399	35.215	0.000	3809.957	3772.646	3779.922	3779.344	3752.721	633
2:38:11	59.956	3767.438	35.199	35.210	0.000	3809.951	3772.630	3780.014	3779.344	3752.803	633
2:38:13	59.963	3765.606	29.599	33.246	0.000	3807.988	3772.609	3780.099	3779.344	3752.884	633
2:38:15	59.963	3765.606	29.599	31.969	0.000	3806.711	3772.587	3780.181	3779.344	3752.965	633
2:38:17	59.961	3761.570	31.201	31.701	0.000	3806.442	3772.554	3780.260	3779.344	3753.045	633
2:38:19	59.963	3761.920	29.599	30.965	0.000	3805.707	3772.522	3780.337	3779.344	3753.125	633
2:38:21	59.963	3761.920	29.599	30.487	0.000	3805.229	3772.490	3780.413	3779.344	3753.205	633
2:38:23	59.963	3758.522	29.599	30.176	0.000	3804.918	3772.447	3780.486	3779.344	3753.284	633
2:38:25	59.968	3752.429	25.601	28.575	0.000	3803.317	3772.387	3780.555	3779.344	3753.362	633
2:38:27	59.968	3752.429	25.601	27.534	0.000	3802.276	3772.328	3780.620	3779.344	3753.440	633

2:38:29	59.968	3753.830	25.601	26.858	0.000	3801.599	3772.272	3780.683	3779.344	3753.518	633
2:38:31	59.97	3753.510	23.999	25.857	0.000	3800.599	3772.217	3780.742	3779.344	3753.595	633
2:38:33	59.97	3753.510	23.999	25.207	0.000	3799.949	3772.161	3780.799	3779.344	3753.672	633
2:38:35	59.973	3752.741	21.600	23.945	0.000	3798.686	3772.104	3780.852	3779.344	3753.748	633
2:38:37	59.965	3753.178	28.000	25.364	0.000	3800.106	3772.048	3780.909	3779.344	3753.823	633
2:38:39	59.965	3753.178	28.000	26.286	0.000	3801.028	3771.992	3780.968	3779.344	3753.899	633
2:38:41	59.967	3753.291	26.401	26.326	0.000	3801.068	3771.937	3781.027	3779.344	3753.974	633
2:38:43	59.972	3752.872	22.400	24.952	0.000	3799.694	3771.882	3781.081	3779.344	3754.048	633
2:38:45	59.972	3752.872	22.400	24.059	0.000	3798.801	3771.826	3781.133	3779.344	3754.122	633
2:38:47	59.976	3749.398	19.199	22.358	0.000	3797.100	3771.761	3781.179	3779.344	3754.196	633
2:38:49	59.969	3747.476	24.799	23.212	0.000	3797.954	3771.691	3781.228	3779.344	3754.269	633
2:38:51	59.969	3747.476	24.799	23.767	0.000	3798.509	3771.621	3781.278	3779.344	3754.341	633
2:38:53	59.973	3741.285	21.600	23.009	0.000	3797.751	3771.533	3781.325	3779.344	3754.414	633
2:38:55	59.978	3746.651	17.599	21.116	0.000	3795.857	3771.462	3781.367	3779.344	3754.485	633
2:38:57	59.978	3746.651	17.599	19.885	0.000	3794.627	3771.391	3781.405	3779.344	3754.557	633
2:38:59	59.981	3743.351	15.201	18.246	0.000	3792.987	3771.311	3781.438	3779.344	3754.628	633
2:39:01	59.981	3741.618	15.201	17.180	0.000	3791.922	3771.226	3781.468	3779.344	3754.698	633
2:39:03	59.981	3741.618	15.201	16.487	0.000	3791.229	3771.142	3781.496	3779.344	3754.769	633
2:39:05	59.982	3738.484	14.401	15.757	0.000	3790.499	3771.049	3781.521	3779.344	3754.839	633
2:39:07	59.984	3738.901	12.799	14.722	0.000	3789.464	3770.959	3781.544	3779.344	3754.908	633
2:39:09	59.984	3738.901	12.799	14.049	0.000	3788.791	3770.868	3781.564	3779.344	3754.977	633
2:39:11	59.982	3737.273	14.401	14.172	0.000	3788.914	3770.774	3781.585	3779.344	3755.046	633
2:39:13	59.979	3736.308	16.800	15.092	0.000	3789.834	3770.677	3781.608	3779.344	3755.114	633
2:39:15	59.979	3736.308	16.800	15.690	0.000	3790.431	3770.581	3781.633	3779.344	3755.182	633
2:39:17	59.98	3735.448	16.000	15.798	0.000	3790.540	3770.483	3781.657	3779.344	3755.249	633
2:39:19	59.978	3735.650	17.599	16.429	0.000	3791.171	3770.387	3781.684	3779.344	3755.316	633
2:39:21	59.978	3735.650	17.599	16.839	0.000	3791.580	3770.290	3781.711	3779.344	3755.383	633
2:39:23	59.98	3738.012	16.000	16.545	0.000	3791.287	3770.201	3781.738	3779.344	3755.449	633
2:39:25	59.98	3736.748	16.000	16.354	0.000	3791.096	3770.109	3781.764	3779.344	3755.515	633
2:39:27	59.98	3736.748	16.000	16.231	0.000	3790.972	3770.017	3781.789	3779.344	3755.581	633
2:39:29	59.978	3736.067	17.599	16.710	0.000	3791.451	3769.924	3781.815	3779.344	3755.646	633
2:39:31	59.972	3736.094	22.400	18.701	0.000	3793.443	3769.832	3781.847	3779.344	3755.711	633
2:39:33	59.972	3736.094	22.400	19.996	0.000	3794.738	3769.740	3781.882	3779.344	3755.776	633
2:39:35	59.971	3738.571	23.199	21.117	0.000	3795.859	3769.655	3781.920	3779.344	3755.840	633
2:39:37	59.974	3738.875	20.801	21.006	0.000	3795.748	3769.572	3781.958	3779.344	3755.904	633
2:39:39	59.974	3738.875	20.801	20.934	0.000	3795.676	3769.489	3781.995	3779.344	3755.967	633
2:39:41	59.975	3738.647	20.001	20.608	0.000	3795.350	3769.406	3782.031	3779.344	3756.031	633
2:39:43	59.972	3737.684	22.400	21.235	0.000	3795.977	3769.321	3782.068	3779.344	3756.093	633
2:39:45	59.972	3737.684	22.400	21.643	0.000	3796.384	3769.236	3782.107	3779.344	3756.156	633
2:39:47	59.969	3737.892	24.799	22.747	0.000	3797.489	3769.152	3782.148	3779.344	3756.218	633
2:39:49	59.974	3740.017	20.801	22.066	0.000	3796.808	3769.074	3782.187	3779.344	3756.280	633
2:39:51	59.974	3740.017	20.801	21.623	0.000	3796.365	3768.997	3782.225	3779.344	3756.342	633
2:39:53	59.972	3742.053	22.400	21.895	0.000	3796.637	3768.926	3782.263	3779.344	3756.403	633
2:39:55	59.972	3742.424	22.400	22.072	0.000	3796.813	3768.855	3782.301	3779.344	3756.464	633
2:39:57	59.972	3742.424	22.400	22.187	0.000	3796.928	3768.786	3782.340	3779.344	3756.524	633
2:39:59	59.977	3742.245	18.399	20.861	0.000	3795.603	3768.716	3782.375	3779.344	3756.584	633

2:40:01	59.978	3741.723	17.599	19.719	0.000	3794.461	3768.645	3782.406	3779.344	3756.644	633
2:40:03	59.978	3741.723	17.599	18.977	0.000	3793.719	3768.575	3782.436	3779.344	3756.704	633
2:40:05	59.976	3740.629	19.199	19.055	0.000	3793.797	3768.502	3782.466	3779.344	3756.763	633
2:40:07	59.974	3739.964	20.801	19.666	0.000	3794.408	3768.427	3782.497	3779.344	3756.822	633
2:40:09	59.974	3739.964	20.801	20.063	0.000	3794.805	3768.353	3782.529	3779.344	3756.881	633
2:40:11	59.977	3742.833	18.399	19.481	0.000	3794.222	3768.287	3782.559	3779.344	3756.939	633
2:40:13	59.978	3741.268	17.599	18.822	0.000	3793.564	3768.217	3782.588	3779.344	3756.997	633
2:40:15	59.978	3741.268	17.599	18.394	0.000	3793.136	3768.148	3782.615	3779.344	3757.055	633
2:40:17	59.979	3738.966	16.800	17.836	0.000	3792.578	3768.073	3782.640	3779.344	3757.112	633
2:40:19	59.977	3738.706	18.399	18.033	0.000	3792.775	3767.998	3782.666	3779.344	3757.169	633
2:40:21	59.977	3738.706	18.399	18.161	0.000	3792.903	3767.923	3782.693	3779.344	3757.226	633
2:40:23	59.974	3739.860	20.801	19.085	0.000	3793.827	3767.851	3782.721	3779.344	3757.283	633
2:40:25	59.971	3738.102	23.199	20.525	0.000	3795.267	3767.775	3782.753	3779.344	3757.339	633
2:40:27	59.971	3738.102	23.199	21.461	0.000	3796.203	3767.700	3782.787	3779.344	3757.395	633
2:40:29	59.971	3743.507	23.199	22.070	0.000	3796.811	3767.639	3782.822	3779.344	3757.451	633
2:40:31	59.968	3743.419	25.601	23.306	0.000	3798.047	3767.578	3782.861	3779.344	3757.506	633
2:40:33	59.968	3743.419	25.601	24.109	0.000	3798.851	3767.517	3782.901	3779.344	3757.561	633
2:40:35	59.966	3745.744	27.200	25.191	0.000	3799.933	3767.462	3782.944	3779.344	3757.616	633
2:40:37	59.971	3747.340	23.199	24.494	0.000	3799.236	3767.412	3782.985	3779.344	3757.671	633
2:40:39	59.971	3747.340	23.199	24.041	0.000	3798.783	3767.362	3783.024	3779.344	3757.725	633
2:40:41	59.973	3749.750	21.600	23.187	0.000	3797.928	3767.318	3783.062	3779.344	3757.779	633
2:40:43	59.969	3746.217	24.799	23.751	0.000	3798.493	3767.265	3783.100	3779.344	3757.833	633
2:40:45	59.969	3746.217	24.799	24.118	0.000	3798.859	3767.213	3783.139	3779.344	3757.886	633
2:40:47	59.972	3743.745	22.400	23.516	0.000	3798.258	3767.155	3783.176	3779.344	3757.940	633
2:40:49	59.973	3743.149	21.600	22.846	0.000	3797.588	3767.096	3783.212	3779.344	3757.993	633
2:40:51	59.973	3743.149	21.600	22.410	0.000	3797.152	3767.037	3783.246	3779.344	3758.045	633
2:40:53	59.97	3739.453	23.999	22.966	0.000	3797.708	3766.969	3783.282	3779.344	3758.098	633
2:40:55	59.974	3733.376	20.801	22.208	0.000	3796.950	3766.886	3783.315	3779.344	3758.150	633
2:40:57	59.974	3733.376	20.801	21.716	0.000	3796.457	3766.804	3783.347	3779.344	3758.202	633
2:40:59	59.982	3737.583	14.401	19.156	0.000	3793.897	3766.733	3783.373	3779.344	3758.254	633
2:41:01	59.985	3736.229	12.000	16.651	0.000	3791.393	3766.659	3783.393	3779.344	3758.305	633
2:41:03	59.985	3736.229	12.000	15.023	0.000	3789.765	3766.585	3783.408	3779.344	3758.356	633
2:41:05	59.985	3733.434	12.000	13.965	0.000	3788.706	3766.505	3783.421	3779.344	3758.407	633
2:41:07	59.989	3733.115	8.801	12.158	0.000	3786.899	3766.424	3783.429	3779.344	3758.458	633
2:41:09	59.989	3733.115	8.801	10.983	0.000	3785.725	3766.344	3783.435	3779.344	3758.508	633
2:41:11	59.989	3729.180	8.801	10.219	0.000	3784.961	3766.255	3783.439	3779.344	3758.559	633
2:41:13	59.987	3725.459	10.400	10.283	0.000	3785.024	3766.157	3783.442	3779.344	3758.609	633
2:41:15	59.987	3725.459	10.400	10.324	0.000	3785.066	3766.059	3783.446	3779.344	3758.658	633
2:41:17	59.99	3720.108	7.999	9.510	0.000	3784.252	3765.950	3783.448	3779.344	3758.708	633
2:41:19	59.996	3720.938	3.201	7.302	0.000	3782.044	3765.843	3783.445	3779.344	3758.757	633
2:41:21	59.996	3720.938	3.201	5.867	0.000	3780.608	3765.736	3783.438	3779.344	3758.806	633
2:41:23	60.001	3725.677	-0.800	3.534	0.000	3778.275	3765.641	3783.426	3779.344	3758.855	633
2:41:25	60.004	3727.754	-3.201	1.176	0.000	3775.918	3765.551	3783.408	3779.344	3758.903	633
2:41:27	60.004	3727.754	-3.201	-0.356	0.000	3774.386	3765.462	3783.387	3779.344	3758.952	633
2:41:29	60.006	3727.683	-4.800	-1.911	0.000	3772.830	3765.373	3783.362	3779.344	3759.000	633
2:41:31	60.014	3727.231	-11.200	-5.162	0.000	3769.579	3765.284	3783.330	3779.344	3759.048	633

2:41:33	60.014	3727.231	-11.200	-7.276	0.000	3767.466	3765.195	3783.293	3779.344	3759.095	633
2:41:35	60.019	3726.446	-15.201	-10.049	0.000	3764.692	3765.104	3783.249	3779.344	3759.143	633
2:41:37	60.025	3726.016	-20.001	-13.533	0.000	3761.209	3765.013	3783.198	3779.344	3759.190	633
2:41:39	60.025	3726.016	-20.001	-15.797	0.000	3758.945	3764.922	3783.141	3779.344	3759.237	633
2:41:41	60.026	3716.375	-20.801	-17.548	0.000	3757.194	3764.810	3783.081	3779.344	3759.284	633
2:41:43	60.029	3717.333	-23.199	-19.526	0.000	3755.216	3764.700	3783.017	3779.344	3759.330	633
2:41:45	60.029	3717.333	-23.199	-20.812	0.000	3753.930	3764.590	3782.949	3779.344	3759.377	633
2:41:47	60.029	3717.142	-23.199	-21.647	0.000	3753.094	3764.481	3782.881	3779.344	3759.423	633
2:41:49	60.036	3715.166	-28.799	-24.151	0.000	3750.591	3764.368	3782.806	3779.344	3759.469	633
2:41:51	60.036	3715.166	-28.799	-25.778	0.000	3748.964	3764.255	3782.729	3779.344	3759.514	633
2:41:53	60.037	3710.283	-29.599	-27.115	0.000	3747.627	3764.131	3782.648	3779.344	3759.560	633
2:41:55	60.036	3710.158	-28.799	-27.705	0.000	3747.037	3764.008	3782.567	3779.344	3759.605	633
2:41:57	60.036	3710.158	-28.799	-28.088	0.000	3746.654	3763.886	3782.485	3779.344	3759.650	633
2:41:59	60.041	3698.591	-32.800	-29.737	0.000	3745.005	3763.737	3782.400	3779.344	3759.695	633
2:42:01	60.044	3704.591	-35.199	-31.649	0.000	3743.093	3763.603	3782.311	3779.344	3759.740	633
2:42:03	60.044	3704.591	-35.199	-32.891	0.000	3741.850	3763.469	3782.220	3779.344	3759.784	633
2:42:05	60.043	3702.482	-34.399	-33.419	0.000	3741.323	3763.332	3782.127	3779.344	3759.828	633
2:42:07	60.048	3701.316	-38.400	-35.163	0.000	3739.579	3763.192	3782.031	3779.344	3759.872	633
2:42:09	60.048	3701.316	-38.400	-36.296	0.000	3738.446	3763.053	3781.933	3779.344	3759.916	633
2:42:11	60.046	3699.529	-36.801	-36.473	0.000	3738.269	3762.911	3781.836	3779.344	3759.960	633
2:42:13	60.043	3699.726	-34.399	-35.747	0.000	3738.995	3762.769	3781.740	3779.344	3760.003	633
2:42:15	60.043	3699.726	-34.399	-35.275	0.000	3739.466	3762.629	3781.645	3779.344	3760.047	633
2:42:17	60.043	3690.477	-34.399	-34.969	0.000	3739.773	3762.468	3781.552	3779.344	3760.090	633
2:42:19	60.043	3696.865	-34.399	-34.769	0.000	3739.972	3762.322	3781.460	3779.344	3760.133	633
2:42:21	60.043	3696.865	-34.399	-34.640	0.000	3740.102	3762.177	3781.368	3779.344	3760.175	633

A Point	2:27:19		
FPointA	60.0390	2:27:19 AM	
A Value	60.0417		
C Value	59.8360	#N/A	
Delta FCA	-0.205751419		
FR C	-307.7	MW/0.1 Hz	
Slope A-C dF/dT	#N/A	Hz/second	
C Value Maximum Resource Loss	633		
Secondary C Value	No	n/a	Time

A Point	2:27:19		
FPointA	60.03900146	2:27:19	
A Value	60.04174995		
C Value	59.83599854	#N/A	
Delta FC			

	Value B 12 to 24 sec	FR B 12 to 24 sec	Value B 18 to 30 sec	FR B 18 to 30 sec	Value B 20 to 40 sec	FR B 20 to 40 sec	Value B 18 to 52 sec	FR B 18 to 52 sec	Value B 20 to 52 sec
B Frequency Value	59.8823		59.8844		59.8887		59.8879		59.8887
Delta FB	-0.1595	-397.436	-0.1573	-402.634	-0.1530	-415.164	-0.1538	-411.959	-0.1530
Slope B dF/dT	-0.00797319		-0.00786606		-0.0076522		-0.0076903		-0.0076522
RatioB-C	77.5032		76.4617		74.3829		74.7530		74.3829
Sustainability Index	-0.0172		-0.0193		-0.0236		-0.0228		-0.0236

Tzero	2:27:19
FT+4	59.83599854
FT+10	59.89099884
FT+20	59.88299942
FT+60	59.88999939

Interconnection Evaluation

riod (indicates ramp direction during recovery period)

B Value Average Resource Loss	633
B Value Average LaaR Loss	0
B Value Average Net Loss	633

			Interconnection Bias Total		
			EI	ERCOT	WECC
Interconnection Bias Setting	-660		-6349	-660	-2024
IPFR as a % of Bias Setting	0.00%				
Interconnection Total Energy	37446	60.07%			
Interconnection Peak Energy	62339				

Frequency and Interconnection Frequency Response @ different Average periods of B

Generator Trip MW	Generator Trip MW	Generator Trip MW	Generator Trip MW	Generator Trip MW	Generator Trip MW	LaaR Trip MW	Total Generation Trip MW	Interconne Primary Frequency Response	FR B 20 to 52 sec Average MW
								MW/0.1 Hz	
							0		
							0		
							0		
							0		

	Value B 12 to 24 sec Average Frequency	FR B 12 to 24 sec Average MW	Value B 18 to 30 sec Average Frequency	FR B 18 to 30 sec Average MW	Value B 20 to 40 sec Average Frequency	FR B 20 to 40 sec Average MW	Value B 18 to 52 sec Average Frequency	FR B 18 to 52 sec Average MW	Value B 20 to 52 sec Average Frequency
T-72 sec									
T-70 sec									
T-68 sec									

	0			T-66 sec										
	0			T-64 sec										
	0			T-62 sec										
	0			T-60 sec										
	0			T-58 sec										
	0			T-56 sec										
	0			T-54 sec										
	0			T-52 sec										
	0			T-50 sec										
	0			T-48 sec										
	0			T-46 sec										
	0			T-44 sec										
	0			T-42 sec										
	0			T-40 sec										
	0			T-38 sec										
	0			T-36 sec										
	0			T-34 sec										
	0			T-32 sec										
	0			T-30 sec										
	0			T-28 sec										
	0			T-26 sec										
	0			T-24 sec										
	0			T-22 sec										
	0			T-20 sec										
	0			T-18 sec										
	0			T-16 sec	60.042									
	0			T-14 sec	60.042									
	0			T-12 sec	60.042									
	0			T-10 sec	60.042									
	0			T-08 sec	60.042									
	0			T-06 sec	60.042									
	0			T-04 sec	60.042									
	0			T-02 sec	60.042									
	633	-992.952		T+0 sec										
	633	-992.952		T+02 sec										
	633	-307.653		T+04 sec										
0	633	-307.653		T+06 sec										
0	633	-366.424		T+08 sec										
0	633	-419.897		T+10 sec										
0	633	-419.897		T+12 sec	59.8823	-397.436								
0	633	-391.347		T+14 sec	59.8823	-397.436								
0	633	-379.61		T+16 sec	59.8823	-397.436								
0	633	-379.61		T+18 sec	59.8823	-397.436	59.8844	-402.634			59.8879	-411.959		
0	633	-398.739	-413.8616294	T+20 sec	59.8823	-397.436	59.8844	-402.634	59.8887	-415.164	59.8879	-411.959	59.8887	
0	633	-406.425	-413.8616294	T+22 sec	59.8823	-397.436	59.8844	-402.634	59.8887	-415.164	59.8879	-411.959	59.8887	
0	633	-406.425	-413.8616294	T+24 sec	59.8823	-397.436	59.8844	-402.634	59.8887	-415.164	59.8879	-411.959	59.8887	

0	633	-403.824	-413.8616294	T+26 sec		59.8844	-402.634	59.8887	-415.164	59.8879	-411.959	59.8887
0	633	-411.709	-413.8616294	T+28 sec		59.8844	-402.634	59.8887	-415.164	59.8879	-411.959	59.8887
0	633	-411.709	-413.8616294	T+30 sec		59.8844	-402.634	59.8887	-415.164	59.8879	-411.959	59.8887
0	633	-417.132	-413.8616294	T+32 sec				59.8887	-415.164	59.8879	-411.959	59.8887
0	633	-428.429	-413.8616294	T+34 sec				59.8887	-415.164	59.8879	-411.959	59.8887
0	633	-428.429	-413.8616294	T+36 sec				59.8887	-415.164	59.8879	-411.959	59.8887
0	633	-425.551	-413.8616294	T+38 sec				59.8887	-415.164	59.8879	-411.959	59.8887
0	633	-428.429	-413.8616294	T+40 sec				59.8887	-415.164	59.8879	-411.959	59.8887
0	633	-428.429	-413.8616294	T+42 sec						59.8879	-411.959	59.8887
0	633	-419.897	-413.8616294	T+44 sec						59.8879	-411.959	59.8887
0	633	-403.824	-413.8616294	T+46 sec						59.8879	-411.959	59.8887
0	633	-403.824	-413.8616294	T+48 sec						59.8879	-411.959	59.8887
0	633	-403.824	-413.8616294	T+50 sec						59.8879	-411.959	59.8887
0	633	-409.05	-413.8616294	T+52 sec						59.8879	-411.959	59.8887
0	633	-409.05		T+54 sec								
0	633	-411.709		T+56 sec								
0	633	-417.132		T+58 sec								
0	633	-417.132		T+60 sec								
0	633	-414.403		T+62 sec								
0	633	-375.114		T+64 sec								
0	633	-375.114		T+66 sec								
0	633	-342.622		T+68 sec								
0	633	-333.599		T+70 sec								
0	633	-333.599		T+72 sec								
0	633	-344.493		T+74 sec								
0	633	-360.173		T+76 sec								
0	633	-360.173		T+78 sec								
0	633	-358.136		T+80 sec								
0	633	-360.173										
0	633	-360.173										
0	633	-370.714										
0	633	-388.944										
0	633	-388.944										
0	633	-391.347										
0	633	-406.425										
0	633	-406.425										
0	633	-417.132										
0	633	-414.403										
0	633	-414.403										
0	633	-425.551										
0	633	-456.216										
0	633	-456.216										
0	633	-452.953										
0	633	-459.526										
0	633	-459.526										

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0	633	-503.381
0	633	-503.381
0	633	-511.512
0	633	-511.512
0	633	-519.91
0	633	-519.91
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0	633	-634.595
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0	633	-713.233
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0	633	-882.246
0	633	-870.125
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0	633	-894.709
0	633	-920.722
0	633	-920.722
0	633	-962.764
0	633	-992.952
0	633	-992.952
0	633	-962.764
0	633	-962.764
0	633	-962.764
0	633	-992.952
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0	633	-1025.09
0	633	-1059.39
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0	633	-1025.09
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0	633	50667.83
0	633	50667.83
0	633	50667.83
0	633	50667.83
0	633	50667.83

Non-Conforming Load sign convention + (Data is positive for Load then enter "+" else "-"

FR B
20 to 52 sec

-413.862

Time of Freque
Value A Pre-Pert
Value B Post-Pertu
Pre
Value A Pre-Perturbati
Value B Post-Perturbatio
Pre to Pos

Frequency, Actual Interchange, Adjustment Data, Bias and Load used in the evaluation

12 to 24 second

FR B
20 to 52 sec
Average
MW

	T	Frequency Hz	Net Actual Interchange MW	JOU Dynamic Schedules Imp(-) Exp (+) MW	Non-Conforming Load Load (-) MW	Pumped Hydro Load (-) Gen (+) MW	Ramping Units Gen (+) MW	Transferred Frequency Response Rec (-) Del (+) MW/0.1 Hz	Contingent BA Lost Generation Load (-) Gen (+) MW	BA Bias Setting MW/0.1 Hz	BA Load MW	Expected Primary Freq Response MW	T	Frequency Hz
T-72 sec	2:26:09	60.0270	3671.19	350.00	-253.63	0.00	141.50	10.00	15.00	-103.00	7593.39	-21.600	T-72 sec	2:26:09
T-70 sec	2:26:11	60.0270	3671.19	350.00	-253.63	0.00	141.50	10.00	15.00	-103.00	7593.39	-21.600	T-70 sec	2:26:11
T-68 sec	2:26:13	60.0260	3668.61	350.00	-253.63	0.00	142.00	10.00	15.00	-103.00	7593.72	-20.801	T-68 sec	2:26:13

	T-66 sec	2:26:15	60.0220	3664.50	350.00	-253.63	0.00	142.50	10.00	15.00	-103.00	7594.05	-17.599	T-66 sec	2:26:15	
	T-64 sec	2:26:17	60.0220	3664.50	350.00	-253.63	0.00	142.50	10.00	15.00	-103.00	7594.05	-17.599	T-64 sec	2:26:17	
	T-62 sec	2:26:19	60.0170	3666.06	350.00	-253.63	0.00	143.00	10.00	15.00	-103.00	7594.38	-13.599	T-62 sec	2:26:19	
	T-60 sec	2:26:21	60.0190	3666.79	350.00	-253.63	0.00	143.50	10.00	15.00	-103.00	7594.71	-15.201	T-60 sec	2:26:21	
	T-58 sec	2:26:23	60.0190	3666.79	350.00	-253.63	0.00	143.50	10.00	15.00	-103.00	7594.71	-15.201	T-58 sec	2:26:23	
	T-56 sec	2:26:25	60.0190	3670.45	350.00	-246.96	0.00	144.00	10.00	15.00	-103.00	7595.04	-15.201	T-56 sec	2:26:25	
	T-54 sec	2:26:27	60.0210	3671.67	350.00	-246.96	0.00	144.50	10.00	15.00	-103.00	7595.37	-16.800	T-54 sec	2:26:27	
	T-52 sec	2:26:29	60.0210	3671.67	350.00	-246.96	0.00	144.50	10.00	15.00	-103.00	7595.37	-16.800	T-52 sec	2:26:29	
	T-50 sec	2:26:31	60.0210	3672.49	350.00	-246.96	0.00	145.00	10.00	15.00	-103.00	7595.70	-16.800	T-50 sec	2:26:31	
	T-48 sec	2:26:33	60.0190	3672.86	350.00	-246.96	0.00	145.50	10.00	15.00	-103.00	7596.03	-15.201	T-48 sec	2:26:33	
	T-46 sec	2:26:35	60.0190	3672.86	350.00	-246.96	0.00	145.50	10.00	15.00	-103.00	7596.03	-15.201	T-46 sec	2:26:35	
	T-44 sec	2:26:37	60.0220	3672.16	350.00	-246.96	0.00	146.00	10.00	15.00	-103.00	7596.36	-17.599	T-44 sec	2:26:37	
	T-42 sec	2:26:39	60.0310	3669.98	350.00	-254.54	0.00	146.50	10.00	15.00	-103.00	7596.69	-24.799	T-42 sec	2:26:39	
	T-40 sec	2:26:41	60.0310	3669.98	350.00	-254.54	0.00	146.50	10.00	15.00	-103.00	7596.69	-24.799	T-40 sec	2:26:41	
	T-38 sec	2:26:43	60.0370	3666.47	350.00	-254.54	0.00	147.00	10.00	15.00	-103.00	7597.02	-29.599	T-38 sec	2:26:43	
	T-36 sec	2:26:45	60.0360	3661.60	350.00	-254.54	0.00	147.50	10.00	15.00	-103.00	7597.35	-28.799	T-36 sec	2:26:45	
	T-34 sec	2:26:47	60.0360	3661.60	350.00	-254.54	0.00	147.50	10.00	15.00	-103.00	7597.35	-28.799	T-34 sec	2:26:47	
	T-32 sec	2:26:49	60.0460	3660.67	350.00	-254.54	0.00	148.00	10.00	15.00	-103.00	7597.68	-36.801	T-32 sec	2:26:49	
	T-30 sec	2:26:51	60.0480	3649.19	350.00	-165.10	0.00	148.50	10.00	15.00	-103.00	7598.01	-38.400	T-30 sec	2:26:51	
	T-28 sec	2:26:53	60.0480	3649.19	350.00	-165.10	0.00	148.50	10.00	15.00	-103.00	7598.01	-38.400	T-28 sec	2:26:53	
	T-26 sec	2:26:55	60.0430	3650.03	350.00	-165.10	0.00	149.00	10.00	15.00	-103.00	7598.34	-34.399	T-26 sec	2:26:55	
	T-24 sec	2:26:57	60.0410	3649.51	350.00	-165.10	0.00	149.50	10.00	15.00	-103.00	7598.67	-32.800	T-24 sec	2:26:57	
	T-22 sec	2:26:59	60.0410	3649.51	350.00	-165.10	0.00	149.50	10.00	15.00	-103.00	7598.67	-32.800	T-22 sec	2:26:59	
	T-20 sec	2:27:01	60.0410	3654.29	350.00	-165.10	0.00	150.00	10.00	15.00	-103.00	7599.00	-32.800	T-20 sec	2:27:01	
	T-18 sec	2:27:03	60.0390	3651.87	350.00	-165.10	0.00	150.50	10.00	15.00	-103.00	7599.33	-31.201	T-18 sec	2:27:03	
	T-16 sec	2:27:05	60.0390	3651.87	350.00	-165.10	0.00	150.50	10.00	15.00	-103.00	7599.33	-31.201	T-16 sec	2:27:05	60.042
	T-14 sec	2:27:07	60.0430	3651.06	350.00	-165.48	0.00	151.00	10.00	15.00	-103.00	7599.66	-34.399	T-14 sec	2:27:07	60.042
	T-12 sec	2:27:09	60.0450	3648.24	350.00	-165.48	0.00	151.50	10.00	15.00	-103.00	7599.99	-35.999	T-12 sec	2:27:09	60.042
	T-10 sec	2:27:11	60.0450	3648.24	350.00	-165.48	0.00	151.50	10.00	15.00	-103.00	7599.99	-35.999	T-10 sec	2:27:11	60.042
	T-08 sec	2:27:13	60.0410	3645.39	350.00	-165.48	0.00	152.00	10.00	15.00	-103.00	7600.32	-32.800	T-08 sec	2:27:13	60.042
	T-06 sec	2:27:15	60.0410	3645.45	350.00	-165.48	0.00	152.50	10.00	15.00	-103.00	7600.65	-32.800	T-06 sec	2:27:15	60.042
	T-04 sec	2:27:17	60.0410	3645.45	350.00	-165.48	0.00	152.50	10.00	15.00	-103.00	7600.65	-32.800	T-04 sec	2:27:17	60.042
	T-02 sec	2:27:19	60.0390	3640.68	350.00	-165.48	0.00	153.00	10.00	15.00	-103.00	7600.98	-31.201	T-02 sec	2:27:19	60.042
	T+0 sec	2:27:21	59.9780	3659.46	350.00	-206.46	0.00	153.50	10.00	0.00	-103.00	7601.31	17.599	T+0 sec	2:27:21	
	T+02 sec	2:27:23	59.9780	3659.46	350.00	-206.46	0.00	153.50	10.00	0.00	-103.00	7601.31	17.599	T+02 sec	2:27:23	
	T+04 sec	2:27:25	59.8360	3696.36	350.00	-206.46	0.00	154.00	10.00	0.00	-103.00	7570.00	131.201	T+04 sec	2:27:25	
	T+06 sec	2:27:27	59.8360	3696.36	350.00	-206.46	0.00	154.00	10.00	0.00	-103.00	7570.00	131.201	T+06 sec	2:27:27	
	T+08 sec	2:27:29	59.8690	3734.67	335.00	-206.46	0.00	154.50	10.00	0.00	-103.00	7569.00	104.800	T+08 sec	2:27:29	
	T+10 sec	2:27:31	59.8910	3737.16	335.00	-206.46	0.00	155.00	10.00	0.00	-103.00	7570.00	87.201	T+10 sec	2:27:31	
	T+12 sec	2:27:33	59.8910	3737.16	335.00	-206.46	0.00	155.00	10.00	0.00	-103.00	7570.00	87.201	T+12 sec	2:27:33	59.882
	T+14 sec	2:27:35	59.8800	3766.11	335.00	-206.46	0.00	155.50	10.00	0.00	-103.00	7570.00	95.999	T+14 sec	2:27:35	59.882
	T+16 sec	2:27:37	59.8750	3766.19	335.00	-211.26	0.00	156.00	10.00	0.00	-103.00	7570.00	100.000	T+16 sec	2:27:37	59.882
	T+18 sec	2:27:39	59.8750	3766.19	335.00	-211.26	0.00	156.00	10.00	0.00	-103.00	7570.00	100.000	T+18 sec	2:27:39	59.882
-413.862	T+20 sec	2:27:41	59.8830	3769.93	335.00	-211.26	1.00	156.50	10.00	0.00	-103.00	7570.00	93.600	T+20 sec	2:27:41	59.882
-413.862	T+22 sec	2:27:43	59.8860	3780.62	335.00	-211.26	1.00	157.00	10.00	0.00	-103.00	7570.00	91.199	T+22 sec	2:27:43	59.882
-413.862	T+24 sec	2:27:45	59.8860	3780.62	335.00	-211.26	1.00	157.00	10.00	0.00	-103.00	7570.00	91.199	T+24 sec	2:27:45	59.882

-413.862	T+26 sec	2:27:47	59.8850	3782.50	335.00	-211.26	1.00	157.50	10.00	0.00	-103.00	7570.00	92.001	T+26 sec	2:27:47
-413.862	T+28 sec	2:27:49	59.8880	3784.96	335.00	-211.26	1.00	158.00	10.00	0.00	-103.00	7570.00	89.600	T+28 sec	2:27:49
-413.862	T+30 sec	2:27:51	59.8880	3784.96	335.00	-211.26	1.00	158.00	10.00	0.00	-103.00	7570.00	89.600	T+30 sec	2:27:51
-413.862	T+32 sec	2:27:53	59.8900	3784.42	335.00	-214.35	1.00	158.50	10.00	0.00	-103.00	7570.00	88.000	T+32 sec	2:27:53
-413.862	T+34 sec	2:27:55	59.8940	3788.07	335.00	-214.35	1.00	159.00	10.00	0.00	-103.00	7570.00	84.799	T+34 sec	2:27:55
-413.862	T+36 sec	2:27:57	59.8940	3788.07	335.00	-214.35	1.00	159.00	10.00	0.00	-103.00	7570.00	84.799	T+36 sec	2:27:57
-413.862	T+38 sec	2:27:59	59.8930	3788.87	335.00	-214.35	1.00	159.50	10.00	0.00	-103.00	7570.00	85.599	T+38 sec	2:27:59
-413.862	T+40 sec	2:28:01	59.8940	3788.47	335.00	-214.35	2.00	160.00	10.00	0.00	-103.00	7570.00	84.799	T+40 sec	2:28:01
-413.862	T+42 sec	2:28:03	59.8940	3788.47	335.00	-214.35	2.00	160.00	10.00	0.00	-103.00	7570.00	84.799	T+42 sec	2:28:03
-413.862	T+44 sec	2:28:05	59.8910	3793.07	335.00	-214.35	3.00	160.50	10.00	0.00	-103.00	7570.00	87.201	T+44 sec	2:28:05
-413.862	T+46 sec	2:28:07	59.8850	3794.37	335.00	-212.17	4.00	161.00	10.00	0.00	-103.00	7570.00	92.001	T+46 sec	2:28:07
-413.862	T+48 sec	2:28:09	59.8850	3794.37	335.00	-212.17	4.00	161.00	10.00	0.00	-103.00	7570.00	92.001	T+48 sec	2:28:09
-413.862	T+50 sec	2:28:11	59.8850	3800.43	335.00	-212.17	5.00	161.50	10.00	0.00	-103.00	7570.00	92.001	T+50 sec	2:28:11
-413.862	T+52 sec	2:28:13	59.8870	3799.96	335.00	-212.17	6.00	162.00	10.00	0.00	-103.00	7570.00	90.399	T+52 sec	2:28:13
	T+54 sec	2:28:15	59.8870	3799.96	335.00	-212.17	6.00	162.00	10.00	0.00	-103.00	7570.00	90.399	T+54 sec	2:28:15
	T+56 sec	2:28:17	59.8880	3802.93	335.00	-212.17	7.00	162.50	10.00	0.00	-103.00	7570.00	89.600	T+56 sec	2:28:17
	T+58 sec	2:28:19	59.8900	3802.95	335.00	-212.17	8.00	163.00	10.00	0.00	-103.00	7570.00	88.000	T+58 sec	2:28:19
	T+60 sec	2:28:21	59.8900	3802.95	335.00	-212.17	8.00	163.00	10.00	0.00	-103.00	7570.00	88.000	T+60 sec	2:28:21
	T+62 sec	2:28:23	59.8890	3805.50	335.00	-215.60	9.00	163.50	10.00	0.00	-103.00	7570.00	88.800	T+62 sec	2:28:23
	T+64 sec	2:28:25	59.8730	3805.62	335.00	-215.60	10.00	164.00	10.00	0.00	-103.00	7568.00	101.599	T+64 sec	2:28:25
	T+66 sec	2:28:27	59.8730	3805.62	335.00	-215.60	10.00	164.00	10.00	0.00	-103.00	7568.00	101.599	T+66 sec	2:28:27
	T+68 sec	2:28:29	59.8570	3811.50	335.00	-215.60	11.00	164.50	10.00	0.00	-103.00	7565.00	114.401	T+68 sec	2:28:29
	T+70 sec	2:28:31	59.8520	3814.86	335.00	-215.60	12.00	165.00	10.00	0.00	-103.00	7560.00	118.399	T+70 sec	2:28:31
	T+72 sec	2:28:33	59.8520	3814.86	335.00	-215.60	12.00	165.00	10.00	0.00	-103.00	7560.00	118.399	T+72 sec	2:28:33
	T+74 sec	2:28:35	59.8580	3825.64	335.00	-215.60	13.00	165.50	10.00	0.00	-103.00	7563.00	113.599	T+74 sec	2:28:35
	T+76 sec	2:28:37	59.8660	3826.05	335.00	-218.33	14.00	166.00	10.00	0.00	-103.00	7564.00	107.199	T+76 sec	2:28:37
	T+78 sec	2:28:39	59.8660	3826.05	335.00	-218.33	14.00	166.00	10.00	0.00	-103.00	7564.00	107.199	T+78 sec	2:28:39
	T+80 sec	2:28:41	59.8650	3827.52	335.00	-218.33	15.00	166.50	10.00	0.00	-103.00	7566.00	107.999	T+80 sec	2:28:41
		2:28:43	59.8660	3826.75	335.00	-218.33	16.00	167.00	10.00	0.00	-103.00	7570.00	107.199		
		2:28:45	59.8660	3826.75	335.00	-218.33	16.00	167.00	10.00	0.00	-103.00	7570.00	107.199		
		2:28:47	59.8710	3826.45	335.00	-218.33	16.00	167.50	10.00	0.00	-103.00	7570.00	103.201		
		2:28:49	59.8790	3825.71	335.00	-218.33	16.00	168.00	10.00	0.00	-103.00	7570.00	96.799		
		2:28:51	59.8790	3825.71	335.00	-218.33	16.00	168.00	10.00	0.00	-103.00	7570.00	96.799		
		2:28:53	59.8800	3822.51	335.00	-217.38	16.00	168.50	10.00	0.00	-103.00	7570.00	95.999		
		2:28:55	59.8860	3819.08	335.00	-217.38	16.00	169.00	10.00	0.00	-103.00	7570.00	91.199		
		2:28:57	59.8860	3819.08	335.00	-217.38	16.00	169.00	10.00	0.00	-103.00	7570.00	91.199		
		2:28:59	59.8900	3816.81	335.00	-217.38	16.00	169.50	10.00	0.00	-103.00	7569.00	88.000		
		2:29:01	59.8890	3815.01	335.00	-217.38	16.00	170.00	10.00	0.00	-103.00	7575.00	88.800		
		2:29:03	59.8890	3815.01	335.00	-217.38	16.00	170.00	10.00	0.00	-103.00	7575.00	88.800		
		2:29:05	59.8930	3811.84	335.00	-217.38	16.00	170.50	10.00	0.00	-103.00	7573.00	85.599		
		2:29:07	59.9030	3809.65	335.00	-214.83	16.00	171.00	10.00	0.00	-103.00	7571.00	77.600		
		2:29:09	59.9030	3809.65	335.00	-214.83	16.00	171.00	10.00	0.00	-103.00	7571.00	77.600		
		2:29:11	59.9020	3805.59	335.00	-214.83	16.00	171.50	10.00	0.00	-103.00	7573.00	78.400		
		2:29:13	59.9040	3804.19	335.00	-214.83	16.00	172.00	10.00	0.00	-103.00	7575.00	76.801		
		2:29:15	59.9040	3804.19	335.00	-214.83	16.00	172.00	10.00	0.00	-103.00	7575.00	76.801		

2:29:17	59.9070	3793.98	335.00	-214.83	16.00	172.50	10.00	0.00	-103.00	7577.00	74.399
2:29:19	59.9160	3792.17	335.00	-214.83	16.00	173.00	10.00	0.00	-103.00	7577.00	67.200
2:29:21	59.9160	3792.17	335.00	-214.83	16.00	173.00	10.00	0.00	-103.00	7577.00	67.200
2:29:23	59.9160	3789.53	335.00	-227.66	16.00	173.50	10.00	0.00	-103.00	7578.00	67.200
2:29:25	59.9180	3788.13	335.00	-227.66	16.00	174.00	10.00	0.00	-103.00	7579.00	65.601
2:29:27	59.9180	3788.13	335.00	-227.66	16.00	174.00	10.00	0.00	-103.00	7579.00	65.601
2:29:29	59.9200	3783.03	335.00	-227.66	16.00	174.50	10.00	0.00	-103.00	7580.00	64.001
2:29:31	59.9200	3781.70	335.00	-227.66	16.00	175.00	10.00	0.00	-103.00	7581.00	64.001
2:29:33	59.9200	3781.70	335.00	-227.66	16.00	175.00	10.00	0.00	-103.00	7581.00	64.001
2:29:35	59.9170	3775.64	335.00	-227.66	16.00	175.50	10.00	0.00	-103.00	7585.00	66.400
2:29:37	59.9210	3774.60	335.00	-225.02	16.00	176.00	10.00	0.00	-103.00	7588.00	63.199
2:29:39	59.9210	3774.60	335.00	-225.02	16.00	176.00	10.00	0.00	-103.00	7588.00	63.199
2:29:41	59.9230	3773.96	335.00	-225.02	16.00	176.50	10.00	0.00	-103.00	7589.00	61.600
2:29:43	59.9250	3772.72	335.00	-225.02	0.00	177.00	10.00	0.00	-103.00	7589.00	60.001
2:29:45	59.9250	3772.72	335.00	-225.02	0.00	177.00	10.00	0.00	-103.00	7589.00	60.001
2:29:47	59.9280	3769.63	335.00	-225.02	0.00	177.50	10.00	0.00	-103.00	7590.00	57.599
2:29:49	59.9320	3768.71	335.00	-225.02	0.00	178.00	10.00	0.00	-103.00	7590.00	54.401
2:29:51	59.9320	3768.71	335.00	-225.02	0.00	178.00	10.00	0.00	-103.00	7590.00	54.401
2:29:53	59.9270	3767.02	335.00	-228.37	0.00	178.50	10.00	0.00	-103.00	7590.00	58.401
2:29:55	59.9310	3767.41	335.00	-228.37	0.00	179.00	10.00	0.00	-103.00	7591.00	55.200
2:29:57	59.9310	3767.41	335.00	-228.37	0.00	179.00	10.00	0.00	-103.00	7591.00	55.200
2:29:59	59.9290	3766.26	335.00	-228.37	0.00	179.50	10.00	0.00	-103.00	7591.00	56.799
2:30:01	59.9310	3765.67	335.00	-228.37	0.00	180.00	10.00	0.00	-103.00	7591.00	55.200
2:30:03	59.9310	3765.67	335.00	-228.37	0.00	180.00	10.00	0.00	-103.00	7591.00	55.200
2:30:05	59.9370	3766.12	335.00	-228.37	0.00	180.50	10.00	0.00	-103.00	7592.00	50.400
2:30:07	59.9450	3765.10	335.00	-234.08	0.00	181.00	10.00	0.00	-103.00	7592.00	44.000
2:30:09	59.9450	3765.10	335.00	-234.08	0.00	181.00	10.00	0.00	-103.00	7592.00	44.000
2:30:11	59.9490	3758.39	335.00	-234.08	0.00	181.50	10.00	0.00	-103.00	7593.00	40.799
2:30:13	59.9420	3753.92	335.00	-234.08	0.00	182.00	10.00	0.00	-103.00	7594.00	46.399
2:30:15	59.9420	3753.92	335.00	-234.08	0.00	182.00	10.00	0.00	-103.00	7594.00	46.399
2:30:17	59.9410	3746.89	335.00	-234.08	0.00	182.50	10.00	0.00	-103.00	7595.00	47.198
2:30:19	59.9450	3747.88	335.00	-234.08	0.00	183.00	10.00	0.00	-103.00	7655.00	44.000
2:30:21	59.9450	3747.88	335.00	-234.08	0.00	183.00	10.00	0.00	-103.00	7655.00	44.000
2:30:23	59.9480	3748.66	335.00	-228.80	0.00	183.50	10.00	0.00	-103.00	7656.00	41.599
2:30:25	59.9490	3746.71	335.00	-228.80	0.00	184.00	10.00	0.00	-103.00	7656.00	40.799
2:30:27	59.9490	3746.71	335.00	-228.80	0.00	184.00	10.00	0.00	-103.00	7656.00	40.799
2:30:29	59.9510	3742.74	335.00	-228.80	0.00	184.50	10.00	0.00	-103.00	7657.00	39.200
2:30:31	59.9530	3740.26	335.00	-228.80	0.00	185.00	10.00	0.00	-103.00	7657.00	37.601
2:30:33	59.9530	3740.26	335.00	-228.80	0.00	185.00	10.00	0.00	-103.00	7657.00	37.601
2:30:35	59.9510	3731.38	335.00	-228.80	0.00	185.50	10.00	0.00	-103.00	7658.00	39.200
2:30:37	59.9520	3727.84	335.00	-229.47	0.00	186.00	10.00	0.00	-103.00	7658.00	38.400
2:30:39	59.9520	3727.84	335.00	-229.47	0.00	186.00	10.00	0.00	-103.00	7658.00	38.400
2:30:41	59.9520	3722.65	335.00	-249.34	0.00	186.50	10.00	0.00	-103.00	7659.00	38.400
2:30:43	59.9520	3720.58	335.00	-249.34	0.00	187.00	10.00	0.00	-103.00	7659.00	38.400
2:30:45	59.9520	3720.58	335.00	-249.34	0.00	187.00	10.00	0.00	-103.00	7659.00	38.400
2:30:47	59.9540	3718.14	335.00	-249.34	0.00	187.50	10.00	0.00	-103.00	7659.00	36.801

2:30:49	59.9530	3715.75	335.00	-249.34	0.00	188.00	10.00	0.00	-103.00	7660.00	37.601
2:30:51	59.9530	3715.75	335.00	-249.34	0.00	188.00	10.00	0.00	-103.00	7660.00	37.601
2:30:53	59.9530	3713.48	335.00	-249.34	0.00	188.50	10.00	0.00	-103.00	7660.00	37.601
2:30:55	59.9540	3710.85	335.00	-258.28	0.00	189.00	10.00	0.00	-103.00	7661.00	36.801
2:30:57	59.9540	3710.85	335.00	-258.28	0.00	189.00	10.00	0.00	-103.00	7661.00	36.801
2:30:59	59.9540	3712.09	335.00	-258.28	0.00	189.50	10.00	0.00	-103.00	7661.00	36.801
2:31:01	59.9570	3714.62	335.00	-258.28	0.00	190.00	10.00	0.00	-103.00	7625.40	34.399
2:31:03	59.9570	3714.62	335.00	-258.28	0.00	190.00	10.00	0.00	-103.00	7625.40	34.399
2:31:05	59.9560	3716.17	335.00	-258.28	0.00	190.50	10.00	0.00	-103.00	7625.73	35.199
2:31:07	59.9560	3716.46	335.00	-258.28	0.00	191.00	10.00	0.00	-103.00	7626.06	35.199
2:31:09	59.9560	3716.46	335.00	-258.28	0.00	191.00	10.00	0.00	-103.00	7626.06	35.199
2:31:11	59.9550	3717.76	335.00	-258.41	0.00	191.50	10.00	0.00	-103.00	7626.39	35.999
2:31:13	59.9610	3722.36	335.00	-258.41	0.00	192.00	10.00	0.00	-103.00	7626.72	31.201
2:31:15	59.9610	3722.36	335.00	-258.41	0.00	192.00	10.00	0.00	-103.00	7626.72	31.201
2:31:17	59.9620	3722.66	335.00	-258.41	0.00	192.50	10.00	0.00	-103.00	7627.05	30.399
2:31:19	59.9680	3722.27	335.00	-258.41	0.00	193.00	10.00	0.00	-103.00	7627.38	25.601
2:31:21	59.9680	3722.27	335.00	-258.41	0.00	193.00	10.00	0.00	-103.00	7627.38	25.601
2:31:23	59.9660	3721.79	335.00	-258.41	0.00	193.50	10.00	0.00	-103.00	7627.71	27.200
2:31:25	59.9680	3723.09	335.00	-260.54	0.00	194.00	10.00	0.00	-103.00	7628.04	25.601
2:31:27	59.9680	3723.09	335.00	-260.54	0.00	194.00	10.00	0.00	-103.00	7628.04	25.601
2:31:29	59.9700	3723.43	335.00	-260.54	0.00	194.50	10.00	0.00	-103.00	7628.37	23.999
2:31:31	59.9700	3723.89	335.00	-260.54	0.00	195.00	10.00	0.00	-103.00	7628.70	23.999
2:31:33	59.9700	3723.89	335.00	-260.54	0.00	195.00	10.00	0.00	-103.00	7628.70	23.999
2:31:35	59.9690	3727.12	335.00	-260.54	0.00	195.50	10.00	0.00	-103.00	7629.03	24.799
2:31:37	59.9700	3728.05	335.00	-260.54	0.00	196.00	10.00	0.00	-103.00	7629.36	23.999
2:31:39	59.9700	3728.05	335.00	-260.54	0.00	196.00	10.00	0.00	-103.00	7629.36	23.999
2:31:41	59.9710	3732.53	335.00	-257.88	0.00	196.50	10.00	0.00	-103.00	7629.69	23.199
2:31:43	59.9730	3733.33	335.00	-257.88	0.00	197.00	10.00	0.00	-103.00	7630.02	21.600
2:31:45	59.9730	3733.33	335.00	-257.88	0.00	197.00	10.00	0.00	-103.00	7630.02	21.600
2:31:47	59.9760	3736.91	335.00	-257.88	0.00	197.50	10.00	0.00	-103.00	7630.35	19.199
2:31:49	59.9780	3736.82	335.00	-257.88	0.00	198.00	10.00	0.00	-103.00	7630.68	17.599
2:31:51	59.9780	3736.82	335.00	-257.88	0.00	198.00	10.00	0.00	-103.00	7630.68	17.599
2:31:53	59.9760	3739.94	335.00	-257.88	0.00	198.50	10.00	0.00	-103.00	7631.01	19.199
2:31:55	59.9760	3740.88	335.00	-258.59	0.00	199.00	10.00	0.00	-103.00	7631.34	19.199
2:31:57	59.9760	3740.88	335.00	-258.59	0.00	199.00	10.00	0.00	-103.00	7631.34	19.199
2:31:59	59.9780	3745.23	335.00	-258.59	0.00	199.50	10.00	0.00	-103.00	7631.67	17.599
2:32:01	59.9800	3746.61	335.00	-258.59	0.00	200.00	10.00	0.00	-103.00	7632.00	16.000
2:32:03	59.9800	3746.61	335.00	-258.59	0.00	200.00	10.00	0.00	-103.00	7632.00	16.000
2:32:05	59.9820	3750.72	335.00	-258.59	0.00	200.50	10.00	0.00	-103.00	7632.33	14.401
2:32:07	59.9800	3751.56	335.00	-258.59	0.00	201.00	10.00	0.00	-103.00	7632.66	16.000
2:32:09	59.9800	3751.56	335.00	-258.59	0.00	201.00	10.00	0.00	-103.00	7632.66	16.000
2:32:11	59.9790	3755.60	335.00	-261.91	0.00	201.50	10.00	0.00	-103.00	7632.99	16.800
2:32:13	59.9790	3756.41	335.00	-261.91	0.00	202.00	10.00	0.00	-103.00	7633.32	16.800
2:32:15	59.9790	3756.41	335.00	-261.91	0.00	202.00	10.00	0.00	-103.00	7633.32	16.800
2:32:17	59.9830	3760.41	335.00	-261.91	0.00	202.50	10.00	0.00	-103.00	7633.65	13.599
2:32:19	59.9840	3760.98	335.00	-261.91	0.00	203.00	10.00	0.00	-103.00	7633.98	12.799

2:32:21	59.9840	3760.98	335.00	-261.91	0.00	203.00	10.00	0.00	-103.00	7633.98	12.799
2:32:23	59.9880	3762.74	335.00	-261.91	0.00	203.50	10.00	0.00	-103.00	7634.31	9.601
2:32:25	59.9870	3763.21	335.00	-256.75	0.00	204.00	10.00	0.00	-103.00	7634.64	10.400
2:32:27	59.9870	3763.21	335.00	-256.75	0.00	204.00	10.00	0.00	-103.00	7634.64	10.400
2:32:29	59.9870	3766.09	335.00	-256.75	0.00	204.50	10.00	0.00	-103.00	7634.97	10.400
2:32:31	59.9930	3766.43	335.00	-256.75	0.00	205.00	10.00	0.00	-103.00	7635.30	5.600
2:32:33	59.9930	3766.43	335.00	-256.75	0.00	205.00	10.00	0.00	-103.00	7635.30	5.600
2:32:35	59.9920	3767.79	335.00	-256.75	0.00	205.50	10.00	0.00	-103.00	7635.63	6.400
2:32:37	59.9890	3768.63	335.00	-256.75	0.00	206.00	10.00	0.00	-103.00	7635.96	8.801
2:32:39	59.9890	3768.63	335.00	-256.75	0.00	206.00	10.00	0.00	-103.00	7635.96	8.801
2:32:41	59.9860	3772.44	335.00	-167.43	0.00	206.50	10.00	0.00	-103.00	7636.29	11.200
2:32:43	59.9830	3773.69	335.00	-167.43	0.00	207.00	10.00	0.00	-103.00	7636.62	13.599
2:32:45	59.9830	3773.69	335.00	-167.43	0.00	207.00	10.00	0.00	-103.00	7636.62	13.599
2:32:47	59.9880	3775.84	335.00	-167.43	0.00	207.50	10.00	0.00	-103.00	7636.95	9.601
2:32:49	59.9960	3775.36	335.00	-167.43	0.00	208.00	10.00	0.00	-103.00	7637.28	3.201
2:32:51	59.9960	3775.36	335.00	-167.43	0.00	208.00	10.00	0.00	-103.00	7637.28	3.201
2:32:53	59.9980	3775.49	335.00	-167.43	0.00	208.50	10.00	0.00	-103.00	7637.61	1.599
2:32:55	60.0010	3776.42	335.00	-164.97	0.00	209.00	10.00	0.00	-103.00	7637.94	-0.800
2:32:57	60.0010	3776.42	335.00	-164.97	0.00	209.00	10.00	0.00	-103.00	7637.94	-0.800
2:32:59	59.9990	3779.69	335.00	-164.97	0.00	209.50	10.00	0.00	-103.00	7638.27	0.800
2:33:01	59.9990	3781.26	335.00	-164.97	0.00	210.00	10.00	0.00	-103.00	7638.60	0.800
2:33:03	59.9990	3781.26	335.00	-164.97	0.00	210.00	10.00	0.00	-103.00	7638.60	0.800
2:33:05	60.0020	3783.09	335.00	-164.97	0.00	210.50	10.00	0.00	-103.00	7638.93	-1.599
2:33:07	60.0070	3783.90	335.00	-164.97	0.00	211.00	10.00	0.00	-103.00	7639.26	-5.600
2:33:09	60.0070	3783.90	335.00	-164.97	0.00	211.00	10.00	0.00	-103.00	7639.26	-5.600
2:33:11	60.0080	3785.77	335.00	-157.63	0.00	211.50	10.00	0.00	-103.00	7639.59	-6.400
2:33:13	60.0140	3785.46	335.00	-157.63	0.00	212.00	10.00	0.00	-103.00	7639.92	-11.200
2:33:15	60.0140	3785.46	335.00	-157.63	0.00	212.00	10.00	0.00	-103.00	7639.92	-11.200
2:33:17	60.0170	3786.30	335.00	-157.63	0.00	212.50	10.00	0.00	-103.00	7640.25	-13.599
2:33:19	60.0210	3787.26	335.00	-157.63	0.00	213.00	10.00	0.00	-103.00	7640.58	-16.800
2:33:21	60.0210	3787.26	335.00	-157.63	0.00	213.00	10.00	0.00	-103.00	7640.58	-16.800
2:33:23	60.0170	3787.96	335.00	-157.63	0.00	213.50	10.00	0.00	-103.00	7640.91	-13.599
2:33:25	60.0190	3788.03	335.00	-155.53	0.00	214.00	10.00	0.00	-103.00	7641.24	-15.201
2:33:27	60.0190	3788.03	335.00	-155.53	0.00	214.00	10.00	0.00	-103.00	7641.24	-15.201
2:33:29	60.0230	3789.22	335.00	-155.53	0.00	214.50	10.00	0.00	-103.00	7641.57	-18.399
2:33:31	60.0250	3787.54	335.00	-155.53	0.00	215.00	10.00	0.00	-103.00	7641.90	-20.001
2:33:33	60.0250	3787.54	335.00	-155.53	0.00	215.00	10.00	0.00	-103.00	7641.90	-20.001
2:33:35	60.0210	3786.08	335.00	-155.53	0.00	215.50	10.00	0.00	-103.00	7642.23	-16.800
2:33:37	60.0240	3787.93	335.00	-155.53	0.00	216.00	10.00	0.00	-103.00	7642.56	-19.199
2:33:39	60.0240	3787.93	335.00	-155.53	0.00	216.00	10.00	0.00	-103.00	7642.56	-19.199
2:33:41	60.0240	3786.87	335.00	-160.45	0.00	216.50	10.00	0.00	-103.00	7642.89	-19.199
2:33:43	60.0200	3786.55	335.00	-160.45	0.00	217.00	10.00	0.00	-103.00	7643.22	-16.000
2:33:45	60.0200	3786.55	335.00	-160.45	0.00	217.00	10.00	0.00	-103.00	7643.22	-16.000
2:33:47	60.0250	3785.02	335.00	-160.45	0.00	217.50	10.00	0.00	-103.00	7643.55	-20.001
2:33:49	60.0200	3785.61	335.00	-160.45	0.00	218.00	10.00	0.00	-103.00	7643.88	-16.000
2:33:51	60.0200	3785.61	335.00	-160.45	0.00	218.00	10.00	0.00	-103.00	7643.88	-16.000

2:33:53	60.0200	3785.80	335.00	-160.45	0.00	218.50	10.00	0.00	-103.00	7644.21	-16.000
2:33:55	60.0220	3786.86	335.00	-163.96	0.00	219.00	10.00	0.00	-103.00	7644.54	-17.599
2:33:57	60.0220	3786.86	335.00	-163.96	0.00	219.00	10.00	0.00	-103.00	7644.54	-17.599
2:33:59	60.0220	3785.25	335.00	-163.96	0.00	219.50	10.00	0.00	-103.00	7644.87	-17.599
2:34:01	60.0210	3785.73	335.00	-163.96	0.00	220.00	10.00	0.00	-103.00	7645.20	-16.800
2:34:03	60.0210	3785.73	335.00	-163.96	0.00	220.00	10.00	0.00	-103.00	7645.20	-16.800
2:34:05	60.0230	3785.82	335.00	-163.96	0.00	220.50	10.00	0.00	-103.00	7645.53	-18.399
2:34:07	60.0220	3785.80	335.00	-163.96	0.00	221.00	10.00	0.00	-103.00	7645.86	-17.599
2:34:09	60.0220	3785.80	335.00	-163.96	0.00	221.00	10.00	0.00	-103.00	7645.86	-17.599
2:34:11	60.0190	3786.94	335.00	-166.07	0.00	221.50	10.00	0.00	-103.00	7646.19	-15.201
2:34:13	60.0180	3787.63	335.00	-166.07	0.00	222.00	10.00	0.00	-103.00	7646.52	-14.401
2:34:15	60.0180	3787.63	335.00	-166.07	0.00	222.00	10.00	0.00	-103.00	7646.52	-14.401
2:34:17	60.0180	3789.67	335.00	-166.07	0.00	222.50	10.00	0.00	-103.00	7646.85	-14.401
2:34:19	60.0190	3789.40	335.00	-166.07	0.00	223.00	10.00	0.00	-103.00	7647.18	-15.201
2:34:21	60.0190	3789.40	335.00	-166.07	0.00	223.00	10.00	0.00	-103.00	7647.18	-15.201
2:34:23	60.0190	3789.18	335.00	-166.07	0.00	223.50	10.00	0.00	-103.00	7647.51	-15.201
2:34:25	60.0150	3789.37	335.00	-163.77	0.00	224.00	10.00	0.00	-103.00	7647.84	-12.000
2:34:27	60.0150	3789.37	335.00	-163.77	0.00	224.00	10.00	0.00	-103.00	7647.84	-12.000
2:34:29	60.0160	3788.66	335.00	-163.77	0.00	224.50	10.00	0.00	-103.00	7648.17	-12.799
2:34:31	60.0130	3788.93	335.00	-163.77	0.00	225.00	10.00	0.00	-103.00	7648.50	-10.400
2:34:33	60.0130	3788.93	335.00	-163.77	0.00	225.00	10.00	0.00	-103.00	7648.50	-10.400
2:34:35	60.0120	3790.81	335.00	-163.77	0.00	225.50	10.00	0.00	-103.00	7648.83	-9.601
2:34:37	60.0100	3790.41	335.00	-163.77	0.00	226.00	10.00	0.00	-103.00	7649.16	-7.999
2:34:39	60.0100	3790.41	335.00	-163.77	0.00	226.00	10.00	0.00	-103.00	7649.16	-7.999
2:34:41	60.0070	3791.54	335.00	-165.10	0.00	226.50	10.00	0.00	-103.00	7649.49	-5.600
2:34:43	60.0090	3792.95	335.00	-165.10	0.00	227.00	10.00	0.00	-103.00	7649.82	-7.199
2:34:45	60.0090	3792.95	335.00	-165.10	0.00	227.00	10.00	0.00	-103.00	7649.82	-7.199
2:34:47	60.0090	3791.44	335.00	-165.10	0.00	227.50	10.00	0.00	-103.00	7650.15	-7.199
2:34:49	60.0030	3791.43	335.00	-165.10	0.00	228.00	10.00	0.00	-103.00	7650.48	-2.399
2:34:51	60.0030	3791.43	335.00	-165.10	0.00	228.00	10.00	0.00	-103.00	7650.48	-2.399
2:34:53	59.9990	3790.46	335.00	-165.10	0.00	228.50	10.00	0.00	-103.00	7650.81	0.800
2:34:55	59.9920	3790.22	335.00	-165.48	0.00	229.00	10.00	0.00	-103.00	7651.14	6.400
2:34:57	59.9920	3790.22	335.00	-165.48	0.00	229.00	10.00	0.00	-103.00	7651.14	6.400
2:34:59	59.9910	3788.46	335.00	-165.48	0.00	229.50	10.00	0.00	-103.00	7651.47	7.199
2:35:01	59.9920	3788.10	335.00	-165.48	0.00	230.00	10.00	0.00	-103.00	7651.80	6.400
2:35:03	59.9920	3788.10	335.00	-165.48	0.00	230.00	10.00	0.00	-103.00	7651.80	6.400
2:35:05	59.9880	3788.19	335.00	-165.48	0.00	230.50	10.00	0.00	-103.00	7652.13	9.601
2:35:07	59.9850	3788.50	335.00	-165.48	0.00	231.00	10.00	0.00	-103.00	7652.46	12.000
2:35:09	59.9850	3788.50	335.00	-165.48	0.00	231.00	10.00	0.00	-103.00	7652.46	12.000
2:35:11	59.9840	3788.57	335.00	-206.46	0.00	231.50	10.00	0.00	-103.00	7652.79	12.799
2:35:13	59.9840	3788.10	335.00	-206.46	0.00	232.00	10.00	0.00	-103.00	7616.00	12.799
2:35:15	59.9840	3788.10	335.00	-206.46	0.00	232.00	10.00	0.00	-103.00	7616.00	12.799
2:35:17	59.9820	3786.45	335.00	-206.46	0.00	232.50	10.00	0.00	-103.00	7626.00	14.401
2:35:19	59.9820	3787.73	335.00	-206.46	0.00	233.00	10.00	0.00	-103.00	7632.00	14.401
2:35:21	59.9820	3787.73	335.00	-206.46	0.00	233.00	10.00	0.00	-103.00	7632.00	14.401
2:35:23	59.9790	3789.29	335.00	-206.46	0.00	233.50	10.00	0.00	-103.00	7632.00	16.800

2:35:25	59.9760	3788.26	335.00	-211.26	0.00	234.00	10.00	0.00	-103.00	7632.00	19.199
2:35:27	59.9760	3788.26	335.00	-211.26	0.00	234.00	10.00	0.00	-103.00	7632.00	19.199
2:35:29	59.9760	3790.47	335.00	-211.26	1.00	234.50	10.00	0.00	-103.00	7632.00	19.199
2:35:31	59.9820	3790.66	335.00	-211.26	1.00	235.00	10.00	0.00	-103.00	7632.00	14.401
2:35:33	59.9820	3790.66	335.00	-211.26	1.00	235.00	10.00	0.00	-103.00	7632.00	14.401
2:35:35	59.9780	3789.67	335.00	-211.26	1.00	235.50	10.00	0.00	-103.00	7632.00	17.599
2:35:37	59.9740	3789.27	335.00	-211.26	1.00	236.00	10.00	0.00	-103.00	7632.00	20.801
2:35:39	59.9740	3789.27	335.00	-211.26	1.00	236.00	10.00	0.00	-103.00	7632.00	20.801
2:35:41	59.9760	3790.43	335.00	-214.35	1.00	236.50	10.00	0.00	-103.00	7632.00	19.199
2:35:43	59.9770	3789.91	335.00	-214.35	1.00	237.00	10.00	0.00	-103.00	7632.00	18.399
2:35:45	59.9770	3789.91	335.00	-214.35	1.00	237.00	10.00	0.00	-103.00	7632.00	18.399
2:35:47	59.9750	3787.44	335.00	-214.35	1.00	237.50	10.00	0.00	-103.00	7632.00	20.001
2:35:49	59.9690	3788.96	335.00	-214.35	2.00	238.00	10.00	0.00	-103.00	7632.00	24.799
2:35:51	59.9690	3788.96	335.00	-214.35	2.00	238.00	10.00	0.00	-103.00	7632.00	24.799
2:35:53	59.9700	3791.88	335.00	-214.35	3.00	238.50	10.00	0.00	-103.00	7632.00	23.999
2:35:55	59.9730	3792.91	335.00	-212.17	4.00	239.00	10.00	0.00	-103.00	7632.00	21.600
2:35:57	59.9730	3792.91	335.00	-212.17	4.00	239.00	10.00	0.00	-103.00	7632.00	21.600
2:35:59	59.9780	3789.13	335.00	-212.17	5.00	239.50	10.00	0.00	-103.00	7632.00	17.599
2:36:01	59.9780	3788.08	335.00	-212.17	6.00	240.00	10.00	0.00	-103.00	7632.00	17.599
2:36:03	59.9780	3788.08	335.00	-212.17	6.00	240.00	10.00	0.00	-103.00	7632.00	17.599
2:36:05	59.9750	3787.14	335.00	-212.17	7.00	240.50	10.00	0.00	-103.00	7632.00	20.001
2:36:07	59.9760	3787.16	335.00	-212.17	8.00	241.00	10.00	0.00	-103.00	7632.00	19.199
2:36:09	59.9760	3787.16	335.00	-212.17	8.00	241.00	10.00	0.00	-103.00	7632.00	19.199
2:36:11	59.9750	3787.40	335.00	-215.60	9.00	241.50	10.00	0.00	-103.00	7632.00	20.001
2:36:13	59.9690	3786.49	335.00	-215.60	10.00	242.00	10.00	0.00	-103.00	7632.00	24.799
2:36:15	59.9690	3786.49	335.00	-215.60	10.00	242.00	10.00	0.00	-103.00	7632.00	24.799
2:36:17	59.9660	3789.21	335.00	-215.60	11.00	242.50	10.00	0.00	-103.00	7632.00	27.200
2:36:19	59.9660	3790.51	335.00	-215.60	12.00	243.00	10.00	0.00	-103.00	7632.00	27.200
2:36:21	59.9660	3790.51	335.00	-215.60	12.00	243.00	10.00	0.00	-103.00	7632.00	27.200
2:36:23	59.9690	3792.22	335.00	-215.60	13.00	243.50	10.00	0.00	-103.00	7632.00	24.799
2:36:25	59.9680	3790.96	335.00	-218.33	14.00	244.00	10.00	0.00	-103.00	7632.00	25.601
2:36:27	59.9680	3790.96	335.00	-218.33	14.00	244.00	10.00	0.00	-103.00	7632.00	25.601
2:36:29	59.9650	3789.03	335.00	-218.33	15.00	244.50	10.00	0.00	-103.00	7632.00	28.000
2:36:31	59.9700	3789.17	335.00	-218.33	16.00	245.00	10.00	0.00	-103.00	7632.00	23.999
2:36:33	59.9700	3789.17	335.00	-218.33	16.00	245.00	10.00	0.00	-103.00	7632.00	23.999
2:36:35	59.9720	3785.69	335.00	-218.33	16.00	245.50	10.00	0.00	-103.00	7632.00	22.400
2:36:37	59.9670	3784.83	335.00	-218.33	16.00	246.00	10.00	0.00	-103.00	7632.00	26.401
2:36:39	59.9670	3784.83	335.00	-218.33	16.00	246.00	10.00	0.00	-103.00	7632.00	26.401
2:36:41	59.9690	3784.32	335.00	-217.38	16.00	246.50	10.00	0.00	-103.00	7632.00	24.799
2:36:43	59.9690	3782.81	335.00	-217.38	16.00	247.00	10.00	0.00	-103.00	7632.00	24.799
2:36:45	59.9690	3782.81	335.00	-217.38	16.00	247.00	10.00	0.00	-103.00	7632.00	24.799
2:36:47	59.9670	3779.35	335.00	-217.38	16.00	247.50	10.00	0.00	-103.00	7631.00	26.401
2:36:49	59.9660	3779.06	335.00	-217.38	16.00	248.00	10.00	0.00	-103.00	7625.00	27.200
2:36:51	59.9660	3779.06	335.00	-217.38	16.00	248.00	10.00	0.00	-103.00	7625.00	27.200
2:36:53	59.9650	3779.21	335.00	-217.38	16.00	248.50	10.00	0.00	-103.00	7623.00	28.000
2:36:55	59.9670	3779.33	335.00	-214.83	16.00	249.00	10.00	0.00	-103.00	7621.00	26.401

2:36:57	59.9670	3779.33	335.00	-214.83	16.00	249.00	10.00	0.00	-103.00	7621.00	26.401
2:36:59	59.9650	3775.65	335.00	-214.83	16.00	249.50	10.00	0.00	-103.00	7623.00	28.000
2:37:01	59.9640	3776.60	335.00	-214.83	16.00	250.00	10.00	0.00	-103.00	7625.00	28.799
2:37:03	59.9640	3776.60	335.00	-214.83	16.00	250.00	10.00	0.00	-103.00	7625.00	28.799
2:37:05	59.9700	3776.02	335.00	-214.83	16.00	250.50	10.00	0.00	-103.00	7627.00	23.999
2:37:07	59.9690	3773.17	335.00	-214.83	16.00	251.00	10.00	0.00	-103.00	7628.00	24.799
2:37:09	59.9690	3773.17	335.00	-214.83	16.00	251.00	10.00	0.00	-103.00	7628.00	24.799
2:37:11	59.9680	3768.79	335.00	-227.66	16.00	251.50	10.00	0.00	-103.00	7628.00	25.601
2:37:13	59.9650	3768.50	335.00	-227.66	16.00	252.00	10.00	0.00	-103.00	7629.00	28.000
2:37:15	59.9650	3768.50	335.00	-227.66	16.00	252.00	10.00	0.00	-103.00	7629.00	28.000
2:37:17	59.9700	3767.37	335.00	-227.66	16.00	252.50	10.00	0.00	-103.00	7630.00	23.999
2:37:19	59.9680	3764.79	335.00	-227.66	16.00	253.00	10.00	0.00	-103.00	7631.00	25.601
2:37:21	59.9680	3764.79	335.00	-227.66	16.00	253.00	10.00	0.00	-103.00	7631.00	25.601
2:37:23	59.9650	3759.59	335.00	-227.66	16.00	253.50	10.00	0.00	-103.00	7635.00	28.000
2:37:25	59.9690	3761.89	335.00	-225.02	16.00	254.00	10.00	0.00	-103.00	7638.00	24.799
2:37:27	59.9690	3761.89	335.00	-225.02	16.00	254.00	10.00	0.00	-103.00	7638.00	24.799
2:37:29	59.9670	3760.58	335.00	-225.02	16.00	254.50	10.00	0.00	-103.00	7639.00	26.401
2:37:31	59.9660	3760.16	335.00	-225.02	16.00	255.00	10.00	0.00	-103.00	7642.00	27.200
2:37:33	59.9660	3760.16	335.00	-225.02	16.00	255.00	10.00	0.00	-103.00	7642.00	27.200
2:37:35	59.9790	3759.49	335.00	-225.02	16.00	255.50	10.00	0.00	-103.00	7644.00	16.800
2:37:37	59.9830	3757.77	335.00	-225.02	16.00	256.00	10.00	0.00	-103.00	7645.00	13.599
2:37:39	59.9830	3757.77	335.00	-225.02	16.00	256.00	10.00	0.00	-103.00	7645.00	13.599
2:37:41	59.9740	3753.09	335.00	-228.37	16.00	256.50	10.00	0.00	-103.00	7647.00	20.801
2:37:43	59.9650	3751.64	335.00	-228.37	16.00	257.00	10.00	0.00	-103.00	7648.00	28.000
2:37:45	59.9650	3751.64	335.00	-228.37	16.00	257.00	10.00	0.00	-103.00	7648.00	28.000
2:37:47	59.9620	3758.22	335.00	-228.37	16.00	257.50	10.00	0.00	-103.00	7649.00	30.399
2:37:49	59.9610	3759.25	335.00	-228.37	16.00	258.00	10.00	0.00	-103.00	7650.00	31.201
2:37:51	59.9610	3759.25	335.00	-228.37	16.00	258.00	10.00	0.00	-103.00	7650.00	31.201
2:37:53	59.9610	3760.96	335.00	-228.37	16.00	258.50	10.00	0.00	-103.00	7651.00	31.201
2:37:55	59.9630	3762.02	335.00	-234.08	16.00	259.00	10.00	0.00	-103.00	7652.00	29.599
2:37:57	59.9630	3762.02	335.00	-234.08	16.00	259.00	10.00	0.00	-103.00	7652.00	29.599
2:37:59	59.9590	3763.10	335.00	-234.08	16.00	259.50	10.00	0.00	-103.00	7653.00	32.800
2:38:01	59.9510	3763.86	335.00	-234.08	16.00	260.00	10.00	0.00	-103.00	7654.00	39.200
2:38:03	59.9510	3763.86	335.00	-234.08	16.00	260.00	10.00	0.00	-103.00	7654.00	39.200
2:38:05	59.9530	3766.13	335.00	-234.08	16.00	260.50	10.00	0.00	-103.00	7655.00	37.601
2:38:07	59.9570	3768.34	335.00	-234.08	16.00	261.00	10.00	0.00	-103.00	7655.00	34.399
2:38:09	59.9570	3768.34	335.00	-234.08	16.00	261.00	10.00	0.00	-103.00	7655.00	34.399
2:38:11	59.9560	3767.44	335.00	-228.80	16.00	261.50	10.00	0.00	-103.00	7656.00	35.199
2:38:13	59.9630	3765.61	335.00	-228.80	16.00	262.00	10.00	0.00	-103.00	7656.00	29.599
2:38:15	59.9630	3765.61	335.00	-228.80	16.00	262.00	10.00	0.00	-103.00	7656.00	29.599
2:38:17	59.9610	3761.57	335.00	-228.80	16.00	262.50	10.00	0.00	-103.00	7657.00	31.201
2:38:19	59.9630	3761.92	335.00	-228.80	16.00	263.00	10.00	0.00	-103.00	7657.00	29.599
2:38:21	59.9630	3761.92	335.00	-228.80	16.00	263.00	10.00	0.00	-103.00	7657.00	29.599
2:38:23	59.9630	3758.52	335.00	-228.80	16.00	263.50	10.00	0.00	-103.00	7658.00	29.599
2:38:25	59.9680	3752.43	335.00	-229.47	16.00	264.00	10.00	0.00	-103.00	7658.00	25.601
2:38:27	59.9680	3752.43	335.00	-229.47	16.00	264.00	10.00	0.00	-103.00	7658.00	25.601

2:38:29	59.9680	3753.83	335.00	-229.47	16.00	264.50	10.00	0.00	-103.00	7659.00	25.601
2:38:31	59.9700	3753.51	335.00	-229.47	16.00	265.00	10.00	0.00	-103.00	7659.00	23.999
2:38:33	59.9700	3753.51	335.00	-229.47	16.00	265.00	10.00	0.00	-103.00	7659.00	23.999
2:38:35	59.9730	3752.74	335.00	-229.47	16.00	265.50	10.00	0.00	-103.00	7659.00	21.600
2:38:37	59.9650	3753.18	335.00	-229.47	16.00	266.00	10.00	0.00	-103.00	7660.00	28.000
2:38:39	59.9650	3753.18	335.00	-229.47	16.00	266.00	10.00	0.00	-103.00	7660.00	28.000
2:38:41	59.9670	3753.29	335.00	-228.98	16.00	266.50	10.00	0.00	-103.00	7660.00	26.401
2:38:43	59.9720	3752.87	335.00	-228.98	16.00	267.00	10.00	0.00	-103.00	7661.00	22.400
2:38:45	59.9720	3752.87	335.00	-228.98	16.00	267.00	10.00	0.00	-103.00	7661.00	22.400
2:38:47	59.9760	3749.40	335.00	-228.98	16.00	267.50	10.00	0.00	-103.00	7661.00	19.199
2:38:49	59.9690	3747.48	335.00	-228.98	16.00	268.00	10.00	0.00	-103.00	7662.00	24.799
2:38:51	59.9690	3747.48	335.00	-228.98	16.00	268.00	10.00	0.00	-103.00	7662.00	24.799
2:38:53	59.9730	3741.29	335.00	-228.98	16.00	268.50	10.00	0.00	-103.00	7662.00	21.600
2:38:55	59.9780	3746.65	335.00	-219.98	16.00	269.00	10.00	0.00	-103.00	7663.00	17.599
2:38:57	59.9780	3746.65	335.00	-219.98	16.00	269.00	10.00	0.00	-103.00	7663.00	17.599
2:38:59	59.9810	3743.35	335.00	-219.98	16.00	269.50	10.00	0.00	-103.00	7663.00	15.201
2:39:01	59.9810	3741.62	335.00	-219.98	16.00	270.00	10.00	0.00	-103.00	7664.00	15.201
2:39:03	59.9810	3741.62	335.00	-219.98	16.00	270.00	10.00	0.00	-103.00	7664.00	15.201
2:39:05	59.9820	3738.48	335.00	-219.98	16.00	270.50	10.00	0.00	-103.00	7664.00	14.401
2:39:07	59.9840	3738.90	335.00	-219.98	16.00	271.00	10.00	0.00	-103.00	7665.00	12.799
2:39:09	59.9840	3738.90	335.00	-219.98	16.00	271.00	10.00	0.00	-103.00	7665.00	12.799
2:39:11	59.9820	3737.27	335.00	-229.09	16.00	271.50	10.00	0.00	-103.00	7666.00	14.401
2:39:13	59.9790	3736.31	335.00	-229.09	16.00	272.00	10.00	0.00	-103.00	7666.00	16.800
2:39:15	59.9790	3736.31	335.00	-229.09	16.00	272.00	10.00	0.00	-103.00	7666.00	16.800
2:39:17	59.9800	3735.45	335.00	-229.09	16.00	272.50	10.00	0.00	-103.00	7667.00	16.000
2:39:19	59.9780	3735.65	335.00	-229.09	16.00	273.00	10.00	0.00	-103.00	7668.00	17.599
2:39:21	59.9780	3735.65	335.00	-229.09	16.00	273.00	10.00	0.00	-103.00	7668.00	17.599
2:39:23	59.9800	3738.01	335.00	-229.09	16.00	273.50	10.00	0.00	-103.00	7668.00	16.000
2:39:25	59.9800	3736.75	335.00	-229.66	16.00	274.00	10.00	0.00	-103.00	7669.00	16.000
2:39:27	59.9800	3736.75	335.00	-229.66	16.00	274.00	10.00	0.00	-103.00	7669.00	16.000
2:39:29	59.9780	3736.07	335.00	-229.66	16.00	274.50	10.00	0.00	-103.00	7669.00	17.599
2:39:31	59.9720	3736.09	335.00	-229.66	16.00	275.00	10.00	0.00	-103.00	7670.00	22.400
2:39:33	59.9720	3736.09	335.00	-229.66	16.00	275.00	10.00	0.00	-103.00	7670.00	22.400
2:39:35	59.9710	3738.57	335.00	-229.66	16.00	275.50	10.00	0.00	-103.00	7670.00	23.199
2:39:37	59.9740	3738.87	335.00	-229.66	16.00	276.00	10.00	0.00	-103.00	7671.00	20.801
2:39:39	59.9740	3738.87	335.00	-229.66	16.00	276.00	10.00	0.00	-103.00	7671.00	20.801
2:39:41	59.9750	3738.65	335.00	-229.23	16.00	276.50	10.00	0.00	-103.00	7671.00	20.001
2:39:43	59.9720	3737.68	335.00	-229.23	16.00	277.00	10.00	0.00	-103.00	7672.00	22.400
2:39:45	59.9720	3737.68	335.00	-229.23	16.00	277.00	10.00	0.00	-103.00	7672.00	22.400
2:39:47	59.9690	3737.89	335.00	-229.23	16.00	277.50	10.00	0.00	-103.00	7673.00	24.799
2:39:49	59.9740	3740.02	335.00	-229.23	16.00	278.00	10.00	0.00	-103.00	7673.00	20.801
2:39:51	59.9740	3740.02	335.00	-229.23	16.00	278.00	10.00	0.00	-103.00	7673.00	20.801
2:39:53	59.9720	3742.05	350.00	-229.23	16.00	278.50	10.00	0.00	-103.00	7673.00	22.400
2:39:55	59.9720	3742.42	350.00	-231.41	16.00	279.00	10.00	0.00	-103.00	7673.00	22.400
2:39:57	59.9720	3742.42	350.00	-231.41	16.00	279.00	10.00	0.00	-103.00	7673.00	22.400
2:39:59	59.9770	3742.25	350.00	-231.41	16.00	279.50	10.00	0.00	-103.00	7673.00	18.399

2:40:01	59.9780	3741.72	350.00	-231.41	16.00	280.00	10.00	0.00	-103.00	7673.00	17.599
2:40:03	59.9780	3741.72	350.00	-231.41	16.00	280.00	10.00	0.00	-103.00	7673.00	17.599
2:40:05	59.9760	3740.63	350.00	-231.41	16.00	280.50	10.00	0.00	-103.00	7673.00	19.199
2:40:07	59.9740	3739.96	350.00	-231.41	16.00	281.00	10.00	0.00	-103.00	7673.00	20.801
2:40:09	59.9740	3739.96	350.00	-231.41	16.00	281.00	10.00	0.00	-103.00	7673.00	20.801
2:40:11	59.9770	3742.83	350.00	-218.62	16.00	281.50	10.00	0.00	-103.00	7673.00	18.399
2:40:13	59.9780	3741.27	350.00	-218.62	16.00	282.00	10.00	0.00	-103.00	7673.00	17.599
2:40:15	59.9780	3741.27	350.00	-218.62	16.00	282.00	10.00	0.00	-103.00	7673.00	17.599
2:40:17	59.9790	3738.97	350.00	-218.62	16.00	282.50	10.00	0.00	-103.00	7673.00	16.800
2:40:19	59.9770	3738.71	350.00	-218.62	16.00	283.00	10.00	0.00	-103.00	7673.00	18.399
2:40:21	59.9770	3738.71	350.00	-218.62	16.00	283.00	10.00	0.00	-103.00	7673.00	18.399
2:40:23	59.9740	3739.86	350.00	-218.62	16.00	283.50	10.00	0.00	-103.00	7673.00	20.801
2:40:25	59.9710	3738.10	350.00	-213.54	16.00	284.00	10.00	0.00	-103.00	7673.00	23.199
2:40:27	59.9710	3738.10	350.00	-213.54	16.00	284.00	10.00	0.00	-103.00	7673.00	23.199
2:40:29	59.9710	3743.51	350.00	-213.54	16.00	284.50	10.00	0.00	-103.00	7673.00	23.199
2:40:31	59.9680	3743.42	350.00	-213.54	16.00	285.00	10.00	0.00	-103.00	7673.00	25.601
2:40:33	59.9680	3743.42	350.00	-213.54	16.00	285.00	10.00	0.00	-103.00	7673.00	25.601
2:40:35	59.9660	3745.74	350.00	-213.54	16.00	285.50	10.00	0.00	-103.00	7674.00	27.200
2:40:37	59.9710	3747.34	350.00	-213.54	16.00	286.00	10.00	0.00	-103.00	7675.00	23.199
2:40:39	59.9710	3747.34	350.00	-213.54	16.00	286.00	10.00	0.00	-103.00	7675.00	23.199
2:40:41	59.9730	3749.75	350.00	-225.65	16.00	286.50	10.00	0.00	-103.00	7676.00	21.600
2:40:43	59.9690	3746.22	350.00	-225.65	16.00	287.00	10.00	0.00	-103.00	7677.00	24.799
2:40:45	59.9690	3746.22	350.00	-225.65	16.00	287.00	10.00	0.00	-103.00	7677.00	24.799
2:40:47	59.9720	3743.75	350.00	-225.65	16.00	287.50	10.00	0.00	-103.00	7678.00	22.400
2:40:49	59.9730	3743.15	350.00	-225.65	16.00	288.00	10.00	0.00	-103.00	7679.00	21.600
2:40:51	59.9730	3743.15	350.00	-225.65	16.00	288.00	10.00	0.00	-103.00	7679.00	21.600
2:40:53	59.9700	3739.45	350.00	-225.65	16.00	288.50	10.00	0.00	-103.00	7680.00	23.999
2:40:55	59.9740	3733.38	350.00	-212.57	16.00	289.00	10.00	0.00	-103.00	7681.00	20.801
2:40:57	59.9740	3733.38	350.00	-212.57	16.00	289.00	10.00	0.00	-103.00	7681.00	20.801
2:40:59	59.9820	3737.58	350.00	-212.57	16.00	289.50	10.00	0.00	-103.00	7682.00	14.401
2:41:01	59.9850	3736.23	350.00	-212.57	16.00	290.00	10.00	0.00	-103.00	7684.00	12.000
2:41:03	59.9850	3736.23	350.00	-212.57	16.00	290.00	10.00	0.00	-103.00	7684.00	12.000
2:41:05	59.9850	3733.43	350.00	-212.57	16.00	290.50	10.00	0.00	-103.00	7685.00	12.000
2:41:07	59.9890	3733.12	350.00	-212.57	16.00	291.00	10.00	0.00	-103.00	7687.00	8.801
2:41:09	59.9890	3733.12	350.00	-212.57	16.00	291.00	10.00	0.00	-103.00	7687.00	8.801
2:41:11	59.9890	3729.18	350.00	-219.90	16.00	291.50	10.00	0.00	-103.00	7689.00	8.801
2:41:13	59.9870	3725.46	350.00	-219.90	16.00	292.00	10.00	0.00	-103.00	7690.00	10.400
2:41:15	59.9870	3725.46	350.00	-219.90	16.00	292.00	10.00	0.00	-103.00	7690.00	10.400
2:41:17	59.9900	3720.11	350.00	-219.90	16.00	292.50	10.00	0.00	-103.00	7692.00	7.999
2:41:19	59.9960	3720.94	350.00	-219.90	16.00	293.00	10.00	0.00	-103.00	7692.00	3.201
2:41:21	59.9960	3720.94	350.00	-219.90	16.00	293.00	10.00	0.00	-103.00	7692.00	3.201
2:41:23	60.0010	3725.68	350.00	-219.90	16.00	293.50	10.00	0.00	-103.00	7693.00	-0.800
2:41:25	60.0040	3727.75	350.00	-231.18	16.00	294.00	10.00	0.00	-103.00	7693.00	-3.201
2:41:27	60.0040	3727.75	350.00	-231.18	16.00	294.00	10.00	0.00	-103.00	7693.00	-3.201
2:41:29	60.0060	3727.68	350.00	-231.18	16.00	294.50	10.00	0.00	-103.00	7694.00	-4.800
2:41:31	60.0140	3727.23	350.00	-231.18	16.00	295.00	10.00	0.00	-103.00	7694.00	-11.200

2:41:33	60.0140	3727.23	350.00	-231.18	16.00	295.00	10.00	0.00	-103.00	7694.00	-11.200
2:41:35	60.0190	3726.45	350.00	-231.18	16.00	295.50	10.00	0.00	-103.00	7695.00	-15.201
2:41:37	60.0250	3726.02	350.00	-231.18	16.00	296.00	10.00	0.00	-103.00	7695.00	-20.001
2:41:39	60.0250	3726.02	350.00	-231.18	16.00	296.00	10.00	0.00	-103.00	7695.00	-20.001
2:41:41	60.0260	3716.37	350.00	-226.63	16.00	296.50	10.00	0.00	-103.00	7695.00	-20.801
2:41:43	60.0290	3717.33	350.00	-226.63	16.00	297.00	10.00	0.00	-103.00	7696.00	-23.199
2:41:45	60.0290	3717.33	350.00	-226.63	16.00	297.00	10.00	0.00	-103.00	7696.00	-23.199
2:41:47	60.0290	3717.14	350.00	-226.63	16.00	297.50	10.00	0.00	-103.00	7696.00	-23.199
2:41:49	60.0360	3715.17	350.00	-226.63	16.00	298.00	10.00	0.00	-103.00	7697.00	-28.799
2:41:51	60.0360	3715.17	350.00	-226.63	16.00	298.00	10.00	0.00	-103.00	7697.00	-28.799
2:41:53	60.0370	3710.28	350.00	-226.63	16.00	298.50	10.00	0.00	-103.00	7697.00	-29.599
2:41:55	60.0360	3710.16	350.00	-227.26	16.00	299.00	10.00	0.00	-103.00	7697.00	-28.799
2:41:57	60.0360	3710.16	350.00	-227.26	16.00	299.00	10.00	0.00	-103.00	7697.00	-28.799
2:41:59	60.0410	3698.59	350.00	-227.26	16.00	299.50	10.00	0.00	-103.00	7698.00	-32.800
2:42:01	60.0440	3704.59	350.00	-227.26	16.00	300.00	10.00	0.00	-103.00	7698.00	-35.199
2:42:03	60.0440	3704.59	350.00	-227.26	16.00	300.00	10.00	0.00	-103.00	7698.00	-35.199
2:42:05	60.0430	3702.48	350.00	-227.26	16.00	300.50	10.00	0.00	-103.00	7698.33	-34.399
2:42:07	60.0480	3701.32	350.00	-227.26	16.00	301.00	10.00	0.00	-103.00	7698.66	-38.400
2:42:09	60.0480	3701.32	350.00	-227.26	16.00	301.00	10.00	0.00	-103.00	7698.66	-38.400
2:42:11	60.0460	3699.53	350.00	-229.29	16.00	301.50	10.00	0.00	-103.00	7698.99	-36.801
2:42:13	60.0430	3699.73	350.00	-229.29	16.00	302.00	10.00	0.00	-103.00	7699.32	-34.399
2:42:15	60.0430	3699.73	350.00	-229.29	16.00	302.00	10.00	0.00	-103.00	7699.32	-34.399
2:42:17	60.0430	3690.48	350.00	-229.29	16.00	302.50	10.00	0.00	-103.00	7699.65	-34.399
2:42:19	60.0430	3696.86	350.00	-229.29	16.00	303.00	10.00	0.00	-103.00	7699.98	-34.399
2:42:21	60.0430	3696.86	350.00	-229.29	16.00	303.00	10.00	0.00	-103.00	7699.98	-34.399

Date:	Monday, October 12, 2009				
Time of T(0)	2:27:21				
ncy Recovery to 60 Hz or Pre-Perturbation Hz	2:33:03				Time of Frequency Recovery to 60 Hz or Pre-P
urbation Average Frequency [T(-2) to T(-16)]	60.0417	Hz			Value A Pre-Perturbation Average Frequency [T
rbation Average Frequency [T(+12 to T(+24)]	59.8823	Hz			Value B Post-Perturbation Average Frequency [T
to Post Perturbation Delta Frequency Actual	-0.159	Hz			Pre to Post Perturbation Delta Fre
on Average Interchange MW [T(-2) to T(-16)]	3647.05	MW			Value A Pre-Perturbation Average Interchange MW [T
n Average Interchange MW [T(+12 to T(+24)]	3766.69	MW			Value B Post-Perturbation Average Interchange MW [T
st Perturbation Interchange Delta MW Actual	119.64	MW			Pre to Post Perturbation Interchange De
Net Total Adjustments	-53.75	MW			Net Tot
EPFR for FRO Pre-Perturbation Average	-33.40	MW			EPFR for FRO Pre-Perturl
EPFR for FRO Post-Perturbation Average	94.17	MW			EPFR for FRO Post-Perturl
EPFR for FRO Delta	127.57	MW			EPFI
EPFR for FRO Adjusted	73.82	MW			EPFR fo
Pre JOU Dynamic Schedules MW	350.00		Pre-Perturbation Bias Setting	-103.000 MW/0.1 Hz	Pre JOU Dynamic
Pre Non-Conforming Load MW	-165.43		Post-Perturbation Bias Setting	-103.000 MW/0.1 Hz	Pre Non-Confor
Pre Pumped Hydro MW	0.00		EPFR for Bias Setting Pre-Perturbation Average	-43.0025 MW	Pre Pump
Pre Ramping Units MW	151.81		EPFR for Bias Setting Post-Perturbation Average	121.2453 MW	Pre Ram
Pre Transferred Frequency Response MW	-4.17		EPFR for Bias Setting Delta	164.2478 MW	Pre Transferred Frequency
Pre Contingent BA Lost Generation MW	15.00		Primary Frequency Response Delivery of Bias	72.84%	Pre Contingent BA Lost G
Sum of Pre Perturbation Adjustments	347.21				Sum of Pre Perturbatio
Post JOU Dynamic Schedules MW	335.00		Pre-Perturbation BA Load	7600.196 MW	Post JOU Dynamic
Post Non-Conforming Load MW	-209.89		Post-Perturbation BA Load	7570.000 MW	Post Non-Confor
Post Pumped Hydro MW	0.43		Pre to Post Perturbation BA Load Change	-30.196 MW	Post Pump
Post Ramping Units MW	156.14		Load Dampening Frequency Response	-18.936 MW/0.1 Hz	Post Ram
Post Transferred Frequency Response MW	11.77		Load Dampening % of Total BA Frequency Response	25.24%	Post Transferred Frequency
Post Contingent BA Lost Generation MW	0.00				Post Contingent BA Lost G
Sum of Post Perturbation Adjustments	293.46				Sum of Post Perturbatio
Net Total Adjustments MW	-53.75				Net Total Ad

Average Period Evaluation

Initial P.U. Performance for FRO	0.938	P.U.
Initial P.U. Performance Adjusted for FRO	1.359	P.U.

18 to 30 second Average Period Evalu

Initial P.U. Perfor

Initial P.U. Performance Ac

Net Actual Interchange MW	JOU Dynamic Schedules Imp(-) Exp (+) MW	Non-Conforming Load Load (-) MW	Pumped Hydro Load (-) Gen (+) MW	Ramping Units Gen (+) MW	Transferred Frequency Response Rec (-) Del (+) MW/0.1 Hz	Contingent BA Lost Generation Load (-) Gen (+) MW	BA Bias Setting MW/0.1 Hz	BA Load MW	EPFR MW	Expected Net Actual Interchange MW

T	Frequency Hz	Net Actual Interchange MW	JOU Dynamic Schedules Imp(-) Exp (+) MW
T-72 sec	2:26:09		
T-70 sec	2:26:11		
T-68 sec	2:26:13		

										T-66 sec	2:26:15				
										T-64 sec	2:26:17				
										T-62 sec	2:26:19				
										T-60 sec	2:26:21				
										T-58 sec	2:26:23				
										T-56 sec	2:26:25				
										T-54 sec	2:26:27				
										T-52 sec	2:26:29				
										T-50 sec	2:26:31				
										T-48 sec	2:26:33				
										T-46 sec	2:26:35				
										T-44 sec	2:26:37				
										T-42 sec	2:26:39				
										T-40 sec	2:26:41				
										T-38 sec	2:26:43				
										T-36 sec	2:26:45				
										T-34 sec	2:26:47				
										T-32 sec	2:26:49				
										T-30 sec	2:26:51				
										T-28 sec	2:26:53				
										T-26 sec	2:26:55				
										T-24 sec	2:26:57				
										T-22 sec	2:26:59				
										T-20 sec	2:27:01				
										T-18 sec	2:27:03				
3647.046	350.000	-165.430		0.000	151.813	10.000	15.000	-103.000	7600.196	-33.400		T-16 sec	2:27:05	60.042	3647.046	350.000
3647.046	350.000	-165.430		0.000	151.813	10.000	15.000	-103.000	7600.196	-33.400		T-14 sec	2:27:07	60.042	3647.046	350.000
3647.046	350.000	-165.430		0.000	151.813	10.000	15.000	-103.000	7600.196	-33.400		T-12 sec	2:27:09	60.042	3647.046	350.000
3647.046	350.000	-165.430		0.000	151.813	10.000	15.000	-103.000	7600.196	-33.400		T-10 sec	2:27:11	60.042	3647.046	350.000
3647.046	350.000	-165.430		0.000	151.813	10.000	15.000	-103.000	7600.196	-33.400		T-08 sec	2:27:13	60.042	3647.046	350.000
3647.046	350.000	-165.430		0.000	151.813	10.000	15.000	-103.000	7600.196	-33.400		T-06 sec	2:27:15	60.042	3647.046	350.000
3647.046	350.000	-165.430		0.000	151.813	10.000	15.000	-103.000	7600.196	-33.400		T-04 sec	2:27:17	60.042	3647.046	350.000
3647.046	350.000	-165.430		0.000	151.813	10.000	15.000	-103.000	7600.196	-33.400		T-02 sec	2:27:19	60.042	3647.046	350.000
												T+0 sec	2:27:21			
												T+02 sec	2:27:23			
												T+04 sec	2:27:25			
												T+06 sec	2:27:27			
												T+08 sec	2:27:29			
												T+10 sec	2:27:31			
3766.689	335.000	-209.885		0.429	156.143	10.000	0.000	-103.000	7570.000	94.171	3720.866	T+12 sec	2:27:33			
3766.689	335.000	-209.885		0.429	156.143	10.000	0.000	-103.000	7570.000	94.171	3720.866	T+14 sec	2:27:35			
3766.689	335.000	-209.885		0.429	156.143	10.000	0.000	-103.000	7570.000	94.171	3720.866	T+16 sec	2:27:37			
3766.689	335.000	-209.885		0.429	156.143	10.000	0.000	-103.000	7570.000	94.171	3720.866	T+18 sec	2:27:39	59.884	3778.540	335.000
3766.689	335.000	-209.885		0.429	156.143	10.000	0.000	-103.000	7570.000	94.171	3720.866	T+20 sec	2:27:41	59.884	3778.540	335.000
3766.689	335.000	-209.885		0.429	156.143	10.000	0.000	-103.000	7570.000	94.171	3720.866	T+22 sec	2:27:43	59.884	3778.540	335.000
3766.689	335.000	-209.885		0.429	156.143	10.000	0.000	-103.000	7570.000	94.171	3720.866	T+24 sec	2:27:45	59.884	3778.540	335.000

T+26 sec	2:27:47	59.884	3778.540	335.000
T+28 sec	2:27:49	59.884	3778.540	335.000
T+30 sec	2:27:51	59.884	3778.540	335.000
T+32 sec	2:27:53			
T+34 sec	2:27:55			
T+36 sec	2:27:57			
T+38 sec	2:27:59			
T+40 sec	2:28:01			
T+42 sec	2:28:03			
T+44 sec	2:28:05			
T+46 sec	2:28:07			
T+48 sec	2:28:09			
T+50 sec	2:28:11			
T+52 sec	2:28:13			
T+54 sec	2:28:15			
T+56 sec	2:28:17			
T+58 sec	2:28:19			
T+60 sec	2:28:21			
T+62 sec	2:28:23			
T+64 sec	2:28:25			
T+66 sec	2:28:27			
T+68 sec	2:28:29			
T+70 sec	2:28:31			
T+72 sec	2:28:33			
T+74 sec	2:28:35			
T+76 sec	2:28:37			
T+78 sec	2:28:39			
T+80 sec	2:28:41			

Date:	Monday, October 12, 2009				
Time of T(0)	2:27:21				
erturbation Hz	2:33:03				
T(-2) to T(-16)]	60.0417	Hz			
(+18 to T(+30)]	59.8844	Hz			
equency Actual	-0.157	Hz			
T(-2) to T(-16)]	3647.05	MW			
(+18 to T(+30)]	3778.54	MW			
elta MW Actual	131.49	MW			
al Adjustments	-53.91	MW			
bation Average	-33.40	MW			
bation Average	92.46	MW			
R for FRO Delta	125.86	MW			
r FRO Adjusted	71.95	MW			
Schedules MW	350.00		Pre-Perturbation Bias Setting	-103.000	MW/0.1 Hz
ming Load MW	-165.43		Post-Perturbation Bias Setting	-103.000	MW/0.1 Hz
ped Hydro MW	0.00		EPFR for Bias Setting Pre-Perturbation Average	-43.0025	MW
ping Units MW	151.81		EPFR for Bias Setting Post-Perturbation Average	119.0383	MW
Response MW	-4.17		EPFR for Bias Setting Delta	162.0407	MW
ieneration MW	15.00		Primary Frequency Response Delivery of Bias	81.15%	
n Adjustments	347.21				
Schedules MW	335.00		Pre-Perturbation BA Load	7600.196	MW
ming Load MW	-211.26		Post-Perturbation BA Load	7570.000	MW
ped Hydro MW	0.86		Pre to Post Perturbation BA Load Change	-30.196	MW
ping Units MW	157.14		Load Dampening Frequency Response	-19.194	MW/0.1 Hz
Response MW	11.56		Load Dampening % of Total BA Frequency Response	22.96%	
ieneration MW	0.00				
n Adjustments	293.30				
justments MW	-53.91				

uation

mance for FRO	1.045	P.U.
djusted for FRO	1.473	P.U.

Non-Conforming Load Load (-) MW	Pumped Hydro Load (-) Gen (+) MW	Ramping Units Gen (+) MW	Transferred Frequency Response Rec (-) Del (+) MW/0.1 Hz	Contingent BA Lost Generation Load (-) Gen (+) MW	BA Bias Setting MW/0.1 Hz	BA Load MW	EPFR MW	Expected Net Actual Interchange MW

Date:	Monday, October 12, 2009	
Time of T(0)	2:27:21	
Time of Frequency Recovery to 60 Hz or Pre-Perturbation Hz	2:33:03	
Value A Pre-Perturbation Average Frequency [T(-2) to T(-16)]	60.0417	
Value B Post-Perturbation Average Frequency [T(+20 to T(+40)]	59.8892	
Pre to Post Perturbation Delta Frequency Actual	-0.153	
Value A Pre-Perturbation Average Interchange MW [T(-2) to T(-16)]	3647.05	
Value B Post-Perturbation Average Interchange MW [T(+20 to T(+40)]	3783.77	
Pre to Post Perturbation Interchange Delta MW Actual	136.73	
Net Total Adjustments	-54.51	
EPFR for FRO Pre-Perturbation Average	-33.40	
EPFR for FRO Post-Perturbation Average	88.65	
EPFR for FRO Delta	122.05	
EPFR for FRO Adjusted	67.54	
Pre JOU Dynamic Schedules MW	350.00	
Pre Non-Conforming Load MW	-165.43	
Pre Pumped Hydro MW	0.00	
Pre Ramping Units MW	151.81	
Pre Transferred Frequency Response MW	-4.17	
Pre Contingent BA Lost Generation MW	15.00	
Sum of Pre Perturbation Adjustments	347.21	
Post JOU Dynamic Schedules MW	335.00	
Post Non-Conforming Load MW	-212.66	
Post Pumped Hydro MW	1.09	
Post Ramping Units MW	158.18	
Post Transferred Frequency Response MW	11.08	
Post Contingent BA Lost Generation MW	0.00	
Sum of Post Perturbation Adjustments	292.69	
Net Total Adjustments MW	-54.51	

20 to 40 second Average Period Evaluation

Initial P.U. Performance for FRO	1.120	
Initial P.U. Performance Adjusted for FRO	1.567	

T	Frequency Hz	Net Actual Interchange MW	JOU Dynamic Schedules Imp(-) Exp (+) MW	Non-Conforming Load Load (-) MW	Pumped Hydro Load (-) Gen (+) MW

T-72 sec	2:26:09
T-70 sec	2:26:11
T-68 sec	2:26:13

								T-66 sec	2:26:15						
								T-64 sec	2:26:17						
								T-62 sec	2:26:19						
								T-60 sec	2:26:21						
								T-58 sec	2:26:23						
								T-56 sec	2:26:25						
								T-54 sec	2:26:27						
								T-52 sec	2:26:29						
								T-50 sec	2:26:31						
								T-48 sec	2:26:33						
								T-46 sec	2:26:35						
								T-44 sec	2:26:37						
								T-42 sec	2:26:39						
								T-40 sec	2:26:41						
								T-38 sec	2:26:43						
								T-36 sec	2:26:45						
								T-34 sec	2:26:47						
								T-32 sec	2:26:49						
								T-30 sec	2:26:51						
								T-28 sec	2:26:53						
								T-26 sec	2:26:55						
								T-24 sec	2:26:57						
								T-22 sec	2:26:59						
								T-20 sec	2:27:01						
								T-18 sec	2:27:03						
-165.430	0.000	151.813	10.000	15.000	-103.000	7600.196	-33.400	T-16 sec	2:27:05	60.042	3647.046	350.000	-165.430	0.000	
-165.430	0.000	151.813	10.000	15.000	-103.000	7600.196	-33.400	T-14 sec	2:27:07	60.042	3647.046	350.000	-165.430	0.000	
-165.430	0.000	151.813	10.000	15.000	-103.000	7600.196	-33.400	T-12 sec	2:27:09	60.042	3647.046	350.000	-165.430	0.000	
-165.430	0.000	151.813	10.000	15.000	-103.000	7600.196	-33.400	T-10 sec	2:27:11	60.042	3647.046	350.000	-165.430	0.000	
-165.430	0.000	151.813	10.000	15.000	-103.000	7600.196	-33.400	T-08 sec	2:27:13	60.042	3647.046	350.000	-165.430	0.000	
-165.430	0.000	151.813	10.000	15.000	-103.000	7600.196	-33.400	T-06 sec	2:27:15	60.042	3647.046	350.000	-165.430	0.000	
-165.430	0.000	151.813	10.000	15.000	-103.000	7600.196	-33.400	T-04 sec	2:27:17	60.042	3647.046	350.000	-165.430	0.000	
-165.430	0.000	151.813	10.000	15.000	-103.000	7600.196	-33.400	T-02 sec	2:27:19	60.042	3647.046	350.000	-165.430	0.000	
								T+0 sec	2:27:21						
								T+02 sec	2:27:23						
								T+04 sec	2:27:25						
								T+06 sec	2:27:27						
								T+08 sec	2:27:29						
								T+10 sec	2:27:31						
								T+12 sec	2:27:33						
								T+14 sec	2:27:35						
								T+16 sec	2:27:37						
-211.256	0.857	157.143	10.000	0.000	-103.000	7570.000	92.457	3718.996	T+18 sec	2:27:39					
-211.256	0.857	157.143	10.000	0.000	-103.000	7570.000	92.457	3718.996	T+20 sec	2:27:41	59.889	3783.772	335.000	-212.661	1.091
-211.256	0.857	157.143	10.000	0.000	-103.000	7570.000	92.457	3718.996	T+22 sec	2:27:43	59.889	3783.772	335.000	-212.661	1.091
-211.256	0.857	157.143	10.000	0.000	-103.000	7570.000	92.457	3718.996	T+24 sec	2:27:45	59.889	3783.772	335.000	-212.661	1.091

-211.256	0.857	157.143	10.000	0.000	-103.000	7570.000	92.457	3718.996	T+26 sec	2:27:47	59.889	3783.772	335.000	-212.661	1.091
-211.256	0.857	157.143	10.000	0.000	-103.000	7570.000	92.457	3718.996	T+28 sec	2:27:49	59.889	3783.772	335.000	-212.661	1.091
-211.256	0.857	157.143	10.000	0.000	-103.000	7570.000	92.457	3718.996	T+30 sec	2:27:51	59.889	3783.772	335.000	-212.661	1.091
									T+32 sec	2:27:53	59.889	3783.772	335.000	-212.661	1.091
									T+34 sec	2:27:55	59.889	3783.772	335.000	-212.661	1.091
									T+36 sec	2:27:57	59.889	3783.772	335.000	-212.661	1.091
									T+38 sec	2:27:59	59.889	3783.772	335.000	-212.661	1.091
									T+40 sec	2:28:01	59.889	3783.772	335.000	-212.661	1.091
									T+42 sec	2:28:03					
									T+44 sec	2:28:05					
									T+46 sec	2:28:07					
									T+48 sec	2:28:09					
									T+50 sec	2:28:11					
									T+52 sec	2:28:13					
									T+54 sec	2:28:15					
									T+56 sec	2:28:17					
									T+58 sec	2:28:19					
									T+60 sec	2:28:21					
									T+62 sec	2:28:23					
									T+64 sec	2:28:25					
									T+66 sec	2:28:27					
									T+68 sec	2:28:29					
									T+70 sec	2:28:31					
									T+72 sec	2:28:33					
									T+74 sec	2:28:35					
									T+76 sec	2:28:37					
									T+78 sec	2:28:39					
									T+80 sec	2:28:41					

	Date:	Monday, October 12, 2009	
	Time of T(0)	2:27:21	
	Time of Frequency Recovery to 60 Hz or Pre-Perturbation Hz	2:33:03	
Hz	Value A Pre-Perturbation Average Frequency [T(-2) to T(-16)]	60.0417	Hz
Hz	Value B Post-Perturbation Average Frequency [T(+18 to T(+52)]	59.8879	Hz
Hz	Pre to Post Perturbation Delta Frequency Actual	-0.154	Hz
MW	Value A Pre-Perturbation Average Interchange MW [T(-2) to T(-16)]	3647.05	MW
MW	Value B Post-Perturbation Average Interchange MW [T(+18 to T(+52)]	3786.58	MW
MW	Pre to Post Perturbation Interchange Delta MW Actual	139.53	MW
MW	Net Total Adjustments	-52.66	MW
MW	EPFR for FRO Pre-Perturbation Average	-33.40	MW
MW	EPFR for FRO Post-Perturbation Average	89.64	MW
MW	EPFR for FRO Delta	123.04	MW
MW	EPFR for FRO Adjusted	70.38	MW
MW	Pre JOU Dynamic Schedules MW	350.00	MW
MW	Pre Non-Conforming Load MW	-165.43	MW
MW	Pre Pumped Hydro MW	0.00	MW
MW	Pre Ramping Units MW	151.81	MW
MW	Pre Transferred Frequency Response MW	-4.17	MW
MW	Pre Contingent BA Lost Generation MW	15.00	MW
MW	Sum of Pre Perturbation Adjustments	347.21	MW
MW	Post JOU Dynamic Schedules MW	335.00	MW
MW	Post Non-Conforming Load MW	-212.66	MW
MW	Post Pumped Hydro MW	2.00	MW
MW	Post Ramping Units MW	159.00	MW
MW	Post Transferred Frequency Response MW	11.21	MW
MW	Post Contingent BA Lost Generation MW	0.00	MW
MW	Sum of Post Perturbation Adjustments	294.54	MW
MW	Net Total Adjustments MW	-52.66	MW

Pre-Perturbation Bias Setting	-103.000	MW/0.1 Hz
Post-Perturbation Bias Setting	-103.000	MW/0.1 Hz
EPFR for Bias Setting Pre-Perturbation Average	-43.0025	MW
EPFR for Bias Setting Post-Perturbation Average	114.1422	MW
EPFR for Bias Setting Delta	157.1446	MW
Primary Frequency Response Delivery of Bias	87.01%	
Pre-Perturbation BA Load	7600.196	MW
Post-Perturbation BA Load	7570.000	MW
Pre to Post Perturbation BA Load Change	-30.196	MW
Load Dampening Frequency Response	-19.792	MW/0.1 Hz
Load Dampening % of Total BA Frequency Response	22.09%	

EPFR
EPFR
Pri
Load Dam

18 to 52 second Average Period Evaluation

P.U.	Initial P.U. Performance for FRO	1.134	P.U.
P.U.	Initial P.U. Performance Adjusted for FRO	1.562	P.U.

Ramping Units Gen (+) MW	Transferred Frequency Response Rec (-) Del (+) MW/0.1 Hz	Contingent BA Lost Generation Load (-) Gen (+) MW	BA Bias Setting MW/0.1 Hz	BA Load MW	EPFR MW	Expected Net Actual Interchange MW		T	Frequency Hz	Net Actual Interchange MW	JOU Dynamic Schedules Imp(-) Exp (+) MW	Non-Conforming Load Load (-) MW	Pumped Hydro Load (-) Gen (+) MW	Ramping Units Gen (+) MW	Transferred Frequency Response Rec (-) Del (+) MW/0.1 Hz
							T-72 sec	2:26:09							
							T-70 sec	2:26:11							
							T-68 sec	2:26:13							

							T-66 sec	2:26:15						
							T-64 sec	2:26:17						
							T-62 sec	2:26:19						
							T-60 sec	2:26:21						
							T-58 sec	2:26:23						
							T-56 sec	2:26:25						
							T-54 sec	2:26:27						
							T-52 sec	2:26:29						
							T-50 sec	2:26:31						
							T-48 sec	2:26:33						
							T-46 sec	2:26:35						
							T-44 sec	2:26:37						
							T-42 sec	2:26:39						
							T-40 sec	2:26:41						
							T-38 sec	2:26:43						
							T-36 sec	2:26:45						
							T-34 sec	2:26:47						
							T-32 sec	2:26:49						
							T-30 sec	2:26:51						
							T-28 sec	2:26:53						
							T-26 sec	2:26:55						
							T-24 sec	2:26:57						
							T-22 sec	2:26:59						
							T-20 sec	2:27:01						
							T-18 sec	2:27:03						
151.813	10.000	15.000	-103.000	7600.196	-33.400		T-16 sec	2:27:05	60.042	3647.046	350.000	-165.430	0.000	151.813	10.000
151.813	10.000	15.000	-103.000	7600.196	-33.400		T-14 sec	2:27:07	60.042	3647.046	350.000	-165.430	0.000	151.813	10.000
151.813	10.000	15.000	-103.000	7600.196	-33.400		T-12 sec	2:27:09	60.042	3647.046	350.000	-165.430	0.000	151.813	10.000
151.813	10.000	15.000	-103.000	7600.196	-33.400		T-10 sec	2:27:11	60.042	3647.046	350.000	-165.430	0.000	151.813	10.000
151.813	10.000	15.000	-103.000	7600.196	-33.400		T-08 sec	2:27:13	60.042	3647.046	350.000	-165.430	0.000	151.813	10.000
151.813	10.000	15.000	-103.000	7600.196	-33.400		T-06 sec	2:27:15	60.042	3647.046	350.000	-165.430	0.000	151.813	10.000
151.813	10.000	15.000	-103.000	7600.196	-33.400		T-04 sec	2:27:17	60.042	3647.046	350.000	-165.430	0.000	151.813	10.000
151.813	10.000	15.000	-103.000	7600.196	-33.400		T-02 sec	2:27:19	60.042	3647.046	350.000	-165.430	0.000	151.813	10.000
							T+0 sec	2:27:21						
							T+02 sec	2:27:23						
							T+04 sec	2:27:25						
							T+06 sec	2:27:27						
							T+08 sec	2:27:29						
							T+10 sec	2:27:31						
							T+12 sec	2:27:33						
							T+14 sec	2:27:35						
							T+16 sec	2:27:37						
							T+18 sec	2:27:39	59.888	3786.576	335.000	-212.662	2.000	159.000	10.000
158.182	10.000	0.000	-103.000	7570.000	88.654	3714.586	T+20 sec	2:27:41	59.888	3786.576	335.000	-212.662	2.000	159.000	10.000
158.182	10.000	0.000	-103.000	7570.000	88.654	3714.586	T+22 sec	2:27:43	59.888	3786.576	335.000	-212.662	2.000	159.000	10.000
158.182	10.000	0.000	-103.000	7570.000	88.654	3714.586	T+24 sec	2:27:45	59.888	3786.576	335.000	-212.662	2.000	159.000	10.000

158.182	10.000	0.000	-103.000	7570.000	88.654	3714.586	T+26 sec	2:27:47	59.888	3786.576	335.000	-212.662	2.000	159.000	10.000
158.182	10.000	0.000	-103.000	7570.000	88.654	3714.586	T+28 sec	2:27:49	59.888	3786.576	335.000	-212.662	2.000	159.000	10.000
158.182	10.000	0.000	-103.000	7570.000	88.654	3714.586	T+30 sec	2:27:51	59.888	3786.576	335.000	-212.662	2.000	159.000	10.000
158.182	10.000	0.000	-103.000	7570.000	88.654	3714.586	T+32 sec	2:27:53	59.888	3786.576	335.000	-212.662	2.000	159.000	10.000
158.182	10.000	0.000	-103.000	7570.000	88.654	3714.586	T+34 sec	2:27:55	59.888	3786.576	335.000	-212.662	2.000	159.000	10.000
158.182	10.000	0.000	-103.000	7570.000	88.654	3714.586	T+36 sec	2:27:57	59.888	3786.576	335.000	-212.662	2.000	159.000	10.000
158.182	10.000	0.000	-103.000	7570.000	88.654	3714.586	T+38 sec	2:27:59	59.888	3786.576	335.000	-212.662	2.000	159.000	10.000
158.182	10.000	0.000	-103.000	7570.000	88.654	3714.586	T+40 sec	2:28:01	59.888	3786.576	335.000	-212.662	2.000	159.000	10.000
							T+42 sec	2:28:03	59.888	3786.576	335.000	-212.662	2.000	159.000	10.000
							T+44 sec	2:28:05	59.888	3786.576	335.000	-212.662	2.000	159.000	10.000
							T+46 sec	2:28:07	59.888	3786.576	335.000	-212.662	2.000	159.000	10.000
							T+48 sec	2:28:09	59.888	3786.576	335.000	-212.662	2.000	159.000	10.000
							T+50 sec	2:28:11	59.888	3786.576	335.000	-212.662	2.000	159.000	10.000
							T+52 sec	2:28:13	59.888	3786.576	335.000	-212.662	2.000	159.000	10.000
							T+54 sec	2:28:15							
							T+56 sec	2:28:17							
							T+58 sec	2:28:19							
							T+60 sec	2:28:21							
							T+62 sec	2:28:23							
							T+64 sec	2:28:25							
							T+66 sec	2:28:27							
							T+68 sec	2:28:29							
							T+70 sec	2:28:31							
							T+72 sec	2:28:33							
							T+74 sec	2:28:35							
							T+76 sec	2:28:37							
							T+78 sec	2:28:39							
							T+80 sec	2:28:41							

Date:	Monday, October 12, 2009	
Time of T(0)	2:27:21	
Time of Frequency Recovery to 60 Hz or Pre-Perturbation Hz	2:33:03	
Value A Pre-Perturbation Average Frequency [T(-2) to T(-16)]	60.0417	Hz
Value B Post-Perturbation Average Frequency [T(+20 to T(+52)]	59.8887	Hz
Pre to Post Perturbation Delta Frequency Actual	-0.153	Hz
Value A Pre-Perturbation Average Interchange MW [T(-2) to T(-16)]	3647.05	MW
Value B Post-Perturbation Average Interchange MW [T(+20 to T(+52)]	3787.78	MW
Pre to Post Perturbation Interchange Delta MW Actual	140.73	MW
Net Total Adjustments	-52.53	MW
EPFR for FRO Pre-Perturbation Average	-33.40	MW
EPFR for FRO Post-Perturbation Average	89.04	MW
EPFR for FRO Delta	122.44	MW
EPFR for FRO Adjusted	69.91	MW
Pre JOU Dynamic Schedules MW	350.00	MW
Pre Non-Conforming Load MW	-165.43	MW
Pre Pumped Hydro MW	0.00	MW
Pre Ramping Units MW	151.81	MW
Pre Transferred Frequency Response MW	-4.17	MW
Pre Contingent BA Lost Generation MW	15.00	MW
Sum of Pre Perturbation Adjustments	347.21	MW
Post JOU Dynamic Schedules MW	335.00	MW
Post Non-Conforming Load MW	-212.74	MW
Post Pumped Hydro MW	2.12	MW
Post Ramping Units MW	159.18	MW
Post Transferred Frequency Response MW	11.13	MW
Post Contingent BA Lost Generation MW	0.00	MW
Sum of Post Perturbation Adjustments	294.68	MW
Net Total Adjustments MW	-52.53	MW

Pre-Perturbation Bias Setting	-103.000	MW/0.1 Hz
Post-Perturbation Bias Setting	-103.000	MW/0.1 Hz
t for Bias Setting Pre-Perturbation Average	-43.0025	MW
for Bias Setting Post-Perturbation Average	115.4171	MW
EPFR for Bias Setting Delta	158.4196	MW
mary Frequency Response Delivery of Bias	88.08%	
Pre-Perturbation BA Load	7600.196	MW
Post-Perturbation BA Load	7570.000	MW
Pre to Post Perturbation BA Load Change	-30.196	MW
Load Dampening Frequency Response	-19.633	MW/0.1 Hz
ıpening % of Total BA Frequency Response	21.64%	

20 to 52 second Average Period Evaluation

Initial P.U. Performance for FRO	1.149	P.U.
Initial P.U. Performance Adjusted for FRO	1.578	P.U.

Contingent BA Lost Generation Load (-) Gen (+) MW	BA Bias Setting MW/0.1 Hz	BA Load MW	EPFR MW	Expected Net Actual Interchange MW	T	Frequency Hz	Net Actual Interchange MW	JOU Dynamic Schedules Imp(-) Exp (+) MW	Non-Conforming Load Load (-) MW	Pumped Hydro Load (-) Gen (+) MW	Ramping Units Gen (+) MW	Transferred Frequency Response Rec (-) Del (+) MW/0.1 Hz	Contingent BA Lost Generation Load (-) Gen (+) MW
					T-72 sec	2:26:09							
					T-70 sec	2:26:11							
					T-68 sec	2:26:13							

					T-66 sec	2:26:15								
					T-64 sec	2:26:17								
					T-62 sec	2:26:19								
					T-60 sec	2:26:21								
					T-58 sec	2:26:23								
					T-56 sec	2:26:25								
					T-54 sec	2:26:27								
					T-52 sec	2:26:29								
					T-50 sec	2:26:31								
					T-48 sec	2:26:33								
					T-46 sec	2:26:35								
					T-44 sec	2:26:37								
					T-42 sec	2:26:39								
					T-40 sec	2:26:41								
					T-38 sec	2:26:43								
					T-36 sec	2:26:45								
					T-34 sec	2:26:47								
					T-32 sec	2:26:49								
					T-30 sec	2:26:51								
					T-28 sec	2:26:53								
					T-26 sec	2:26:55								
					T-24 sec	2:26:57								
					T-22 sec	2:26:59								
					T-20 sec	2:27:01								
					T-18 sec	2:27:03								
15.000	-103.000	7600.196	-33.400		T-16 sec	2:27:05	60.042	3647.046	350.000	-165.430		0.000	151.813	10.000	15.000
15.000	-103.000	7600.196	-33.400		T-14 sec	2:27:07	60.042	3647.046	350.000	-165.430		0.000	151.813	10.000	15.000
15.000	-103.000	7600.196	-33.400		T-12 sec	2:27:09	60.042	3647.046	350.000	-165.430		0.000	151.813	10.000	15.000
15.000	-103.000	7600.196	-33.400		T-10 sec	2:27:11	60.042	3647.046	350.000	-165.430		0.000	151.813	10.000	15.000
15.000	-103.000	7600.196	-33.400		T-08 sec	2:27:13	60.042	3647.046	350.000	-165.430		0.000	151.813	10.000	15.000
15.000	-103.000	7600.196	-33.400		T-06 sec	2:27:15	60.042	3647.046	350.000	-165.430		0.000	151.813	10.000	15.000
15.000	-103.000	7600.196	-33.400		T-04 sec	2:27:17	60.042	3647.046	350.000	-165.430		0.000	151.813	10.000	15.000
15.000	-103.000	7600.196	-33.400		T-02 sec	2:27:19	60.042	3647.046	350.000	-165.430		0.000	151.813	10.000	15.000
					T+0 sec	2:27:21								
					T+02 sec	2:27:23								
					T+04 sec	2:27:25								
					T+06 sec	2:27:27								
					T+08 sec	2:27:29								
					T+10 sec	2:27:31								
					T+12 sec	2:27:33								
					T+14 sec	2:27:35								
					T+16 sec	2:27:37								
0.000	-103.000	7570.000	89.644	3717.426	T+18 sec	2:27:39								
0.000	-103.000	7570.000	89.644	3717.426	T+20 sec	2:27:41	59.889	3787.775	335.000	-212.744		2.118	159.176	10.000	0.000
0.000	-103.000	7570.000	89.644	3717.426	T+22 sec	2:27:43	59.889	3787.775	335.000	-212.744		2.118	159.176	10.000	0.000
0.000	-103.000	7570.000	89.644	3717.426	T+24 sec	2:27:45	59.889	3787.775	335.000	-212.744		2.118	159.176	10.000	0.000

0.000	-103.000	7570.000	89.644	3717.426	T+26 sec	2:27:47	59.889	3787.775	335.000	-212.744	2.118	159.176	10.000	0.000
0.000	-103.000	7570.000	89.644	3717.426	T+28 sec	2:27:49	59.889	3787.775	335.000	-212.744	2.118	159.176	10.000	0.000
0.000	-103.000	7570.000	89.644	3717.426	T+30 sec	2:27:51	59.889	3787.775	335.000	-212.744	2.118	159.176	10.000	0.000
0.000	-103.000	7570.000	89.644	3717.426	T+32 sec	2:27:53	59.889	3787.775	335.000	-212.744	2.118	159.176	10.000	0.000
0.000	-103.000	7570.000	89.644	3717.426	T+34 sec	2:27:55	59.889	3787.775	335.000	-212.744	2.118	159.176	10.000	0.000
0.000	-103.000	7570.000	89.644	3717.426	T+36 sec	2:27:57	59.889	3787.775	335.000	-212.744	2.118	159.176	10.000	0.000
0.000	-103.000	7570.000	89.644	3717.426	T+38 sec	2:27:59	59.889	3787.775	335.000	-212.744	2.118	159.176	10.000	0.000
0.000	-103.000	7570.000	89.644	3717.426	T+40 sec	2:28:01	59.889	3787.775	335.000	-212.744	2.118	159.176	10.000	0.000
0.000	-103.000	7570.000	89.644	3717.426	T+42 sec	2:28:03	59.889	3787.775	335.000	-212.744	2.118	159.176	10.000	0.000
0.000	-103.000	7570.000	89.644	3717.426	T+44 sec	2:28:05	59.889	3787.775	335.000	-212.744	2.118	159.176	10.000	0.000
0.000	-103.000	7570.000	89.644	3717.426	T+46 sec	2:28:07	59.889	3787.775	335.000	-212.744	2.118	159.176	10.000	0.000
0.000	-103.000	7570.000	89.644	3717.426	T+48 sec	2:28:09	59.889	3787.775	335.000	-212.744	2.118	159.176	10.000	0.000
0.000	-103.000	7570.000	89.644	3717.426	T+50 sec	2:28:11	59.889	3787.775	335.000	-212.744	2.118	159.176	10.000	0.000
0.000	-103.000	7570.000	89.644	3717.426	T+52 sec	2:28:13	59.889	3787.775	335.000	-212.744	2.118	159.176	10.000	0.000
					T+54 sec	2:28:15								
					T+56 sec	2:28:17								
					T+58 sec	2:28:19								
					T+60 sec	2:28:21								
					T+62 sec	2:28:23								
					T+64 sec	2:28:25								
					T+66 sec	2:28:27								
					T+68 sec	2:28:29								
					T+70 sec	2:28:31								
					T+72 sec	2:28:33								
					T+74 sec	2:28:35								
					T+76 sec	2:28:37								
					T+78 sec	2:28:39								
					T+80 sec	2:28:41								

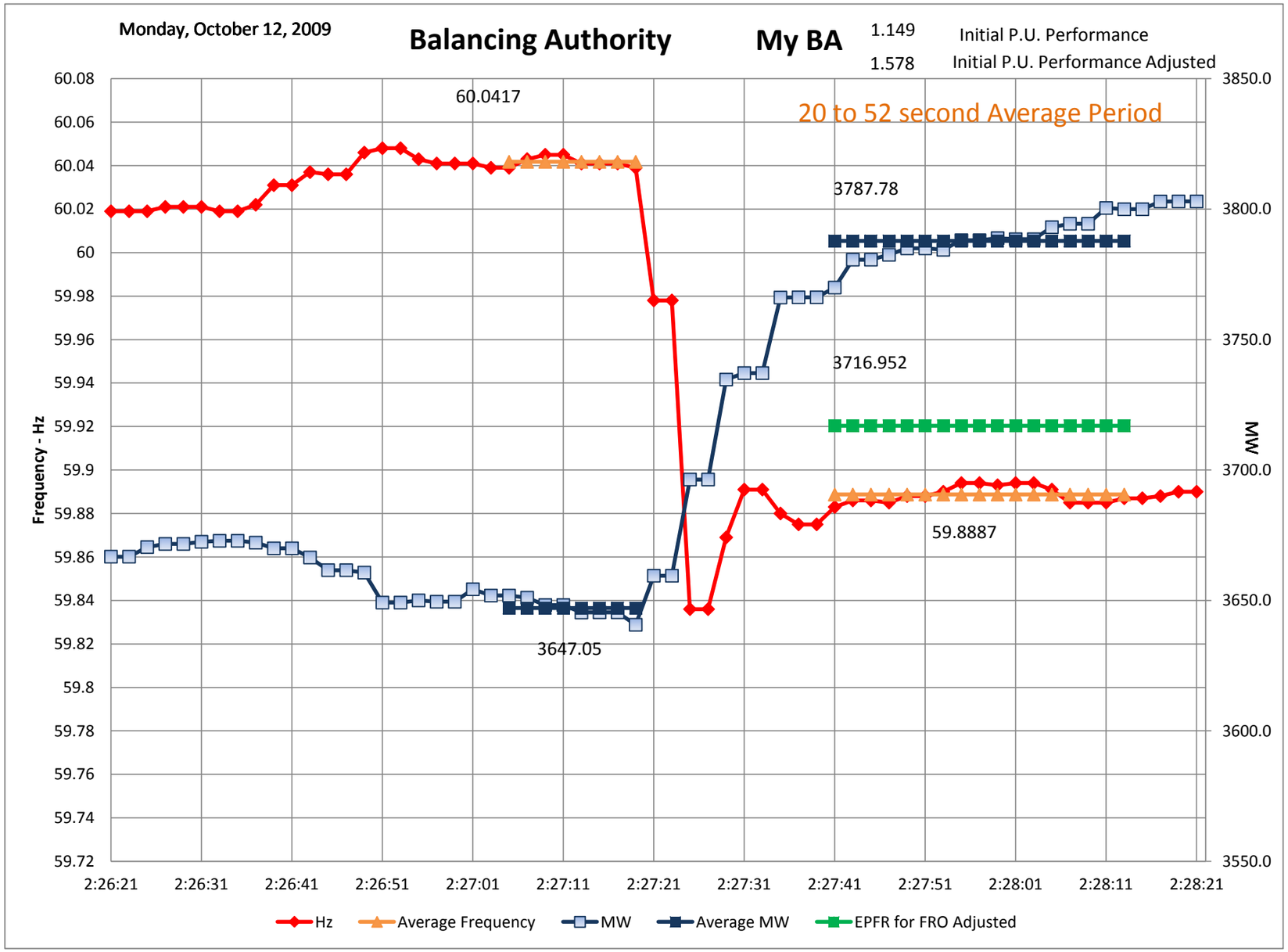
erturbation Bias Setting	-103.000	MW/0.1 Hz
erturbation Bias Setting	-103.000	MW/0.1 Hz
e-Perturbation Average	-43.0025	MW
it-Perturbation Average	114.6328	MW
FR for Bias Setting Delta	157.6353	MW
esponse Delivery of Bias	89.28%	

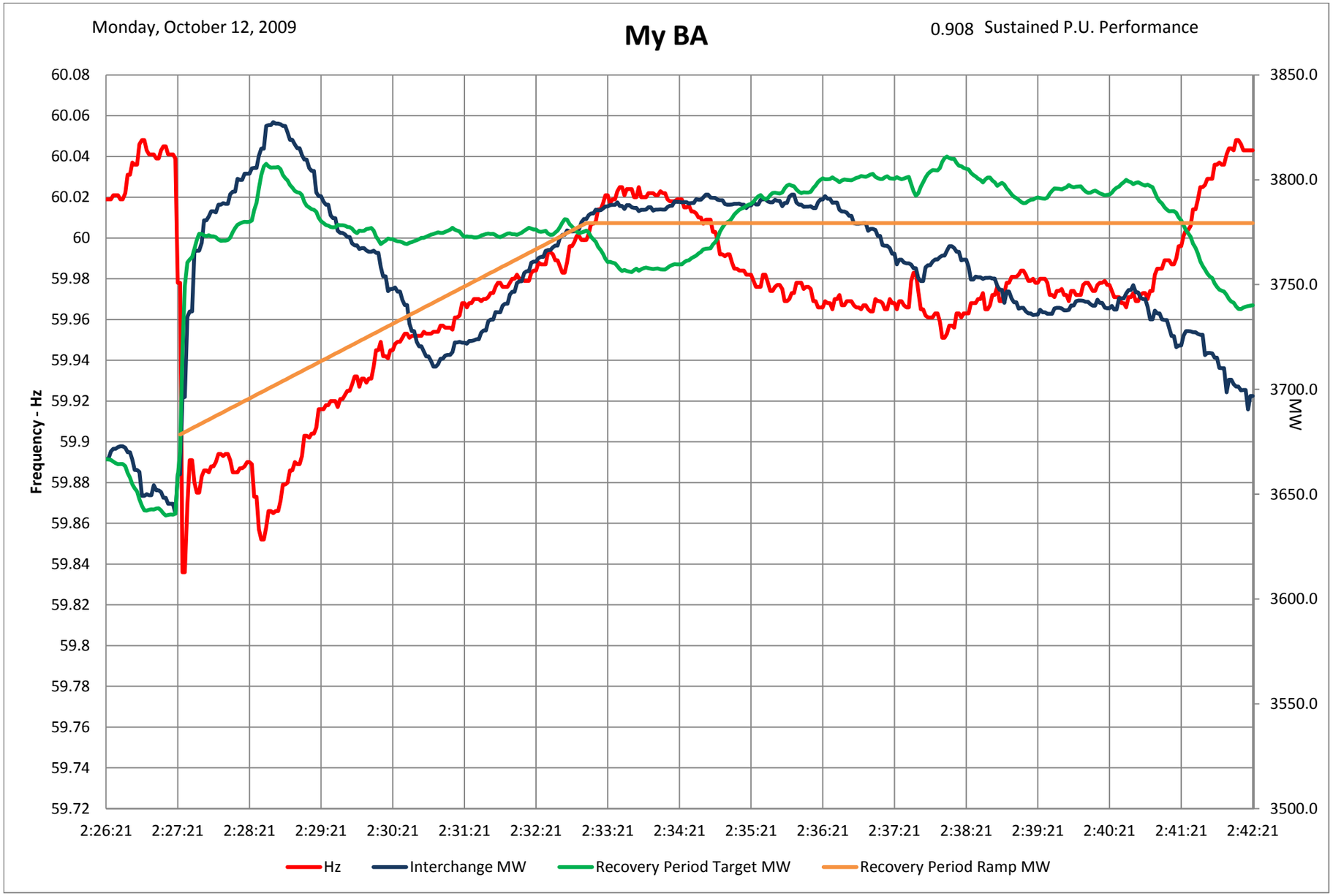
e-Perturbation BA Load	7600.196	MW
it-Perturbation BA Load	7570.000	MW
bation BA Load Change	-30.196	MW
ng Frequency Response	-19.730	MW/0.1 Hz
BA Frequency Response	21.46%	

BA Bias Setting MW/0.1 Hz	BA Load MW	EPFR MW	Expected Net Actual Interchange MW

-103.000	7600.196	-33.400	
-103.000	7600.196	-33.400	
-103.000	7600.196	-33.400	
-103.000	7600.196	-33.400	
-103.000	7600.196	-33.400	
-103.000	7600.196	-33.400	
-103.000	7600.196	-33.400	
-103.000	7600.196	-33.400	
-103.000	7570.000	89.035	3716.952
-103.000	7570.000	89.035	3716.952
-103.000	7570.000	89.035	3716.952

-103.000	7570.000	89.035	3716.952
-103.000	7570.000	89.035	3716.952
-103.000	7570.000	89.035	3716.952
-103.000	7570.000	89.035	3716.952
-103.000	7570.000	89.035	3716.952
-103.000	7570.000	89.035	3716.952
-103.000	7570.000	89.035	3716.952
-103.000	7570.000	89.035	3716.952
-103.000	7570.000	89.035	3716.952
-103.000	7570.000	89.035	3716.952
-103.000	7570.000	89.035	3716.952
-103.000	7570.000	89.035	3716.952
-103.000	7570.000	89.035	3716.952
-103.000	7570.000	89.035	3716.952
-103.000	7570.000	89.035	3716.952


Monday, October 12, 2009
Balancing Authority
My BA
1.149
Initial P.U. Performance
1.578
Initial P.U. Performance Adjusted
60.0417
20 to 52 second Average Period
3787.78
3716.952
59.8887
3647.05
Frequency - Hz
MW
60.08
60.06
60.04
60.02
60
59.98
59.96
59.94
59.92
59.9
59.88
59.86
59.84
59.82
59.8
59.78
59.76
59.74
59.72
3850.0
3800.0
3750.0
3700.0
3650.0
3600.0
3550.0
2:26:21
2:26:31
2:26:41
2:26:51
2:27:01
2:27:11
2:27:21
2:27:31
2:27:41
2:27:51
2:28:01
2:28:11
2:28:21
Hz
Average Frequency
MW
Average MW
EPFR for FRO Adjusted


Monday, October 12, 2009
My BA
0.908 Sustained P.U. Performance
Frequency - Hz
MW
60.08
60.06
60.04
60.02
60
59.98
59.96
59.94
59.92
59.9
59.88
59.86
59.84
59.82
59.8
59.78
59.76
59.74
59.72
3850.0
3800.0
3750.0
3700.0
3650.0
3600.0
3550.0
3500.0
2:26:21
2:27:21
2:28:21
2:29:21
2:30:21
2:31:21
2:32:21
2:33:21
2:34:21
2:35:21
2:36:21
2:37:21
2:38:21
2:39:21
2:40:21
2:41:21
2:42:21
Hz
Interchange MW
Recovery Period Target MW
Recovery Period Ramp MW

Interconnection Performance

Date	A Point Time	FPointA Hz	A Value Hz	t(0) Time	C Value Hz
Monday, October 12, 2009	2:27:19	60.0390	60.0417	2:27:21	59.8360

Value B 12 to 24 sec Average Frequency	FR B 12 to 24 sec Average MW	Value B 18 to 30 sec Average Frequency	FR B 18 to 30 sec Average MW	Value B 20 to 40 sec Average Frequency	FR B 20 to 40 sec Average MW	Value B 18 to 52 sec Average Frequency	FR B 18 to 52 sec Average MW	Value B 20 to 52 sec Average Frequency	FR B 20 to 52 sec Average MW
59.8822861	-397.43625	59.8844288	-402.63425	59.888706	-415.16368	59.8879445	-411.95878	59.888706	-413.86163

Value A Data — BA Performance

Frequency Hz	Net Actual Interchange MW	JOU Dynamic Schedules Imp(-) Exp (+) MW	Non-Conforming Load Load (-) MW	Pumped Hydro Load (-) Gen (+) MW	Ramping Units Gen (+) MW	Transferred Frequency Response Rec (-) Del (+) MW	Contingent BA Lost Generation Load (-) Gen (+) MW	BA Bias Setting MW/0.1 Hz	BA Load MW	Bias Setting EPFR MW
60.04175	3647.05	350.00	-165.43	0.00	151.81	-4.17	15.00	-103	7600.196	-43.0025

Value B — 12 to 24 second Average Period Evaluation

Frequency Hz	Net Actual Interchange MW	JOU Dynamic Schedules Imp(-) Exp (+) MW	Non-Conforming Load Load (-) MW	Pumped Hydro Load (-) Gen (+) MW	Ramping Units Gen (+) MW	Transferred Frequency Response Rec (-) Del (+) MW
59.882286	3766.69	335.00	-209.89	0.43	156.14	11.77

Value B 18 to 30 second Average Period Evaluation

Contingent BA Lost Generation Load (-) Gen (+) MW	Initial Performance Adjusted P.U.	Initial Performance Unadjusted P.U.	Sustained Performance P.U.	BA Bias Setting MW/0.1 Hz	BA Load MW	Bias Setting EPFR MW	Frequency Hz	Net Actual Interchange MW	JOU Dynamic Schedules Imp(-) Exp (+) MW	Non-Conforming Load Load (-) MW	Pumped Hydro Load (-) Gen (+) MW	Ramping Units Gen (+) MW	Transferred Frequency Response Rec (-) Del (+) MW/0.1 Hz	Contingent BA Lost Generation Load (-) Gen (+) MW	Initial Performance Adjusted P.U.
0.00	1.359	0.938	0.908	-103	7570	121.2453	59.884429	3778.54	335.00	-211.26	0.86	157.14	11.56	0.00	1.473

Value B 20 to 40 second Average Period Evaluation

Initial Performance Unadjusted P.U.	Sustained Performance P.U.	BA Bias Setting MW	BA Load MW	Bias Setting EPFR MW	Frequency Hz	Net Actual Interchange MW	JOU Dynamic Schedules Imp(-) Exp (+) MW	Non-Conforming Load Load (-) MW	Pumped Hydro Load (-) Gen (+) MW	Ramping Units Gen (+) MW	Transferred Frequency Response Rec (-) Del (+) MW/0.1 Hz	Contingent BA Lost Generation Load (-) Gen (+) MW	Initial Performance Adjusted P.U.	Initial Performance Unadjusted P.U.	Sustained Performance P.U.
1.045	0.908	-103	7570	119.0383	59.889182	3783.77	335.00	-212.66	1.09	158.18	11.08	0.00	1.567	1.120	0.908

Value B 18 to 52 second Average Period Evaluation Value B

BA Bias Setting MW	BA Load MW	Bias Setting EPFR MW	Frequency Hz	Net Actual Interchange MW	JOU Dynamic Schedules Imp(-) Exp (+) MW	Non-Conforming Load Load (-) MW	Pumped Hydro Load (-) Gen (+) MW	Ramping Units Gen (+) MW	Transferred Frequency Response Rec (-) Del (+) MW	Contingent BA Lost Generation Load (-) Gen (+) MW	Initial Performance Adjusted P.U.	Initial Performance Unadjusted P.U.	Sustained Performance P.U.	BA Bias Setting MW/0.1 Hz	BA Load MW	Bias Setting EPFR MW	Frequency Hz
-103	7570	114.1422	59.887945	3786.58	335.00	-212.66	2.00	159.00	11.21	0.00	1.562	1.134	0.908	-103	7570	115.4171	59.888706

20 to 52 second Average Period Evaluation

Net Actual Interchange MW	JOU Dynamic Schedules Imp(-) Exp (+) MW	Non-Conforming Load Load (-) MW	Pumped Hydro Load (-) Gen (+) MW	Ramping Units Gen (+) MW	Transferred Frequency Response Rec (-) Del (+) MW	Contingent BA Lost Generation Load (-) Gen (+) MW	Initial Performance Adjusted P.U.	Initial Performance Unadjusted P.U.	Sustained Performance P.U.	BA Bias Setting MW/0.1 Hz	BA Load MW	Bias Setting EPFR MW
3787.78	335.00	-165.43	2.12	159.18	11.13	0.00	1.578	1.149	0.908	-103	7570	114.6328

Steps	**To be completed for each event evaluated.**
1	Set-up Data collection in exact same order as the "Data" sheet of this work book. Data should be in this order: Column A: Date and Time in this format, mm/dd/yy HH:MM:SS Column B: Frequency Hz Column C: Net Actual Interchange Column D: Joint Owned Unit dynamic schedule Column E: Non Conforming Load Column F: Pumped Hydro Column G: Ramping units Column H: Transferred Frequency Response Column I: Contingent BA Lost load or generation Column J: BA Bias Setting Column K: BA Load
2	Note: Columns D, E, F, G and H are optional data. If you choose not to use these, leave the columns blank. Do not delete the columns. Use the sign (+/-) convention defined in FRS Form 1.
3	Data compression must be turned off for each data point. Quality data will give you quality results in the evaluation.
4	Data must be at 4 second sample rate for the full 25 minute minimum collection period that starts a minimum of two (2) minutes before the event begins and includes a minimum of 15 minutes after the beginning of the event. The spreadsheet will work with up to 60 minutes of data. Be sure "Data" worksheet is clear of any old data. If using PI historian as your data source, use "PasteSpecial/Values" to enter data into the spreadsheet. Do not include historian data collection formulas in the data.
5	Once data is in place in the "Data" worksheet, determine when the beginning of the event occurred. This is accomplished by knowing the UTC event time from the master event list. Convert the UTC event time to your PI data time and then scroll through the Data worksheet column B data of frequency and observe when frequency moves from the normal, pre-event frequency. This will usually be a single change in frequency of 0.008 to 0.010 Hz more or less. Note the row number in the worksheet that this change occurs. In this sample data spreadsheet this occurs in row 237 of the data.
6	Edit cell "C8" of the "Entry Data" worksheet, change the formula in the cell "C8" to reference the row number identified in step 5 above. In the sample data of this workbook this formula is: "=Data!A237" If the correct row is selected, the "Graph 20 to 52s" worksheet will indicate the first change in frequency of the event on the center vertical grid line of the graph (Red Trend).
7	Determine the end of the event to be evaluated. Use the same rules that are used for DCS only look at frequency instead of ACE. Scroll down the frequency data in column B of the "Data" worksheet until frequency reaches 60 Hz or the pre-disturbance value. Note the row number in the worksheet that this occurs. In this sample data spreadsheet this occurs in row 323.
8	Edit cell "C11" of the "Entry Data" worksheet, change the formula in the cell "C11" to reference the row number identified in step 7 above. In the sample data of this workbook this formula is: "=Data!A323"
9	In cell "R41" of the "Evaluation" spreadsheet, enter the MW value of the unit(s) that tripped (from the Master Event List). This is only necessary for the "Interconnection" evaluation if you're interested. It is not necessary to do this for the BA evaluation but it will provide a comparison of the BA frequency response as compared to the Interconnection frequency response.
10	Use the "copy" button provided to copy the evaluation and event specific data for the "FRS Form 1" of this field trial. This data is summarized in the correct order on worksheet "Form 1 Summary Data" of this workbook. Use PasteSpecial/Values when pasting the data into FRS Form 1 on the appropriate event row.

Steps	**To be completed once at the initial setup of the evaluation spreadsheet for your BA.**
A	Enter the Balancing Authority name as you want it to appear on the graphs in cell "B1" of the "Entry Data" worksheet. For example: "NYISO".
B	Enter your Balancing Authorities Frequency Response Obligation in cell "B2" of the "Entry Data" worksheet. For example: -80 MW/0.1 Hz (This value could change annually)
C	For informational and educational purposes, a "Sustained" performance evaluation is provided in the "Evaluation" worksheet and in the "Sustained" Graph. This evaluation uses a Time Constant (TC) to model the frequency response of your BA. The time constant is located in cell "L13" of the "Evaluation" spreadsheet and should be edited for the types of generators in your BA. Presently this time constant is set at 0.35. The higher the value of the time constant, the faster the delivery of frequency response is expected. Setting the TC to 1.0 effectively turns off the delay and instantaneous frequency response will be modeled. Do not set higher than 1.0. This time constant is only used in the "Sustained" evaluation and is not used for the Field Trial evaluation of performance to the FRO. A typical setting for this time constant is 0.08 to 0.15 for hydro units, 0.10 to 0.20 for large steam turbines and 0.20 to 0.40 for combustion turbines. By observing the slope of your "Interchange Actual" on the "Sustained" Graph, adjust the time constant until the initial slope of the "Target" is similar. When set appropriately, the "Target" trend on the "Sustained" graph will model what Interchange Actual should have done during the event recovery period based on your minimum FRO.

Note: For ease of use, only the necessary worksheets are displayed. If you are interested in viewing graphs and other hidden worksheets, select the "tab" at the bottom, right click, select unhide and select the worksheet you wish to unhide.

Time (T)	Hz	Net Actual Interchange MW	JOU Dynamic Schedules Imp(-) Exp (+) MW	Non-Conforming Load Load (-) MW	Pumped Hydro Load (-) Gen (+) MW	Ramping Units Gen (+) MW	Transferred Frequency Response Rec (-) Del (+) MW/0.1 Hz	Contingent BA Lost Generation Load (-) Gen (+) MW	BA Bias Setting MW/0.1 Hz	BA Load MW
10/12/09 02:12:00	59.981	3669.878418	350	351.361511	0	0	10	15	-103	7500
10/12/09 02:12:04	59.981	3671.699707	350	351.361511	0	0.5	10	15	-103	7500.33
10/12/09 02:12:08	59.98	3671.698486	350	351.361511	0	1	10	15	-103	7500.66
10/12/09 02:12:12	59.981	3672.310303	350	357.94751	0	1.5	10	15	-103	7500.99
10/12/09 02:12:16	59.981	3672.174072	350	357.94751	0	2	10	15	-103	7501.32
10/12/09 02:12:20	59.979	3674.263428	350	357.94751	0	2.5	10	15	-103	7501.65
10/12/09 02:12:24	59.98	3673.84375	350	357.94751	0	3	10	15	-103	7501.98
10/12/09 02:12:28	59.983	3672.106201	350	357.94751	0	3.5	10	15	-103	7502.31
10/12/09 02:12:32	59.986	3669.167969	350	360.234741	0	4	10	15	-103	7502.64
10/12/09 02:12:36	59.976	3673.560303	350	360.234741	0	4.5	10	15	-103	7502.97
10/12/09 02:12:40	59.979	3673.834229	350	360.234741	0	5	10	15	-103	7503.3
10/12/09 02:12:44	59.982	3671.634521	350	360.234741	0	5.5	10	15	-103	7503.63
10/12/09 02:12:48	59.99	3671.560303	350	360.234741	0	6	10	15	-103	7503.96
10/12/09 02:12:52	59.994	3670.771973	350	346.525879	0	6.5	10	15	-103	7504.29
10/12/09 02:12:56	59.995	3668.128906	350	346.525879	0	7	10	15	-103	7504.62
10/12/09 02:13:00	59.995	3669.29126	350	346.525879	0	7.5	10	15	-103	7504.95
10/12/09 02:13:04	59.994	3671.253906	350	346.525879	0	8	10	15	-103	7505.28
10/12/09 02:13:08	59.995	3670.155762	350	346.525879	0	8.5	10	15	-103	7505.61
10/12/09 02:13:12	60.001	3670.712402	350	296.443359	0	9	10	15	-103	7505.94
10/12/09 02:13:16	60.001	3671.183594	350	296.443359	0	9.5	10	15	-103	7506.27
10/12/09 02:13:20	60.003	3670.26709	350	296.443359	0	10	10	15	-103	7506.6
10/12/09 02:13:24	60.003	3671.092285	350	296.443359	0	10.5	10	15	-103	7506.93
10/12/09 02:13:28	60.001	3670.669922	350	296.443359	0	11	10	15	-103	7507.26
10/12/09 02:13:32	60.004	3669.53418	350	341.061157	0	11.5	10	15	-103	7507.59
10/12/09 02:13:36	60.001	3671.628418	350	341.061157	0	12	10	15	-103	7507.92
10/12/09 02:13:40	60.001	3671.968262	350	341.061157	0	12.5	10	15	-103	7508.25
10/12/09 02:13:44	60.004	3671.871582	350	341.061157	0	13	10	15	-103	7508.58
10/12/09 02:13:48	60.004	3671.065674	350	341.061157	0	13.5	10	15	-103	7508.91
10/12/09 02:13:52	60.003	3673.235107	350	322.826294	0	14	10	15	-103	7509.24
10/12/09 02:13:56	60.003	3673.530518	350	322.826294	0	14.5	10	15	-103	7509.57
10/12/09 02:14:00	59.999	3673.186279	350	322.826294	0	15	10	15	-103	7509.9
10/12/09 02:14:04	59.997	3673.576416	350	322.826294	0	15.5	10	15	-103	7510.23
10/12/09 02:14:08	59.996	3671.820557	350	322.826294	0	16	10	15	-103	7510.56
10/12/09 02:14:12	59.993	3671.998047	350	321.544403	0	16.5	10	15	-103	7510.89
10/12/09 02:14:16	59.996	3671.07251	350	321.544403	0	17	10	15	-103	7511.22

10/12/09 02:14:20	60.001	3671.441406	350	321.544403	0	17.5	10	15	-103	7511.55
10/12/09 02:14:24	60.007	3670.161865	350	321.544403	0	18	10	15	-103	7511.88
10/12/09 02:14:28	60.005	3670.619873	350	321.544403	0	18.5	10	15	-103	7512.21
10/12/09 02:14:32	59.999	3672.085693	350	362.136261	0	19	10	15	-103	7512.54
10/12/09 02:14:36	59.999	3670.825684	350	362.136261	0	19.5	10	15	-103	7512.87
10/12/09 02:14:40	60.007	3671.809082	350	362.136261	0	20	10	15	-103	7513.2
10/12/09 02:14:44	60.011	3672.73584	350	362.136261	0	20.5	10	15	-103	7513.53
10/12/09 02:14:48	60.003	3674.414551	350	362.136261	0	21	10	15	-103	7513.86
10/12/09 02:14:52	59.995	3674.754639	350	336.311798	0	21.5	10	15	-103	7514.19
10/12/09 02:14:56	59.994	3675.310547	350	336.311798	0	22	10	15	-103	7514.52
10/12/09 02:15:00	60.001	3675.165527	350	336.311798	0	22.5	10	15	-103	7514.85
10/12/09 02:15:04	59.998	3674.319092	350	336.311798	0	23	10	15	-103	7515.18
10/12/09 02:15:08	59.992	3676.328613	350	336.311798	0	23.5	10	15	-103	7515.51
10/12/09 02:15:12	59.986	3677.791016	350	316.443054	0	24	10	15	-103	7515.84
10/12/09 02:15:16	59.988	3675.542969	350	316.443054	0	24.5	10	15	-103	7516.17
10/12/09 02:15:20	59.988	3676.931396	350	316.443054	0	25	10	15	-103	7516.5
10/12/09 02:15:24	59.985	3677.067139	350	316.443054	0	25.5	10	15	-103	7516.83
10/12/09 02:15:28	59.983	3678.455322	350	316.443054	0	26	10	15	-103	7517.16
10/12/09 02:15:32	59.984	3679.731445	350	325.464294	0	26.5	10	15	-103	7517.49
10/12/09 02:15:36	59.985	3677.626953	350	325.464294	0	27	10	15	-103	7517.82
10/12/09 02:15:40	59.987	3676.409424	350	325.464294	0	27.5	10	15	-103	7518.15
10/12/09 02:15:44	59.99	3677.371094	350	325.464294	0	28	10	15	-103	7518.48
10/12/09 02:15:48	59.983	3678.086426	350	325.464294	0	28.5	10	15	-103	7518.81
10/12/09 02:15:52	59.979	3680.163086	350	336.614166	0	29	10	15	-103	7519.14
10/12/09 02:15:56	59.987	3678.344238	350	336.614166	0	29.5	10	15	-103	7519.47
10/12/09 02:16:00	59.988	3677.677734	350	336.614166	0	30	10	15	-103	7519.8
10/12/09 02:16:04	59.983	3679.279053	350	336.614166	0	30.5	10	15	-103	7520.13
10/12/09 02:16:08	59.979	3679.605713	350	336.614166	0	31	10	15	-103	7520.46
10/12/09 02:16:12	59.989	3679.025879	350	316.726166	0	31.5	10	15	-103	7520.79
10/12/09 02:16:16	59.988	3678.488525	350	316.726166	0	32	10	15	-103	7521.12
10/12/09 02:16:20	59.989	3678.740234	350	316.726166	0	32.5	10	15	-103	7521.45
10/12/09 02:16:24	59.989	3679.390137	350	316.726166	0	33	10	15	-103	7521.78
10/12/09 02:16:28	59.993	3678.330078	350	316.726166	0	33.5	10	15	-103	7522.11
10/12/09 02:16:32	59.996	3677.944336	350	320.195526	0	34	10	15	-103	7522.44
10/12/09 02:16:36	59.998	3678.950928	350	320.195526	0	34.5	10	15	-103	7522.77
10/12/09 02:16:40	59.999	3679.148438	350	320.195526	0	35	10	15	-103	7523.1
10/12/09 02:16:44	59.991	3680.041016	350	320.195526	0	35.5	10	15	-103	7523.43
10/12/09 02:16:48	59.995	3677.860352	350	320.195526	0	36	10	15	-103	7523.76
10/12/09 02:16:52	60.001	3678.266846	350	341.86615	0	36.5	10	15	-103	7524.09
10/12/09 02:16:56	60.006	3677.898682	350	341.86615	0	37	10	15	-103	7524.42

10/12/09 02:17:00	60.009	3679.20874	350	341.86615	0	37.5	10	15	-103	7524.75
10/12/09 02:17:04	60.012	3678.652588	350	341.86615	0	38	10	15	-103	7525.08
10/12/09 02:17:08	60.01	3679.702637	350	341.86615	0	38.5	10	15	-103	7525.41
10/12/09 02:17:12	60.007	3679.805908	350	348.597839	0	39	10	15	-103	7525.74
10/12/09 02:17:16	60.012	3680.262695	350	348.597839	0	39.5	10	15	-103	7526.07
10/12/09 02:17:20	60.01	3679.560791	350	348.597839	0	40	10	15	-103	7526.4
10/12/09 02:17:24	60.007	3679.439941	350	348.597839	0	40.5	10	15	-103	7526.73
10/12/09 02:17:28	60.009	3679.516602	350	348.597839	0	41	10	15	-103	7527.06
10/12/09 02:17:32	60.006	3679.608154	350	329.085022	0	41.5	10	15	-103	7527.39
10/12/09 02:17:36	60.009	3679.260742	350	329.085022	0	42	10	15	-103	7527.72
10/12/09 02:17:40	60.009	3679.024658	350	329.085022	0	42.5	10	15	-103	7528.05
10/12/09 02:17:44	60.005	3678.572266	350	329.085022	0	43	10	15	-103	7528.38
10/12/09 02:17:48	60.001	3678.248779	350	329.085022	0	43.5	10	15	-103	7528.71
10/12/09 02:17:52	59.993	3677.82959	350	342.418243	0	44	10	15	-103	7529.04
10/12/09 02:17:56	59.994	3677.772217	350	342.418243	0	44.5	10	15	-103	7529.37
10/12/09 02:18:00	59.994	3677.093262	350	342.418243	0	45	10	15	-103	7529.7
10/12/09 02:18:04	59.994	3676.400635	350	342.418243	0	45.5	10	15	-103	7530.03
10/12/09 02:18:08	59.993	3679.87207	350	342.418243	0	46	10	15	-103	7530.36
10/12/09 02:18:12	59.99	3678.743164	350	338.794647	0	46.5	10	15	-103	7530.69
10/12/09 02:18:16	59.983	3677.921143	350	338.794647	0	47	10	15	-103	7531.02
10/12/09 02:18:20	59.977	3682.070068	350	338.794647	0	47.5	10	15	-103	7531.35
10/12/09 02:18:24	59.995	3678.655518	350	338.794647	0	48	10	15	-103	7531.68
10/12/09 02:18:28	59.994	3677.780029	350	338.794647	0	48.5	10	15	-103	7532.01
10/12/09 02:18:32	59.987	3678.473145	350	335.931	0	49	10	15	-103	7532.34
10/12/09 02:18:36	59.984	3677.822266	350	335.931	0	49.5	10	15	-103	7532.67
10/12/09 02:18:40	59.985	3677.397461	350	335.931	0	50	10	15	-103	7533
10/12/09 02:18:44	59.985	3677.949707	350	335.931	0	50.5	10	15	-103	7533.33
10/12/09 02:18:48	59.98	3678.962646	350	335.931	0	51	10	15	-103	7533.66
10/12/09 02:18:52	59.981	3680.737305	350	339.712402	0	51.5	10	15	-103	7533.99
10/12/09 02:18:56	59.998	3678.161377	350	339.712402	0	52	10	15	-103	7534.32
10/12/09 02:19:00	60.007	3676.222168	350	339.712402	0	52.5	10	15	-103	7534.65
10/12/09 02:19:04	59.986	3677.49707	350	339.712402	0	53	10	15	-103	7534.98
10/12/09 02:19:08	59.977	3675.185791	350	339.712402	0	53.5	10	15	-103	7535.31
10/12/09 02:19:12	59.976	3680.450928	350	332.024658	0	54	10	15	-103	7535.64
10/12/09 02:19:16	59.974	3683.828613	350	332.024658	0	54.5	10	15	-103	7535.97
10/12/09 02:19:20	59.979	3681.108398	350	332.024658	0	55	10	15	-103	7536.3
10/12/09 02:19:24	59.982	3678.229004	350	332.024658	0	55.5	10	15	-103	7536.63
10/12/09 02:19:28	59.987	3675.759277	350	332.024658	0	56	10	15	-103	7536.96
10/12/09 02:19:32	59.988	3671.165527	350	330.759033	0	56.5	10	15	-103	7537.29
10/12/09 02:19:36	59.987	3670.128662	350	330.759033	0	57	10	15	-103	7537.62

10/12/09 02:19:40	59.985	3672.047852	350	330.759033	0	57.5	10	15	-103	7537.95
10/12/09 02:19:44	59.982	3672.103516	350	330.759033	0	58	10	15	-103	7538.28
10/12/09 02:19:48	59.989	3671.882324	350	330.759033	0	58.5	10	15	-103	7538.61
10/12/09 02:19:52	59.988	3671.335938	350	323.419952	0	59	10	15	-103	7538.94
10/12/09 02:19:56	59.982	3670.37207	350	323.419952	0	59.5	10	15	-103	7539.27
10/12/09 02:20:00	59.981	3671.400879	350	323.419952	0	60	10	15	-103	7539.6
10/12/09 02:20:04	59.983	3672.181396	350	323.419952	0	60.5	10	15	-103	7539.93
10/12/09 02:20:08	59.989	3668.070801	350	323.419952	0	61	10	15	-103	7540.26
10/12/09 02:20:12	59.985	3669.908203	350	342.350922	0	61.5	10	15	-103	7540.59
10/12/09 02:20:16	59.98	3670.262695	350	342.350922	0	62	10	15	-103	7540.92
10/12/09 02:20:20	59.98	3670.102051	350	342.350922	0	62.5	10	15	-103	7541.25
10/12/09 02:20:24	59.979	3671.402588	350	342.350922	0	63	10	15	-103	7541.58
10/12/09 02:20:28	59.981	3672.371826	350	342.350922	0	63.5	10	15	-103	7541.91
10/12/09 02:20:32	59.98	3670.9375	350	345.081818	0	64	10	15	-103	7542.24
10/12/09 02:20:36	59.98	3670.137207	350	345.081818	0	64.5	10	15	-103	7542.57
10/12/09 02:20:40	59.977	3672.390869	350	345.081818	0	65	10	15	-103	7542.9
10/12/09 02:20:44	59.981	3674.051758	350	345.081818	0	65.5	10	15	-103	7543.23
10/12/09 02:20:48	59.976	3671.800293	350	345.081818	0	66	10	15	-103	7543.56
10/12/09 02:20:52	59.972	3673.873535	350	346.537384	0	66.5	10	15	-103	7543.89
10/12/09 02:20:56	59.973	3676.623291	350	346.537384	0	67	10	15	-103	7544.22
10/12/09 02:21:00	59.973	3676.542969	350	346.537384	0	67.5	10	15	-103	7544.55
10/12/09 02:21:04	59.971	3675.752441	350	346.537384	0	68	10	15	-103	7544.88
10/12/09 02:21:08	59.977	3674.869629	350	346.537384	0	68.5	10	15	-103	7545.21
10/12/09 02:21:12	59.975	3671.593262	350	342.905762	0	69	10	15	-103	7545.54
10/12/09 02:21:16	59.98	3669.962891	350	342.905762	0	69.5	10	15	-103	7545.87
10/12/09 02:21:20	59.981	3669.496826	350	342.905762	0	70	10	15	-103	7546.2
10/12/09 02:21:24	59.982	3667.676514	350	342.905762	0	70.5	10	15	-103	7546.53
10/12/09 02:21:28	59.982	3666.599365	350	342.905762	0	71	10	15	-103	7546.86
10/12/09 02:21:32	59.982	3666.44165	350	340.094391	0	71.5	10	15	-103	7547.19
10/12/09 02:21:36	59.985	3667.456299	350	340.094391	0	72	10	15	-103	7547.52
10/12/09 02:21:40	59.989	3665.261719	350	340.094391	0	72.5	10	15	-103	7547.85
10/12/09 02:21:44	59.996	3663.824951	350	340.094391	0	73	10	15	-103	7548.18
10/12/09 02:21:48	59.998	3662.054932	350	340.094391	0	73.5	10	15	-103	7548.51
10/12/09 02:21:52	60.007	3662.076172	350	342.771179	0	74	10	15	-103	7548.84
10/12/09 02:21:56	60.013	3662.959473	350	342.771179	0	74.5	10	15	-103	7549.17
10/12/09 02:22:00	60.013	3664.13916	350	342.771179	0	75	10	15	-103	7549.5
10/12/09 02:22:04	60.008	3664.158691	350	342.771179	0	75.5	10	15	-103	7549.83
10/12/09 02:22:08	60.019	3663.183594	350	342.771179	0	76	10	15	-103	7550.16
10/12/09 02:22:12	60.023	3661.512207	350	342.909912	0	76.5	10	15	-103	7550.49
10/12/09 02:22:16	60.02	3658.661377	350	342.909912	0	77	10	15	-103	7550.82

10/12/09 02:22:20	60.021	3657.571045	350	342.909912	0	77.5	10	15	-103	7551.15
10/12/09 02:22:24	60.019	3657.710449	350	342.909912	0	78	10	15	-103	7551.48
10/12/09 02:22:28	60.022	3660.227539	350	342.909912	0	78.5	10	15	-103	7551.81
10/12/09 02:22:32	60.025	3658.698242	350	343.286011	0	79	10	15	-103	7552.14
10/12/09 02:22:36	60.02	3658.154541	350	343.286011	0	79.5	10	15	-103	7552.47
10/12/09 02:22:40	60.018	3659.777588	350	343.286011	0	80	10	15	-103	7552.8
10/12/09 02:22:44	60.02	3662.531494	350	343.286011	0	80.5	10	15	-103	7553.13
10/12/09 02:22:48	60.019	3662.078857	350	343.286011	0	81	10	15	-103	7553.46
10/12/09 02:22:52	60.022	3662.678223	350	331.852966	0	81.5	10	15	-103	7553.79
10/12/09 02:22:56	60.025	3663.538574	350	331.852966	0	82	10	15	-103	7554.12
10/12/09 02:23:00	60.02	3662.55249	350	331.852966	0	82.5	10	15	-103	7554.45
10/12/09 02:23:04	60.02	3663.600586	350	331.852966	0	83	10	15	-103	7554.78
10/12/09 02:23:08	60.021	3663.689941	350	331.852966	0	83.5	10	15	-103	7555.11
10/12/09 02:23:12	60.018	3663.395752	350	329.98822	0	84	10	15	-103	7555.44
10/12/09 02:23:16	60.014	3664.31543	350	329.98822	0	84.5	10	15	-103	7555.77
10/12/09 02:23:20	60.013	3665.797607	350	329.98822	0	85	10	15	-103	7556.1
10/12/09 02:23:24	60.01	3666.72583	350	329.98822	0	85.5	10	15	-103	7556.43
10/12/09 02:23:28	60.011	3667.54541	350	329.98822	0	86	10	15	-103	7556.76
10/12/09 02:23:32	60.012	3666.44873	350	255.444168	0	86.5	10	15	-103	7557.09
10/12/09 02:23:36	60.009	3667.696045	350	255.444168	0	87	10	15	-103	7557.42
10/12/09 02:23:40	60.009	3667.042969	350	255.444168	0	87.5	10	15	-103	7557.75
10/12/09 02:23:44	60.005	3666.222656	350	255.444168	0	88	10	15	-103	7558.08
10/12/09 02:23:48	59.999	3665.40332	350	255.444168	0	88.5	10	15	-103	7558.41
10/12/09 02:23:52	59.995	3665.679688	350	254.838303	0	89	10	15	-103	7558.74
10/12/09 02:23:56	59.998	3664.94751	350	254.838303	0	89.5	10	15	-103	7559.07
10/12/09 02:24:00	59.998	3666.133301	350	254.838303	0	90	10	15	-103	7559.4
10/12/09 02:24:04	59.995	3666.734619	350	254.838303	0	90.5	10	15	-103	7559.73
10/12/09 02:24:08	59.992	3667.557373	350	254.838303	0	91	10	15	-103	7560.06
10/12/09 02:24:12	59.988	3667.853271	350	257.146973	0	91.5	10	15	-103	7560.39
10/12/09 02:24:16	59.982	3668.690918	350	257.146973	0	92	10	15	-103	7560.72
10/12/09 02:24:20	59.982	3669.606201	350	257.146973	0	92.5	10	15	-103	7561.05
10/12/09 02:24:24	59.984	3670.25	350	257.146973	0	93	10	15	-103	7561.38
10/12/09 02:24:28	59.978	3671.548828	350	257.146973	0	93.5	10	15	-103	7561.71
10/12/09 02:24:32	59.976	3674.262939	350	262.289368	0	94	10	15	-103	7562.04
10/12/09 02:24:36	59.974	3676.418213	350	262.289368	0	94.5	10	15	-103	7562.37
10/12/09 02:24:40	59.979	3674.637451	350	262.289368	0	95	10	15	-103	7562.7
10/12/09 02:24:44	59.981	3675.226074	350	262.289368	0	95.5	10	15	-103	7563.03
10/12/09 02:24:48	59.984	3674.399414	350	262.289368	0	96	10	15	-103	7563.36
10/12/09 02:24:52	59.988	3673.039551	350	256.647949	0	96.5	10	15	-103	7563.69
10/12/09 02:24:56	59.99	3673.056396	350	256.647949	0	97	10	15	-103	7564.02

10/12/09 02:25:00	59.991	3671.493164	350	256.647949	0	97.5	10	15	-103	7564.35
10/12/09 02:25:04	59.991	3670.066162	350	256.647949	0	98	10	15	-103	7564.68
10/12/09 02:25:08	59.993	3671.744141	350	256.647949	0	98.5	10	15	-103	7565.01
10/12/09 02:25:12	60.002	3672.625488	350	256.307251	0	99	10	15	-103	7565.34
10/12/09 02:25:16	60.003	3673.818604	350	256.307251	0	99.5	10	15	-103	7565.67
10/12/09 02:25:20	60.005	3673.182129	350	256.307251	0	100	10	15	-103	7566
10/12/09 02:25:24	60.002	3672.417969	350	256.307251	0	100.5	10	15	-103	7566.33
10/12/09 02:25:28	60.008	3672.216797	350	256.307251	0	101	10	15	-103	7566.66
10/12/09 02:25:32	60.01	3673.182129	350	249.086395	0	101.5	10	15	-103	7566.99
10/12/09 02:25:36	60.011	3673.553467	350	249.086395	0	102	10	15	-103	7567.32
10/12/09 02:25:40	60.014	3674.537109	350	249.086395	0	102.5	10	15	-103	7567.65
10/12/09 02:25:44	60.012	3673.203613	350	249.086395	0	103	10	15	-103	7567.98
10/12/09 02:25:48	60.011	3673.067627	350	249.086395	0	103.5	10	15	-103	7568.31
10/12/09 02:25:52	60.022	3672.519531	350	253.742477	0	104	10	15	-103	7568.64
10/12/09 02:25:56	60.014	3671.288086	350	253.742477	0	104.5	10	15	-103	7568.97
10/12/09 02:26:00	60.014	3672.981689	350	253.742477	0	105	10	15	-103	7569.3
10/12/09 02:26:04	60.017	3671.95166	350	253.742477	0	105.5	10	15	-103	7569.63
10/12/09 02:26:08	60.019	3671.627197	350	253.742477	0	106	10	15	-103	7569.96
10/12/09 02:26:12	60.027	3668.610596	350	257.421204	0	106.5	10	15	-103	7570.29
10/12/09 02:26:16	60.026	3664.495117	350	257.421204	0	107	10	15	-103	7570.62
10/12/09 02:26:20	60.019	3666.820801	350	257.421204	0	107.5	10	15	-103	7570.95
10/12/09 02:26:24	60.019	3670.453613	350	257.421204	0	108	10	15	-103	7571.28
10/12/09 02:26:28	60.019	3671.667969	350	257.421204	0	108.5	10	15	-103	7571.61
10/12/09 02:26:32	60.021	3672.685059	350	261.73822	0	109	10	15	-103	7571.94
10/12/09 02:26:36	60.019	3672.164063	350	261.73822	0	109.5	10	15	-103	7572.27
10/12/09 02:26:40	60.022	3669.98291	350	165.101685	0	110	10	15	-103	7572.6
10/12/09 02:26:44	60.037	3663.758057	350	165.476395	0	110.5	10	15	-103	7572.93
10/12/09 02:26:48	60.036	3660.672363	350	165.476395	0	111	10	15	-103	7573.26
10/12/09 02:26:52	60.046	3649.19043	350	165.476395	0	111.5	10	15	-103	7573.59
10/12/09 02:26:56	60.048	3648.246338	350	165.476395	0	112	10	15	-103	7573.92
10/12/09 02:27:00	60.041	3654.294434	350	165.101685	0	112.5	10	15	-103	7574.25
10/12/09 02:27:04	60.041	3651.874268	350	165.476395	0	113	10	15	-103	7574.58
10/12/09 02:27:08	60.041	3649.187012	350	165.476395	0	113.5	10	15	-103	7574.91
10/12/09 02:27:12	60.045	3645.386963	350	165.476395	0	114	10	15	-103	7575.24
10/12/09 02:27:16	60.041	3645.445801	350	165.476395	0	114.5	10	15	-103	7575.57
10/12/09 02:27:20	60.041	3641.191162	350	165.476395	0	115	10	15	-103	7575.9
10/12/09 02:27:24	59.978	3696.362305	350	206.459106	1	115.5	10	15	-103	7576.23
10/12/09 02:27:28	59.836	3734.672607	335	206.459106	1	116	10	0	-103	7576.56
10/12/09 02:27:32	59.892	3761.249512	335	206.459106	1	116.5	10	0	-103	7576.89
10/12/09 02:27:36	59.88	3766.193848	335	206.459106	1	117	10	0	-103	7577.22

10/12/09 02:27:40	59.875	3769.925049	335	206.459106	1	117.5	10	0	-103	7577.55
10/12/09 02:27:44	59.887	3781.591797	335	211.256042	1	118	10	0	-103	7577.88
10/12/09 02:27:48	59.885	3784.961914	335	211.256042	1	118.5	10	0	-103	7578.21
10/12/09 02:27:52	59.888	3784.418945	335	211.256042	2	119	10	0	-103	7578.54
10/12/09 02:27:56	59.895	3788.327637	335	211.256042	3	119.5	10	0	-103	7578.87
10/12/09 02:28:00	59.893	3788.471924	335	211.256042	4	120	10	0	-103	7579.2
10/12/09 02:28:04	59.894	3793.074463	335	214.346695	5	120.5	10	0	-103	7579.53
10/12/09 02:28:08	59.89	3799.427734	335	214.346695	6	121	10	0	-103	7579.86
10/12/09 02:28:12	59.885	3799.959229	335	214.346695	7	121.5	10	0	-103	7580.19
10/12/09 02:28:16	59.887	3802.925049	335	214.346695	8	122	10	0	-103	7580.52
10/12/09 02:28:20	59.888	3804.387939	335	214.346695	9	122.5	10	0	-103	7580.85
10/12/09 02:28:24	59.889	3805.616699	335	212.172699	10	123	10	0	-103	7581.18
10/12/09 02:28:28	59.873	3811.50293	335	212.172699	11	123.5	10	0	-103	7581.51
10/12/09 02:28:32	59.849	3815.888916	335	212.172699	12	124	10	0	-103	7581.84
10/12/09 02:28:36	59.858	3826.053223	335	212.172699	13	124.5	10	0	-103	7582.17
10/12/09 02:28:40	59.866	3827.523926	335	212.172699	14	125	10	0	-103	7582.5
10/12/09 02:28:44	59.867	3826.783447	335	215.598175	15	125.5	10	0	-103	7582.83
10/12/09 02:28:48	59.871	3825.713379	335	215.598175	16	126	10	0	-103	7583.16
10/12/09 02:28:52	59.879	3822.505371	335	215.598175	16	126.5	10	0	-103	7583.49
10/12/09 02:28:56	59.883	3818.055176	335	215.598175	16	127	10	0	-103	7583.82
10/12/09 02:29:00	59.89	3815.009766	335	215.598175	16	127.5	10	0	-103	7584.15
10/12/09 02:29:04	59.889	3811.838379	335	218.327255	16	128	10	0	-103	7584.48
10/12/09 02:29:08	59.899	3806.972168	335	218.327255	16	128.5	10	0	-103	7584.81
10/12/09 02:29:12	59.902	3804.188477	335	218.327255	16	129	10	0	-103	7585.14
10/12/09 02:29:16	59.904	3793.975098	335	218.327255	16	129.5	10	0	-103	7585.47
10/12/09 02:29:20	59.911	3791.501953	335	218.327255	16	130	10	0	-103	7585.8
10/12/09 02:29:24	59.916	3788.13208	335	217.379425	16	130.5	10	0	-103	7586.13
10/12/09 02:29:28	59.918	3783.02832	335	217.379425	16	131	10	0	-103	7586.46
10/12/09 02:29:32	59.921	3776.358398	335	217.379425	16	131.5	10	0	-103	7586.79
10/12/09 02:29:36	59.917	3774.604248	335	217.379425	16	132	10	0	-103	7587.12
10/12/09 02:29:40	59.921	3773.957764	335	217.379425	16	132.5	10	0	-103	7587.45
10/12/09 02:29:44	59.926	3771.67041	335	214.830353	16	133	10	0	-103	7587.78
10/12/09 02:29:48	59.928	3768.707031	335	214.830353	16	133.5	10	0	-103	7588.11
10/12/09 02:29:52	59.932	3767.020996	335	214.830353	16	134	10	0	-103	7588.44
10/12/09 02:29:56	59.928	3766.788086	335	214.830353	16	134.5	10	0	-103	7588.77
10/12/09 02:30:00	59.929	3765.671631	335	214.830353	16	135	10	0	-103	7589.1
10/12/09 02:30:04	59.933	3764.242676	335	227.655914	16	135.5	10	0	-103	7589.43
10/12/09 02:30:08	59.937	3762.935303	335	227.655914	16	136	10	0	-103	7589.76
10/12/09 02:30:12	59.949	3753.922363	335	227.655914	0	136.5	10	0	-103	7590.09
10/12/09 02:30:16	59.942	3746.888672	335	227.655914	0	137	10	0	-103	7590.42

10/12/09 02:30:20	59.942	3749.593262	335	227.655914	0	137.5	10	0	-103	7590.75
10/12/09 02:30:24	59.948	3746.706055	335	225.018082	0	138	10	0	-103	7591.08
10/12/09 02:30:28	59.949	3742.741455	335	225.018082	0	138.5	10	0	-103	7591.41
10/12/09 02:30:32	59.952	3736.13916	335	225.018082	0	139	10	0	-103	7591.74
10/12/09 02:30:36	59.951	3727.838379	335	225.018082	0	139.5	10	0	-103	7592.07
10/12/09 02:30:40	59.952	3722.648926	335	225.018082	0	140	10	0	-103	7592.4
10/12/09 02:30:44	59.955	3717.996094	335	228.365158	0	140.5	10	0	-103	7592.73
10/12/09 02:30:48	59.954	3715.752686	335	228.365158	0	141	10	0	-103	7593.06
10/12/09 02:30:52	59.953	3713.483643	335	228.365158	0	141.5	10	0	-103	7593.39
10/12/09 02:30:56	59.952	3710.810059	335	228.365158	0	142	10	0	-103	7593.72
10/12/09 02:31:00	59.954	3714.622559	335	228.365158	0	142.5	10	0	-103	7594.05
10/12/09 02:31:04	59.957	3716.168213	335	234.075333	0	143	10	0	-103	7594.38
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10/12/09 02:31:12	59.955	3722.361328	335	234.075333	0	144	10	0	-103	7595.04
10/12/09 02:31:16	59.961	3722.657959	335	234.075333	0	144.5	10	0	-103	7595.37
10/12/09 02:31:20	59.962	3722.277588	335	234.075333	0	145	10	0	-103	7595.7
10/12/09 02:31:24	59.966	3723.09082	335	228.798157	0	145.5	10	0	-103	7596.03
10/12/09 02:31:28	59.968	3723.43457	335	228.798157	0	146	10	0	-103	7596.36
10/12/09 02:31:32	59.974	3725.402832	335	228.798157	0	146.5	10	0	-103	7596.69
10/12/09 02:31:36	59.969	3728.052979	335	228.798157	0	147	10	0	-103	7597.02
10/12/09 02:31:40	59.97	3732.530029	335	228.798157	0	147.5	10	0	-103	7597.35
10/12/09 02:31:44	59.973	3736.535156	335	229.466965	0	148	10	0	-103	7597.68
10/12/09 02:31:48	59.976	3736.821777	335	229.466965	0	148.5	10	0	-103	7598.01
10/12/09 02:31:52	59.978	3739.943848	335	229.466965	0	149	10	0	-103	7598.34
10/12/09 02:31:56	59.978	3741.793701	335	229.466965	0	149.5	10	0	-103	7598.67
10/12/09 02:32:00	59.978	3746.60791	335	229.466965	0	150	10	0	-103	7599
10/12/09 02:32:04	59.98	3750.716309	335	228.980164	0	150.5	10	0	-103	7599.33
10/12/09 02:32:08	59.981	3752.747559	335	228.980164	0	151	10	0	-103	7599.66
10/12/09 02:32:12	59.979	3756.407227	335	228.980164	0	151.5	10	0	-103	7599.99
10/12/09 02:32:16	59.979	3760.405273	335	228.980164	0	152	10	0	-103	7600.32
10/12/09 02:32:20	59.983	3761.406982	335	228.980164	0	152.5	10	0	-103	7600.65
10/12/09 02:32:24	59.988	3763.212158	335	219.975555	0	153	10	0	-103	7600.98
10/12/09 02:32:28	59.987	3766.085205	335	219.975555	0	153.5	10	0	-103	7601.31
10/12/09 02:32:32	59.991	3767.250977	335	219.975555	0	154	10	0	-103	7601.64
10/12/09 02:32:36	59.992	3768.633545	335	219.975555	0	154.5	10	0	-103	7601.97
10/12/09 02:32:40	59.989	3772.44458	335	219.975555	0	155	10	0	-103	7602.3
10/12/09 02:32:44	59.983	3774.668457	335	229.089249	0	155.5	10	0	-103	7602.63
10/12/09 02:32:48	59.988	3775.363281	335	229.089249	0	156	10	0	-103	7602.96
10/12/09 02:32:52	59.996	3775.491699	335	229.089249	0	156.5	10	0	-103	7603.29
10/12/09 02:32:56	59.999	3778.553711	335	229.089249	0	157	10	0	-103	7603.62

10/12/09 02:33:00	59.999	3781.255859	335	229.089249	0	157.5	10	0	-103	7603.95
10/12/09 02:33:04	59.999	3783.092041	335	229.663269	0	158	10	0	-103	7604.28
10/12/09 02:33:08	60.005	3784.420898	335	229.663269	0	158.5	10	0	-103	7604.61
10/12/09 02:33:12	60.008	3785.462646	335	229.663269	0	159	10	0	-103	7604.94
10/12/09 02:33:16	60.014	3786.304199	335	229.663269	0	159.5	10	0	-103	7605.27
10/12/09 02:33:20	60.019	3787.515869	335	229.663269	0	160	10	0	-103	7605.6
10/12/09 02:33:24	60.017	3788.030273	335	229.233856	0	160.5	10	0	-103	7605.93
10/12/09 02:33:28	60.019	3789.21582	335	229.233856	0	161	10	0	-103	7606.26
10/12/09 02:33:32	60.024	3785.841797	335	229.233856	0	161.5	10	0	-103	7606.59
10/12/09 02:33:36	60.021	3787.93042	335	229.233856	0	162	10	0	-103	7606.92
10/12/09 02:33:40	60.024	3786.874756	335	262.1026	0	162.5	10	0	-103	7607.25
10/12/09 02:33:44	60.021	3787.357666	335	262.1026	0	163	10	0	-103	7607.58
10/12/09 02:33:48	60.025	3785.614014	335	262.1026	0	163.5	10	0	-103	7607.91
10/12/09 02:33:52	60.02	3785.803711	335	262.71701	0	164	10	0	-103	7608.24
10/12/09 02:33:56	60.022	3786.877197	335	262.71701	0	164.5	10	0	-103	7608.57
10/12/09 02:34:00	60.022	3785.726074	335	262.71701	0	165	10	0	-103	7608.9
10/12/09 02:34:04	60.021	3785.821045	335	262.71701	0	165.5	10	0	-103	7609.23
10/12/09 02:34:08	60.023	3786.28418	335	262.71701	0	166	10	0	-103	7609.56
10/12/09 02:34:12	60.019	3787.627441	335	260.016479	0	166.5	10	0	-103	7609.89
10/12/09 02:34:16	60.018	3789.67334	335	260.016479	0	167	10	0	-103	7610.22
10/12/09 02:34:20	60.018	3788.47876	335	260.016479	0	167.5	10	0	-103	7610.55
10/12/09 02:34:24	60.019	3789.368896	335	260.016479	0	168	10	0	-103	7610.88
10/12/09 02:34:28	60.015	3788.664551	335	260.016479	0	168.5	10	0	-103	7611.21
10/12/09 02:34:32	60.014	3790.666992	335	263.87323	0	169	10	0	-103	7611.54
10/12/09 02:34:36	60.012	3790.411133	335	263.87323	0	169.5	10	0	-103	7611.87
10/12/09 02:34:40	60.01	3791.539795	335	263.87323	0	170	10	0	-103	7612.2
10/12/09 02:34:44	60.007	3791.0271	335	263.87323	0	170.5	10	0	-103	7612.53
10/12/09 02:34:48	60.009	3791.426025	335	263.87323	0	171	10	0	-103	7612.86
10/12/09 02:34:52	60.003	3790.457275	335	264.5979	0	171.5	10	0	-103	7613.19
10/12/09 02:34:56	59.995	3789.584961	335	264.5979	0	172	10	0	-103	7613.52
10/12/09 02:35:00	59.991	3788.10498	335	264.5979	0	172.5	10	0	-103	7613.85
10/12/09 02:35:04	59.992	3788.189453	335	264.5979	0	173	10	0	-103	7614.18
10/12/09 02:35:08	59.986	3788.540039	335	264.5979	0	173.5	10	0	-103	7614.51
10/12/09 02:35:12	59.984	3788.101074	335	262.415924	0	174	10	0	-103	7614.84
10/12/09 02:35:16	59.984	3786.452881	335	262.415924	0	174.5	10	0	-103	7615.17
10/12/09 02:35:20	59.981	3788.813477	335	262.415924	0	175	10	0	-103	7615.5
10/12/09 02:35:24	59.979	3788.256348	335	262.415924	0	175.5	10	0	-103	7615.83
10/12/09 02:35:28	59.976	3790.467285	335	262.415924	0	176	10	0	-103	7616.16
10/12/09 02:35:32	59.979	3790.42041	335	259.685242	0	176.5	10	0	-103	7616.49
10/12/09 02:35:36	59.978	3789.26709	335	259.685242	0	177	10	0	-103	7616.82

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10/12/09 02:35:44	59.977	3786.243164	335	259.685242	0	178	10	0	-103	7617.48
10/12/09 02:35:48	59.975	3788.962891	335	259.685242	0	178.5	10	0	-103	7617.81
10/12/09 02:35:52	59.969	3791.876953	335	255.911011	0	179	10	0	-103	7618.14
10/12/09 02:35:56	59.971	3792.311279	335	255.911011	0	179.5	10	0	-103	7618.47
10/12/09 02:36:00	59.978	3788.07959	335	255.911011	0	180	10	0	-103	7618.8
10/12/09 02:36:04	59.978	3787.13501	335	255.911011	0	180.5	10	0	-103	7619.13
10/12/09 02:36:08	59.972	3786.996094	335	255.911011	0	181	10	0	-103	7619.46
10/12/09 02:36:12	59.975	3786.486816	335	258.148193	0	181.5	10	0	-103	7619.79
10/12/09 02:36:16	59.969	3789.213867	335	258.148193	0	182	10	0	-103	7620.12
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10/12/09 02:36:32	59.964	3787.394043	335	258.873596	0	184	10	0	-103	7621.44
10/12/09 02:36:36	59.972	3784.830566	335	258.873596	0	184.5	10	0	-103	7621.77
10/12/09 02:36:40	59.967	3784.320313	335	258.873596	0	185	10	0	-103	7622.1
10/12/09 02:36:44	59.968	3782.109863	335	258.873596	0	185.5	10	0	-103	7622.43
10/12/09 02:36:48	59.967	3779.056152	335	258.873596	0	186	10	0	-103	7622.76
10/12/09 02:36:52	59.966	3779.21167	335	249.33757	0	186.5	10	0	-103	7623.09
10/12/09 02:36:56	59.971	3776.429199	335	249.33757	0	187	10	0	-103	7623.42
10/12/09 02:37:00	59.965	3776.59668	335	249.33757	0	187.5	10	0	-103	7623.75
10/12/09 02:37:04	59.964	3776.022949	335	249.33757	0	188	10	0	-103	7624.08
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10/12/09 02:37:12	59.968	3768.50293	335	258.278168	0	189	10	0	-103	7624.74
10/12/09 02:37:16	59.965	3767.366211	335	258.278168	0	189.5	10	0	-103	7625.07
10/12/09 02:37:20	59.973	3760.29541	335	258.278168	0	190	10	0	-103	7625.4
10/12/09 02:37:24	59.965	3761.893799	335	258.278168	0	190.5	10	0	-103	7625.73
10/12/09 02:37:28	59.969	3760.58252	335	258.278168	0	191	10	0	-103	7626.06
10/12/09 02:37:32	59.964	3759.781006	335	258.406372	0	191.5	10	0	-103	7626.39
10/12/09 02:37:36	59.979	3757.772949	335	258.406372	0	192	10	0	-103	7626.72
10/12/09 02:37:40	59.983	3753.087402	335	258.406372	0	192.5	10	0	-103	7627.05
10/12/09 02:37:44	59.967	3753.750977	335	258.406372	0	193	10	0	-103	7627.38
10/12/09 02:37:48	59.962	3759.249756	335	258.406372	0	193.5	10	0	-103	7627.71
10/12/09 02:37:52	59.961	3760.964844	335	260.538879	0	194	10	0	-103	7628.04
10/12/09 02:37:56	59.96	3763.822266	335	260.538879	0	194.5	10	0	-103	7628.37
10/12/09 02:38:00	59.959	3763.858154	335	260.538879	0	195	10	0	-103	7628.7
10/12/09 02:38:04	59.951	3766.126709	335	260.538879	0	195.5	10	0	-103	7629.03
10/12/09 02:38:08	59.954	3767.972168	335	260.538879	0	196	10	0	-103	7629.36
10/12/09 02:38:12	59.956	3765.606445	335	257.88208	0	196.5	10	0	-103	7629.69
10/12/09 02:38:16	59.963	3761.570313	335	257.88208	0	197	10	0	-103	7630.02

10/12/09 02:38:20	59.959	3759.626953	335	257.88208	0	197.5	10	0	-103	7630.35
10/12/09 02:38:24	59.963	3752.428711	335	257.88208	0	198	10	0	-103	7630.68
10/12/09 02:38:28	59.968	3753.82959	335	257.88208	0	198.5	10	0	-103	7631.01
10/12/09 02:38:32	59.968	3753.522949	335	258.588654	0	199	10	0	-103	7631.34
10/12/09 02:38:36	59.973	3753.178223	335	258.588654	0	199.5	10	0	-103	7631.67
10/12/09 02:38:40	59.965	3753.290527	335	258.588654	0	200	10	0	-103	7632
10/12/09 02:38:44	59.967	3752.358643	335	258.588654	0	200.5	10	0	-103	7632.33
10/12/09 02:38:48	59.976	3747.47583	335	258.588654	0	201	10	0	-103	7632.66
10/12/09 02:38:52	59.969	3741.285156	335	261.906158	0	201.5	10	0	-103	7632.99
10/12/09 02:38:56	59.974	3745.738281	335	261.906158	0	202	10	0	-103	7633.32
10/12/09 02:39:00	59.981	3741.618164	335	261.906158	0	202.5	10	0	-103	7633.65
10/12/09 02:39:04	59.981	3738.484375	335	261.906158	0	203	10	0	-103	7633.98
10/12/09 02:39:08	59.982	3737.403564	335	261.906158	0	203.5	10	0	-103	7634.31
10/12/09 02:39:12	59.982	3736.30835	335	256.747803	0	204	10	0	-103	7634.64
10/12/09 02:39:16	59.979	3735.448242	335	256.747803	0	204.5	10	0	-103	7634.97
10/12/09 02:39:20	59.978	3737.540527	335	256.747803	0	205	10	0	-103	7635.3
10/12/09 02:39:24	59.98	3736.747559	350	256.747803	0	205.5	10	0	-103	7635.63
10/12/09 02:39:28	59.98	3736.067383	350	256.747803	0	206	10	0	-103	7635.96
10/12/09 02:39:32	59.976	3736.574951	350	167.431976	0	206.5	10	0	-103	7636.29
10/12/09 02:39:36	59.971	3738.874756	350	167.431976	0	207	10	0	-103	7636.62
10/12/09 02:39:40	59.974	3738.646973	350	167.431976	0	207.5	10	0	-103	7636.95
10/12/09 02:39:44	59.976	3737.38208	350	167.431976	0	208	10	0	-103	7637.28
10/12/09 02:39:48	59.969	3740.016846	350	167.431976	0	208.5	10	0	-103	7637.61
10/12/09 02:39:52	59.974	3742.052734	350	164.973404	0	209	10	0	-103	7637.94
10/12/09 02:39:56	59.972	3742.524414	350	164.973404	0	209.5	10	0	-103	7638.27
10/12/09 02:40:00	59.977	3741.723145	350	164.973404	0	210	10	0	-103	7638.6
10/12/09 02:40:04	59.978	3740.62915	350	164.973404	0	210.5	10	0	-103	7638.93
10/12/09 02:40:08	59.973	3740.775146	350	164.973404	0	211	10	0	-103	7639.26
10/12/09 02:40:12	59.977	3741.267822	350	157.628082	0	211.5	10	0	-103	7639.59
10/12/09 02:40:16	59.978	3738.96582	350	157.628082	0	212	10	0	-103	7639.92
10/12/09 02:40:20	59.981	3738.878662	350	157.628082	0	212.5	10	0	-103	7640.25
10/12/09 02:40:24	59.974	3738.101563	350	157.628082	0	213	10	0	-103	7640.58
10/12/09 02:40:28	59.971	3743.506836	350	157.628082	0	213.5	10	0	-103	7640.91
10/12/09 02:40:32	59.972	3745.250732	350	155.531708	0	214	10	0	-103	7641.24
10/12/09 02:40:36	59.966	3747.3396	350	155.531708	0	214.5	10	0	-103	7641.57
10/12/09 02:40:40	59.971	3749.75	350	155.531708	0	215	10	0	-103	7641.9
10/12/09 02:40:44	59.972	3744.682617	350	155.531708	0	215.5	10	0	-103	7642.23
10/12/09 02:40:48	59.972	3743.148926	350	155.531708	0	216	10	0	-103	7642.56
10/12/09 02:40:52	59.973	3739.452637	350	160.447235	0	216.5	10	0	-103	7642.89
10/12/09 02:40:56	59.971	3731.82959	350	160.447235	0	217	10	0	-103	7643.22

10/12/09 02:41:00	59.982	3736.229492	350	160.447235	0	217.5	10	0	-103	7643.55
10/12/09 02:41:04	59.985	3733.433838	350	160.447235	0	218	10	0	-103	7643.88
10/12/09 02:41:08	59.987	3730.509766	350	160.447235	0	218.5	10	0	-103	7644.21
10/12/09 02:41:12	59.989	3725.45874	350	163.958603	0	219	10	0	-103	7644.54
10/12/09 02:41:16	59.987	3720.10791	350	163.958603	0	219.5	10	0	-103	7644.87
10/12/09 02:41:20	59.994	3725.661377	350	163.958603	0	220	10	0	-103	7645.2
10/12/09 02:41:24	60.001	3727.75415	350	163.958603	0	220.5	10	0	-103	7645.53
10/12/09 02:41:28	60.004	3727.68335	350	163.958603	0	221	10	0	-103	7645.86
10/12/09 02:41:32	60.012	3725.012207	350	166.072449	0	221.5	10	0	-103	7646.19
10/12/09 02:41:36	60.019	3726.015625	350	166.072449	0	222	10	0	-103	7646.52
10/12/09 02:41:40	60.025	3716.374512	350	166.072449	0	222.5	10	0	-103	7646.85
10/12/09 02:41:44	60.027	3717.559814	350	166.072449	0	223	10	0	-103	7647.18
10/12/09 02:41:48	60.029	3715.166016	350	166.072449	0	223.5	10	0	-103	7647.51
10/12/09 02:41:52	60.036	3710.283447	350	163.766586	0	224	10	0	-103	7647.84
10/12/09 02:41:56	60.037	3699.355713	350	163.766586	0	224.5	10	0	-103	7648.17
10/12/09 02:42:00	60.041	3704.591309	350	163.766586	0	225	10	0	-103	7648.5
10/12/09 02:42:04	60.044	3702.482422	350	163.766586	0	225.5	10	0	-103	7648.83
10/12/09 02:42:08	60.046	3700.825928	350	163.766586	0	226	10	0	-103	7649.16
10/12/09 02:42:12	60.046	3699.726074	350	165.101685	0	226.5	10	0	-103	7649.49
10/12/09 02:42:16	60.043	3690.477295	350	165.101685	0	227	10	0	-103	7649.82
10/12/09 02:42:20	60.044	3696.877197	350	165.101685	0	227.5	10	0	-103	7650.15
10/12/09 02:42:24	60.043	3696.54126	350	165.101685	0	228	10	0	-103	7650.48
10/12/09 02:42:28	60.04	3698.686035	350	165.101685	0	228.5	10	0	-103	7650.81
10/12/09 02:42:32	60.039	3698.786865	350	165.476395	0	229	10	0	-103	7651.14
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10/12/09 02:42:44	60.037	3701.61377	350	165.476395	0	230.5	10	0	-103	7652.13
10/12/09 02:42:48	60.035	3702.912598	350	165.476395	0	231	10	0	-103	7652.46
10/12/09 02:42:52	60.033	3705.522461	350	206.459106	0	231.5	10	0	-103	7652.79
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10/12/09 02:43:00	60.032	3703.706299	335	206.459106	0	232.5	10	0	-103	7626
10/12/09 02:43:04	60.034	3705.435303	335	206.459106	0	233	10	0	-103	7632
10/12/09 02:43:08	60.037	3702.587891	335	206.459106	0	233.5	10	0	-103	7632
10/12/09 02:43:12	60.035	3701.941895	335	211.256042	0	234	10	0	-103	7632
10/12/09 02:43:16	60.039	3703.317871	335	211.256042	1	234.5	10	0	-103	7632
10/12/09 02:43:20	60.039	3702.524902	335	211.256042	1	235	10	0	-103	7632
10/12/09 02:43:24	60.034	3703.843506	335	211.256042	1	235.5	10	0	-103	7632
10/12/09 02:43:28	60.037	3702.517578	335	211.256042	1	236	10	0	-103	7632
10/12/09 02:43:32	60.037	3692.427002	335	214.346695	1	236.5	10	0	-103	7632
10/12/09 02:43:36	60.04	3700.275879	335	214.346695	1	237	10	0	-103	7632

10/12/09 02:43:40	60.045	3697.728516	335	214.346695	1	237.5	10	0	-103	7632
10/12/09 02:43:44	60.042	3697.368408	335	214.346695	2	238	10	0	-103	7632
10/12/09 02:43:48	60.04	3698.429199	335	214.346695	3	238.5	10	0	-103	7632
10/12/09 02:43:52	60.046	3693.58374	335	212.172699	4	239	10	0	-103	7632
10/12/09 02:43:56	60.034	3696.79834	335	212.172699	5	239.5	10	0	-103	7632
10/12/09 02:44:00	60.039	3701.791016	335	212.172699	6	240	10	0	-103	7632
10/12/09 02:44:04	60.037	3700.753418	335	212.172699	7	240.5	10	0	-103	7632
10/12/09 02:44:08	60.033	3705.212646	335	212.172699	8	241	10	0	-103	7632
10/12/09 02:44:12	60.031	3707.286621	335	215.598175	9	241.5	10	0	-103	7632
10/12/09 02:44:16	60.027	3707.340332	335	215.598175	10	242	10	0	-103	7632
10/12/09 02:44:20	60.032	3707.383789	335	215.598175	11	242.5	10	0	-103	7632
10/12/09 02:44:24	60.031	3707.615234	335	215.598175	12	243	10	0	-103	7632
10/12/09 02:44:28	60.039	3703.746094	335	215.598175	13	243.5	10	0	-103	7632
10/12/09 02:44:32	60.038	3700.847412	335	218.327255	14	244	10	0	-103	7632
10/12/09 02:44:36	60.035	3702.212158	335	218.327255	15	244.5	10	0	-103	7632
10/12/09 02:44:40	60.04	3700.397461	335	218.327255	16	245	10	0	-103	7632
10/12/09 02:44:44	60.035	3700.366455	335	218.327255	16	245.5	10	0	-103	7632
10/12/09 02:44:48	60.04	3700.661621	335	218.327255	16	246	10	0	-103	7632
10/12/09 02:44:52	60.045	3695.688232	335	217.379425	16	246.5	10	0	-103	7632
10/12/09 02:44:56	60.042	3693.824219	335	217.379425	16	247	10	0	-103	7632
10/12/09 02:45:00	60.044	3696.896973	335	217.379425	16	247.5	10	0	-103	7631
10/12/09 02:45:04	60.041	3697.502441	335	217.379425	16	248	10	0	-103	7625
10/12/09 02:45:08	60.04	3699.426758	335	217.379425	16	248.5	10	0	-103	7623
10/12/09 02:45:12	60.044	3699.806396	335	214.830353	16	249	10	0	-103	7621
10/12/09 02:45:16	60.039	3697.680664	335	214.830353	16	249.5	10	0	-103	7623
10/12/09 02:45:20	60.042	3698.358887	335	214.830353	16	250	10	0	-103	7625
10/12/09 02:45:24	60.038	3699.077148	335	214.830353	16	250.5	10	0	-103	7627
10/12/09 02:45:28	60.037	3701.591797	335	214.830353	16	251	10	0	-103	7628
10/12/09 02:45:32	60.038	3700.142822	335	227.655914	16	251.5	10	0	-103	7628
10/12/09 02:45:36	60.039	3701.139404	335	227.655914	16	252	10	0	-103	7629
10/12/09 02:45:40	60.038	3700.264404	335	227.655914	16	252.5	10	0	-103	7630
10/12/09 02:45:44	60.04	3699.721191	335	227.655914	16	253	10	0	-103	7631
10/12/09 02:45:48	60.037	3699.505127	335	227.655914	16	253.5	10	0	-103	7635
10/12/09 02:45:52	60.039	3699.216064	335	225.018082	16	254	10	0	-103	7638
10/12/09 02:45:56	60.036	3700.661377	335	225.018082	16	254.5	10	0	-103	7639
10/12/09 02:46:00	60.033	3702.967529	335	225.018082	16	255	10	0	-103	7642
10/12/09 02:46:04	60.03	3704.95166	335	225.018082	16	255.5	10	0	-103	7644
10/12/09 02:46:08	60.032	3705.621338	335	225.018082	16	256	10	0	-103	7645
10/12/09 02:46:12	60.042	3701.981201	335	228.365158	16	256.5	10	0	-103	7647
10/12/09 02:46:16	60.036	3700.74707	335	228.365158	16	257	10	0	-103	7648

10/12/09 02:46:20	60.032	3705.059326	335	228.365158	16	257.5	10	0	-103	7649
10/12/09 02:46:24	60.034	3704.44873	335	228.365158	16	258	10	0	-103	7650
10/12/09 02:46:28	60.032	3703.619629	335	228.365158	16	258.5	10	0	-103	7651
10/12/09 02:46:32	60.043	3701.431641	335	234.075333	16	259	10	0	-103	7652
10/12/09 02:46:36	60.042	3696.249512	335	234.075333	16	259.5	10	0	-103	7653
10/12/09 02:46:40	60.04	3693.518066	335	234.075333	16	260	10	0	-103	7654
10/12/09 02:46:44	60.043	3695.197021	335	234.075333	16	260.5	10	0	-103	7655
10/12/09 02:46:48	60.041	3693.786133	335	234.075333	16	261	10	0	-103	7655
10/12/09 02:46:52	60.038	3694.92627	335	228.798157	16	261.5	10	0	-103	7656
10/12/09 02:46:56	60.044	3694.159424	335	228.798157	16	262	10	0	-103	7656
10/12/09 02:47:00	60.036	3692.686279	335	228.798157	16	262.5	10	0	-103	7657
10/12/09 02:47:04	60.041	3693.390137	335	228.798157	16	263	10	0	-103	7657
10/12/09 02:47:08	60.043	3690.951416	335	228.798157	16	263.5	10	0	-103	7658
10/12/09 02:47:12	60.036	3692.042236	335	229.466965	16	264	10	0	-103	7658
10/12/09 02:47:16	60.039	3694.117188	335	229.466965	16	264.5	10	0	-103	7659
10/12/09 02:47:20	60.034	3695.580811	335	229.466965	16	265	10	0	-103	7659
10/12/09 02:47:24	60.035	3695.491211	335	229.466965	16	265.5	10	0	-103	7659
10/12/09 02:47:28	60.036	3696.486328	335	229.466965	16	266	10	0	-103	7660
10/12/09 02:47:32	60.03	3699.170898	335	228.980164	16	266.5	10	0	-103	7660
10/12/09 02:47:36	60.031	3699.251221	335	228.980164	16	267	10	0	-103	7661
10/12/09 02:47:40	60.032	3699.105225	335	228.980164	16	267.5	10	0	-103	7661
10/12/09 02:47:44	60.032	3698.954346	335	228.980164	16	268	10	0	-103	7662
10/12/09 02:47:48	60.032	3698.277344	335	228.980164	16	268.5	10	0	-103	7662
10/12/09 02:47:52	60.037	3695.94043	335	219.975555	16	269	10	0	-103	7663
10/12/09 02:47:56	60.039	3693.223633	335	219.975555	16	269.5	10	0	-103	7663
10/12/09 02:48:00	60.036	3691.918945	335	219.975555	16	270	10	0	-103	7664
10/12/09 02:48:04	60.041	3691.581543	335	219.975555	16	270.5	10	0	-103	7664
10/12/09 02:48:08	60.035	3693.301758	335	219.975555	16	271	10	0	-103	7665
10/12/09 02:48:12	60.038	3694.331299	335	229.089249	16	271.5	10	0	-103	7666
10/12/09 02:48:16	60.041	3693.617188	335	229.089249	16	272	10	0	-103	7666
10/12/09 02:48:20	60.036	3694.27002	335	229.089249	16	272.5	10	0	-103	7667
10/12/09 02:48:24	60.034	3693.747559	335	229.089249	16	273	10	0	-103	7668
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10/12/09 02:48:32	60.037	3691.798828	335	229.663269	16	274	10	0	-103	7669
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10/12/09 02:48:40	60.038	3692.640625	335	229.663269	16	275	10	0	-103	7670
10/12/09 02:48:44	60.038	3689.019531	335	229.663269	16	275.5	10	0	-103	7670
10/12/09 02:48:48	60.033	3690.091797	335	229.663269	16	276	10	0	-103	7671
10/12/09 02:48:52	60.034	3693.320801	335	229.233856	16	276.5	10	0	-103	7671
10/12/09 02:48:56	60.029	3695.224854	335	229.233856	16	277	10	0	-103	7672

10/12/09 02:49:00	60.03	3693.411621	335	229.233856	16	277.5	10	0	-103	7673
10/12/09 02:49:04	60.026	3696.025879	335	229.233856	16	278	10	0	-103	7673
10/12/09 02:49:08	60.021	3699.061523	350	229.233856	16	278.5	10	0	-103	7673
10/12/09 02:49:12	60.023	3698.935059	350	231.409882	16	279	10	0	-103	7673
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10/12/09 02:49:28	60.024	3701.30127	350	231.409882	16	281	10	0	-103	7673
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10/12/09 02:49:36	60.023	3701.70166	350	218.622284	16	282	10	0	-103	7673
10/12/09 02:49:40	60.026	3701.964844	350	218.622284	16	282.5	10	0	-103	7673
10/12/09 02:49:44	60.026	3700.241211	350	218.622284	16	283	10	0	-103	7673
10/12/09 02:49:48	60.021	3701.268066	350	218.622284	16	283.5	10	0	-103	7673
10/12/09 02:49:52	60.025	3700.587402	350	213.535858	16	284	10	0	-103	7673
10/12/09 02:49:56	60.023	3700.176758	350	213.535858	16	284.5	10	0	-103	7673
10/12/09 02:50:00	60.024	3700.277344	350	213.535858	16	285	10	0	-103	7673
10/12/09 02:50:04	60.023	3700.862793	350	213.535858	16	285.5	10	0	-103	7674
10/12/09 02:50:08	60.025	3700.05249	350	213.535858	16	286	10	0	-103	7675
10/12/09 02:50:12	60.02	3700.964844	350	225.651855	16	286.5	10	0	-103	7676
10/12/09 02:50:16	60.015	3703.516113	350	225.651855	16	287	10	0	-103	7677
10/12/09 02:50:20	60.017	3703.672363	350	225.651855	16	287.5	10	0	-103	7678
10/12/09 02:50:24	60.015	3703.003418	350	225.651855	16	288	10	0	-103	7679
10/12/09 02:50:28	60.017	3702.999512	350	225.651855	16	288.5	10	0	-103	7680
10/12/09 02:50:32	60.01	3703.918213	350	212.573639	16	289	10	0	-103	7681
10/12/09 02:50:36	60.002	3703.775391	350	212.573639	16	289.5	10	0	-103	7682
10/12/09 02:50:40	59.999	3701.533691	350	212.573639	16	290	10	0	-103	7684
10/12/09 02:50:44	60.003	3700.880371	350	212.573639	16	290.5	10	0	-103	7685
10/12/09 02:50:48	60.001	3701.388916	350	212.573639	16	291	10	0	-103	7687
10/12/09 02:50:52	59.993	3700.671387	350	219.897293	16	291.5	10	0	-103	7689
10/12/09 02:50:56	59.989	3700.977051	350	219.897293	16	292	10	0	-103	7690
10/12/09 02:51:00	59.985	3699.85376	350	219.897293	16	292.5	10	0	-103	7692
10/12/09 02:51:04	59.986	3700.342285	350	219.897293	16	293	10	0	-103	7692
10/12/09 02:51:08	59.981	3700.789307	350	219.897293	16	293.5	10	0	-103	7693
10/12/09 02:51:12	59.977	3703.165771	350	231.1754	16	294	10	0	-103	7693
10/12/09 02:51:16	59.976	3704.784668	350	231.1754	16	294.5	10	0	-103	7694
10/12/09 02:51:20	59.974	3706.958008	350	231.1754	16	295	10	0	-103	7694
10/12/09 02:51:24	59.975	3706.542969	350	231.1754	16	295.5	10	0	-103	7695
10/12/09 02:51:28	59.971	3707.026611	350	231.1754	16	296	10	0	-103	7695
10/12/09 02:51:32	59.976	3710.53125	350	226.634125	16	296.5	10	0	-103	7695
10/12/09 02:51:36	59.98	3708.018066	350	226.634125	16	297	10	0	-103	7696

10/12/09 02:51:40	59.982	3706.342529	350	226.634125	16	297.5	10	0	-103	7696
10/12/09 02:51:44	59.983	3706.310547	350	226.634125	16	298	10	0	-103	7697
10/12/09 02:51:48	59.979	3706.19043	350	226.634125	16	298.5	10	0	-103	7697
10/12/09 02:51:52	59.976	3709.408936	350	227.255066	16	299	10	0	-103	7697
10/12/09 02:51:56	59.977	3708.530518	350	227.255066	16	299.5	10	0	-103	7698
10/12/09 02:52:00	59.978	3707.23999	350	227.255066	16	300	10	0	-103	7698
10/12/09 02:52:04	59.971	3709.961182	350	227.255066	16	300.5	10	0	-103	7698.33
10/12/09 02:52:08	59.97	3711.980469	350	227.255066	16	301	10	0	-103	7698.66
10/12/09 02:52:12	59.99	3707.866699	350	229.290222	16	301.5	10	0	-103	7698.99
10/12/09 02:52:16	59.999	3705.63916	350	229.290222	16	302	10	0	-103	7699.32
10/12/09 02:52:20	59.998	3703.190918	350	229.290222	16	302.5	10	0	-103	7699.65
10/12/09 02:52:24	60.003	3699.51001	350	229.290222	16	303	10	0	-103	7699.98
10/12/09 02:52:28	60.005	3698.136719	350	229.290222	16	303.5	10	0	-103	7700.31
10/12/09 02:52:32	60.013	3698.668213	350	221.461365	16	304	10	0	-103	7700.64
10/12/09 02:52:36	60.022	3697.868408	350	221.461365	16	304.5	10	0	-103	7700.97
10/12/09 02:52:40	60.025	3693.912109	350	221.461365	16	305	10	0	-103	7701.3
10/12/09 02:52:44	60.024	3688.30127	350	221.461365	16	305.5	10	0	-103	7701.63
10/12/09 02:52:48	60.029	3689.143066	350	221.461365	16	306	10	0	-103	7701.96
10/12/09 02:52:52	60.029	3687.87793	350	241.274368	16	306.5	10	0	-103	7702.29
10/12/09 02:52:56	60.028	3686.683105	350	241.274368	16	307	10	0	-103	7702.62
10/12/09 02:53:00	60.032	3685.576172	350	241.274368	16	307.5	10	0	-103	7702.95
10/12/09 02:53:04	60.031	3686.417969	350	241.274368	16	308	10	0	-103	7703.28
10/12/09 02:53:08	60.022	3687.873047	350	241.274368	16	308.5	10	0	-103	7703.61
10/12/09 02:53:12	60.019	3690.425781	350	243.071854	16	309	10	0	-103	7703.94
10/12/09 02:53:16	60.017	3692.715332	350	243.071854	16	309.5	10	0	-103	7704.27
10/12/09 02:53:20	60.016	3692.46167	350	243.071854	16	310	10	0	-103	7704.6
10/12/09 02:53:24	60.015	3693.248779	350	243.071854	16	310.5	10	0	-103	7704.93
10/12/09 02:53:28	60.009	3695.124268	350	243.071854	16	311	10	0	-103	7705.26
10/12/09 02:53:32	60.008	3694.740723	350	241.670212	16	311.5	10	0	-103	7705.59
10/12/09 02:53:36	60.005	3693.749512	350	241.670212	16	312	10	0	-103	7705.92
10/12/09 02:53:40	59.999	3692.806152	350	241.670212	16	312.5	10	0	-103	7706.25
10/12/09 02:53:44	59.999	3691.406738	350	241.670212	16	313	10	0	-103	7706.58
10/12/09 02:53:48	59.998	3690.587646	350	241.670212	16	313.5	10	0	-103	7706.91
10/12/09 02:53:52	59.994	3688.482666	350	228.149307	16	314	10	0	-103	7707.24
10/12/09 02:53:56	59.993	3689.553467	350	228.149307	16	314.5	10	0	-103	7707.57
10/12/09 02:54:00	59.985	3689.735596	350	228.149307	16	315	10	0	-103	7707.9
10/12/09 02:54:04	59.988	3688.240234	350	228.149307	16	315.5	10	0	-103	7708.23
10/12/09 02:54:08	59.985	3687.475342	350	228.149307	16	316	10	0	-103	7708.56
10/12/09 02:54:12	59.983	3685.659668	350	235.128983	16	316.5	10	0	-103	7708.89
10/12/09 02:54:16	59.986	3684.333496	350	235.128983	16	317	10	0	-103	7709.22

10/12/09 02:54:20	59.99	3683.734863	350	235.128983	16	317.5	10	0	-103	7709.55
10/12/09 02:54:24	59.985	3683.811035	350	235.128983	16	318	10	0	-103	7709.88
10/12/09 02:54:28	59.983	3684.257813	350	235.128983	16	318.5	10	0	-103	7710.21
10/12/09 02:54:32	59.982	3685.091797	350	246.433136	16	319	10	0	-103	7710.54
10/12/09 02:54:36	59.978	3685.086914	350	246.433136	16	319.5	10	0	-103	7710.87
10/12/09 02:54:40	59.975	3685.196045	350	246.433136	16	320	10	0	-103	7711.2
10/12/09 02:54:44	59.975	3688.416992	350	246.433136	16	320.5	10	0	-103	7711.53
10/12/09 02:54:48	59.976	3687.847656	350	246.433136	16	321	10	0	-103	7711.86
10/12/09 02:54:52	59.982	3685.782227	350	236.553543	16	321.5	10	0	-103	7712.19
10/12/09 02:54:56	59.979	3685.142578	350	236.553543	16	322	10	0	-103	7712.52
10/12/09 02:55:00	59.977	3684.093262	350	236.553543	16	322.5	10	0	-103	7712.85
10/12/09 02:55:04	59.978	3682.814209	350	236.553543	16	323	10	0	-103	7713.18
10/12/09 02:55:08	59.979	3682.365723	350	236.553543	16	323.5	10	0	-103	7713.51
10/12/09 02:55:12	59.981	3682.855469	350	230.297562	16	324	10	0	-103	7713.84
10/12/09 02:55:16	59.978	3684.051758	350	230.297562	16	324.5	10	0	-103	7714.17
10/12/09 02:55:20	59.978	3686.048828	350	230.297562	16	325	10	0	-103	7714.5
10/12/09 02:55:24	59.983	3685.286377	350	230.297562	16	325.5	10	0	-103	7714.83
10/12/09 02:55:28	59.99	3682.416016	350	230.297562	16	326	10	0	-103	7715.16
10/12/09 02:55:32	59.993	3679.012451	350	231.175537	16	326.5	10	0	-103	7715.49
10/12/09 02:55:36	59.988	3671.76123	350	231.175537	16	327	10	0	-103	7715.82
10/12/09 02:55:40	59.99	3670.159424	350	231.175537	16	327.5	10	0	-103	7716.15
10/12/09 02:55:44	59.994	3680.17627	350	231.175537	16	328	10	0	-103	7716.48
10/12/09 02:55:48	59.994	3682.700439	350	231.175537	16	328.5	10	0	-103	7716.81
10/12/09 02:55:52	59.993	3685.030273	350	225.61763	16	329	10	0	-103	7717.14
10/12/09 02:55:56	59.984	3684.165039	350	225.61763	16	329.5	10	0	-103	7717.47
10/12/09 02:56:00	59.985	3685.58374	350	225.61763	16	330	10	0	-103	7717.8
10/12/09 02:56:04	59.987	3684.58667	350	225.61763	16	330.5	10	0	-103	7718.13
10/12/09 02:56:08	59.987	3683.674316	350	225.61763	16	331	10	0	-103	7718.46
10/12/09 02:56:12	59.982	3684.244629	350	230.734421	16	331.5	10	0	-103	7718.79
10/12/09 02:56:16	59.982	3685.589111	350	230.734421	16	332	10	0	-103	7719.12
10/12/09 02:56:20	59.992	3682.578857	350	230.734421	16	332.5	10	0	-103	7719.45
10/12/09 02:56:24	60	3682.137695	350	230.734421	16	333	10	0	-103	7719.78
10/12/09 02:56:28	60.003	3681.688965	350	230.734421	16	333.5	10	0	-103	7720.11
10/12/09 02:56:32	60.002	3681.650391	350	234.847107	16	334	10	0	-103	7720.44
10/12/09 02:56:36	60.002	3680.166992	350	234.847107	16	334.5	10	0	-103	7720.77
10/12/09 02:56:40	60.004	3679.429199	350	234.847107	16	335	10	0	-103	7721.1
10/12/09 02:56:44	60.006	3678.981201	350	234.847107	16	335.5	10	0	-103	7721.43
10/12/09 02:56:48	60.012	3676.796143	350	234.847107	16	336	10	0	-103	7721.76
10/12/09 02:56:52	60.021	3674.797607	350	228.960922	16	336.5	10	0	-103	7722.09
10/12/09 02:56:56	60.021	3671.14502	350	228.960922	16	337	10	0	-103	7722.42

10/12/09 02:57:00	60.018	3673.647949	350	228.960922	16	337.5	10	0	-103	7722.75
10/12/09 02:57:04	60.02	3675.864746	350	228.960922	16	338	10	0	-103	7723.08
10/12/09 02:57:08	60.018	3676.403809	350	228.960922	16	338.5	10	0	-103	7723.41
10/12/09 02:57:12	60.019	3677.184814	350	231.177917	16	339	10	0	-103	7723.74
10/12/09 02:57:16	60.018	3678.828369	350	231.177917	16	339.5	10	0	-103	7724.07
10/12/09 02:57:20	60.016	3678.914551	350	231.177917	16	340	10	0	-103	7724.4
10/12/09 02:57:24	60.016	3678.598633	350	231.177917	16	340.5	10	0	-103	7724.73
10/12/09 02:57:28	60.014	3678.250488	350	231.177917	16	341	10	0	-103	7725.06
10/12/09 02:57:32	60.013	3677.250977	350	236.489288	16	341.5	10	0	-103	7725.39
10/12/09 02:57:36	60.015	3674.669434	350	236.489288	16	342	10	0	-103	7725.72
10/12/09 02:57:40	60.016	3674.401855	350	236.489288	16	342.5	10	0	-103	7726.05
10/12/09 02:57:44	60.021	3672.96875	350	236.489288	16	343	10	0	-103	7726.38
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10/12/09 02:57:52	60.024	3670.821045	350	245.038925	16	344	10	0	-103	7727.04
10/12/09 02:57:56	60.025	3671.538574	350	245.038925	16	344.5	10	0	-103	7727.37
10/12/09 02:58:00	60.022	3674.009521	350	245.038925	16	345	10	0	-103	7727.7
10/12/09 02:58:04	60.022	3675.28418	350	245.038925	16	345.5	10	0	-103	7728.03
10/12/09 02:58:08	60.027	3675.703613	350	245.038925	16	346	10	0	-103	7728.36
10/12/09 02:58:12	60.028	3671.342773	350	223.605682	16	346.5	10	0	-103	7728.69
10/12/09 02:58:16	60.032	3668.653809	350	223.605682	16	347	10	0	-103	7729.02
10/12/09 02:58:20	60.03	3666.312256	350	223.605682	16	347.5	10	0	-103	7729.35
10/12/09 02:58:24	60.021	3657.164063	350	223.605682	16	348	10	0	-103	7729.68
10/12/09 02:58:28	60.024	3668.637451	350	223.605682	16	348.5	10	0	-103	7730.01
10/12/09 02:58:32	60.024	3670.112305	350	231.119354	16	349	10	0	-103	7730.34
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10/12/09 02:58:44	60.02	3674.644775	350	231.119354	16	350.5	10	0	-103	7731.33
10/12/09 02:58:48	60.017	3675.970703	350	231.119354	16	351	10	0	-103	7731.66
10/12/09 02:58:52	60.012	3678.313721	350	237.20665	16	351.5	10	0	-103	7731.99
10/12/09 02:58:56	60.011	3680.020264	350	237.20665	16	352	10	0	-103	7732.32
10/12/09 02:59:00	60.01	3679.59668	350	237.20665	16	352.5	10	0	-103	7732.65
10/12/09 02:59:04	60.012	3680.110352	350	237.20665	16	353	10	0	-103	7732.98
10/12/09 02:59:08	60.013	3679.127197	350	237.20665	16	353.5	10	0	-103	7733.31
10/12/09 02:59:12	60.013	3679.636719	350	240.516373	16	354	10	0	-103	7733.64
10/12/09 02:59:16	60.011	3678.417725	350	240.516373	16	354.5	10	0	-103	7733.97
10/12/09 02:59:20	60.008	3679.680908	350	240.516373	16	355	10	0	-103	7734.3
10/12/09 02:59:24	60.011	3679.138184	350	240.516373	16	355.5	10	0	-103	7734.63
10/12/09 02:59:28	60.016	3678.498535	350	240.516373	16	356	10	0	-103	7734.96
10/12/09 02:59:32	60.019	3677.615234	350	237.566055	16	356.5	10	0	-103	7735.29
10/12/09 02:59:36	60.019	3677.431396	350	237.566055	16	357	10	0	-103	7735.62

10/12/09 02:59:40	60.02	3677.31543	350	237.566055	16	357.5	10	0	-103	7735.95
10/12/09 02:59:44	60.018	3678.362061	350	237.566055	16	358	10	0	-103	7736.28
10/12/09 02:59:48	60.016	3680.770752	350	237.566055	16	358.5	10	0	-103	7736.61
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10/12/09 02:59:56	60.018	3679.553223	350	231.581421	16	359.5	10	0	-103	7737.27
10/12/09 03:00:00	60.016	3682.729736	350	231.581421	16	360	10	0	-103	7737.6
10/12/09 03:00:04	60.015	3681.914551	350	231.581421	16	360.5	10	0	-103	7737.93
10/12/09 03:00:08	60.004	3682.483398	350	231.581421	16	361	10	0	-103	7738.26
10/12/09 03:00:12	59.995	3685.306396	350	235.850845	16	361.5	10	0	-103	7738.59
10/12/09 03:00:16	59.982	3684.642578	350	235.850845	16	362	10	0	-103	7738.92
10/12/09 03:00:20	59.97	3689.403809	350	235.850845	16	362.5	10	0	-103	7739.25
10/12/09 03:00:24	59.968	3692.966309	350	235.850845	16	363	10	0	-103	7739.58
10/12/09 03:00:28	59.968	3694.397217	350	235.850845	16	363.5	10	0	-103	7739.91
10/12/09 03:00:32	59.967	3697.406982	350	233.559982	16	364	10	0	-103	7740.24
10/12/09 03:00:36	59.964	3698.616943	350	233.559982	16	364.5	10	0	-103	7740.57
10/12/09 03:00:40	59.966	3699.850098	350	233.559982	16	365	10	0	-103	7740.9
10/12/09 03:00:44	59.963	3701.988525	350	233.559982	16	365.5	10	0	-103	7741.23
10/12/09 03:00:48	59.968	3704.023438	350	233.559982	16	366	10	0	-103	7741.56
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10/12/09 03:01:00	59.976	3704.293457	350	219.009995	16	367.5	10	0	-103	7742.55
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10/12/09 03:01:12	59.974	3705.662354	350	205.338913	16	369	10	0	-103	7743.54
10/12/09 03:01:16	59.974	3706.776367	350	205.338913	16	369.5	10	0	-103	7743.87
10/12/09 03:01:20	59.976	3706.928223	350	205.338913	16	370	10	0	-103	7744.2
10/12/09 03:01:24	59.979	3706.334961	350	205.338913	16	370.5	10	0	-103	7744.53
10/12/09 03:01:28	59.983	3705.943115	350	205.338913	16	371	10	0	-103	7744.86
10/12/09 03:01:32	59.983	3704.777344	350	236.285355	16	371.5	10	0	-103	7745.19
10/12/09 03:01:36	59.979	3705.967529	350	236.285355	16	372	10	0	-103	7745.52
10/12/09 03:01:40	59.987	3704.683105	350	236.285355	16	372.5	10	0	-103	7745.85
10/12/09 03:01:44	59.984	3704.360596	350	236.285355	16	373	10	0	-103	7746.18
10/12/09 03:01:48	59.982	3705.049805	350	236.285355	16	373.5	10	0	-103	7746.51
10/12/09 03:01:52	59.985	3703.740723	350	223.015732	16	374	10	0	-103	7746.84
10/12/09 03:01:56	59.989	3701.795166	350	223.015732	16	374.5	10	0	-103	7747.17
10/12/09 03:02:00	59.996	3701.308105	350	223.015732	16	375	10	0	-103	7747.5
10/12/09 03:02:04	59.997	3700.912842	350	223.015732	16	375.5	10	0	-103	7747.83
10/12/09 03:02:08	59.997	3699.926514	350	223.015732	16	376	10	0	-103	7748.16
10/12/09 03:02:12	59.996	3700.548584	350	223.015732	16	376.5	10	0	-103	7748.49
10/12/09 03:02:16	59.996	3700.223877	350	223.015732	16	377	10	0	-103	7748.82

10/12/09 03:02:20	60.003	3698.031738	350	223.015732	16	377.5	10	0	-103	7749.15
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10/12/09 03:02:28	60.005	3700.738281	350	223.015732	16	378.5	10	0	-103	7749.81
10/12/09 03:02:32	60.006	3701.237793	350	223.015732	16	379	10	0	-103	7750.14
10/12/09 03:02:36	60.001	3700.220215	350	223.015732	16	379.5	10	0	-103	7750.47
10/12/09 03:02:40	60.004	3702.554199	350	223.015732	16	380	10	0	-103	7750.8
10/12/09 03:02:44	60.007	3701.026367	350	223.015732	16	380.5	10	0	-103	7751.13
10/12/09 03:02:48	60.008	3702.943115	350	223.015732	16	381	10	0	-103	7751.46
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10/12/09 03:02:56	60.005	3704.455078	350	223.015732	16	382	10	0	-103	7752.12
10/12/09 03:03:00	59.999	3705.329102	350	223.015732	16	382.5	10	0	-103	7752.45
10/12/09 03:03:04	60	3704.404785	350	223.015732	16	383	10	0	-103	7752.78
10/12/09 03:03:08	60.008	3702.748047	350	223.015732	16	383.5	10	0	-103	7753.11
10/12/09 03:03:12	60.015	3703.016602	350	223.015732	16	384	10	0	-103	7753.44
10/12/09 03:03:16	60.012	3703.297363	350	223.015732	16	384.5	10	0	-103	7753.77
10/12/09 03:03:20	60.005	3705.279053	350	223.015732	16	385	10	0	-103	7754.1
10/12/09 03:03:24	60.011	3704.05127	350	223.015732	16	385.5	10	0	-103	7754.43
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10/12/09 03:03:32	60.018	3703.830322	350	223.015732	16	386.5	10	0	-103	7755.09
10/12/09 03:03:36	60.019	3704.13916	350	223.015732	16	387	10	0	-103	7755.42
10/12/09 03:03:40	60.013	3705.429443	350	223.015732	16	387.5	10	0	-103	7755.75
10/12/09 03:03:44	60.009	3705.539795	350	223.015732	16	388	10	0	-103	7756.08
10/12/09 03:03:48	60.008	3705.748535	350	223.015732	16	388.5	10	0	-103	7756.41
10/12/09 03:03:52	60.011	3706.945313	350	223.015732	16	389	10	0	-103	7756.74
10/12/09 03:03:56	60.02	3705.654541	350	223.015732	16	389.5	10	0	-103	7757.07
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10/12/09 03:04:08	60.021	3704.166504	350	223.015732	16	391	10	0	-103	7758.06
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10/12/09 03:04:16	60.03	3701.062988	350	223.015732	16	392	10	0	-103	7758.72
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10/12/09 03:04:32	60.024	3703.035889	350	223.015732	16	394	10	0	-103	7760.04
10/12/09 03:04:36	60.022	3704.947266	350	223.015732	16	394.5	10	0	-103	7760.37
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10/12/09 03:04:44	60.024	3703.397461	350	223.015732	16	395.5	10	0	-103	7761.03
10/12/09 03:04:48	60.018	3705.441162	350	223.015732	16	396	10	0	-103	7761.36
10/12/09 03:04:52	60.008	3710.072021	350	223.015732	16	396.5	10	0	-103	7761.69
10/12/09 03:04:56	60.017	3707.76709	350	223.015732	16	397	10	0	-103	7762.02

10/12/09 03:05:00	60.019	3708.831055	350	223.015732	16	397.5	10	0	-103	7762.35
10/12/09 03:05:04	60.016	3709.813477	350	223.015732	16	398	10	0	-103	7762.68
10/12/09 03:05:08	60.016	3709.990479	350	223.015732	16	398.5	10	0	-103	7763.01
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10/12/09 03:05:16	60.019	3709.933105	350	223.015732	16	399.5	10	0	-103	7763.67
10/12/09 03:05:20	60.014	3710.591064	350	223.015732	16	400	10	0	-103	7764
10/12/09 03:05:24	60.018	3707.696045	350	223.015732	16	400.5	10	0	-103	7764.33
10/12/09 03:05:28	60.023	3707.120117	350	223.015732	16	401	10	0	-103	7764.66
10/12/09 03:05:32	60.026	3705.848145	350	223.015732	16	401.5	10	0	-103	7764.99
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10/12/09 03:05:44	60.022	3704.868652	350	223.015732	16	403	10	0	-103	7765.98
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10/12/09 03:05:52	60.031	3702.685547	350	223.015732	16	404	10	0	-103	7766.64
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10/12/09 03:06:04	60.033	3698.22168	350	223.015732	16	405.5	10	0	-103	7767.63
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10/12/09 03:06:20	60.015	3703.802246	350	223.015732	16	407.5	10	0	-103	7768.95
10/12/09 03:06:24	60.012	3708.527344	350	223.015732	16	408	10	0	-103	7769.28
10/12/09 03:06:28	60.014	3707.647461	350	223.015732	16	408.5	10	0	-103	7769.61
10/12/09 03:06:32	60.014	3707.494873	350	223.015732	16	409	10	0	-103	7769.94
10/12/09 03:06:36	60.016	3705.397949	350	223.015732	16	409.5	10	0	-103	7770.27
10/12/09 03:06:40	60.013	3709.144043	350	223.015732	16	410	10	0	-103	7770.6
10/12/09 03:06:44	59.997	3708.291016	350	223.015732	16	410.5	10	0	-103	7770.93
10/12/09 03:06:48	59.993	3707.303711	350	223.015732	16	411	10	0	-103	7771.26
10/12/09 03:06:52	59.993	3706.760254	350	223.015732	16	411.5	10	0	-103	7771.59
10/12/09 03:06:56	59.993	3706.683105	350	223.015732	16	412	10	0	-103	7771.92
10/12/09 03:07:00	59.993	3704.933594	350	223.015732	16	412.5	10	0	-103	7772.25
10/12/09 03:07:04	59.988	3706.480957	350	223.015732	16	413	10	0	-103	7772.58
10/12/09 03:07:08	59.983	3706.696289	350	223.015732	16	413.5	10	0	-103	7772.91
10/12/09 03:07:12	59.98	3708.24585	350	223.015732	16	414	10	0	-103	7773.24
10/12/09 03:07:16	59.981	3710.419434	350	223.015732	16	414.5	10	0	-103	7773.57
10/12/09 03:07:20	59.978	3708.707764	350	223.015732	16	415	10	0	-103	7773.9
10/12/09 03:07:24	59.98	3709.191895	350	223.015732	16	415.5	10	0	-103	7774.23
10/12/09 03:07:28	59.98	3709.399414	350	223.015732	16	416	10	0	-103	7774.56
10/12/09 03:07:32	59.984	3709.003906	350	223.015732	16	416.5	10	0	-103	7774.89
10/12/09 03:07:36	59.981	3709.688965	350	223.015732	16	417	10	0	-103	7775.22

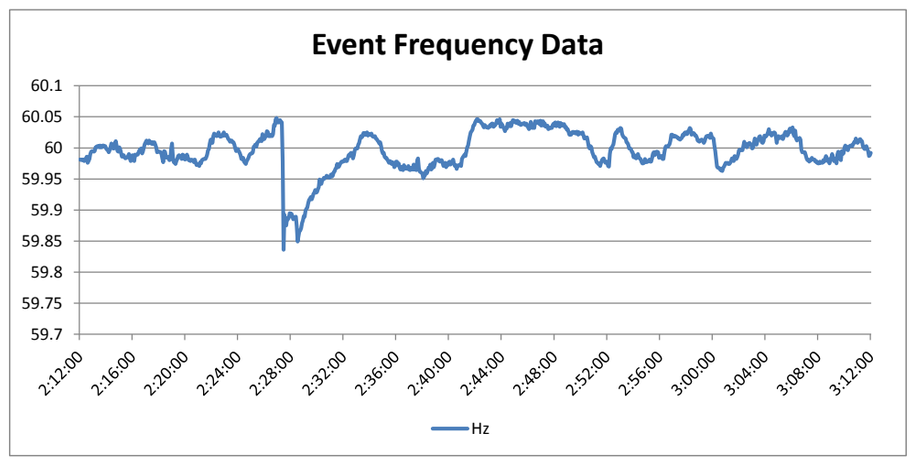
10/12/09 03:07:40	59.981	3706.541016	350	223.015732	16	417.5	10	0	-103	7775.55
10/12/09 03:07:44	59.981	3711.362061	350	223.015732	16	418	10	0	-103	7775.88
10/12/09 03:07:48	59.978	3712.012207	350	223.015732	16	418.5	10	0	-103	7776.21
10/12/09 03:07:52	59.979	3712.092773	350	223.015732	16	419	10	0	-103	7776.54
10/12/09 03:07:56	59.976	3714.612061	350	223.015732	16	419.5	10	0	-103	7776.87
10/12/09 03:08:00	59.975	3715.322754	350	223.015732	16	420	10	0	-103	7777.2
10/12/09 03:08:04	59.975	3714.717285	350	223.015732	16	420.5	10	0	-103	7777.53
10/12/09 03:08:08	59.978	3715.001221	350	223.015732	16	421	10	0	-103	7777.86
10/12/09 03:08:12	59.976	3714.062744	350	223.015732	16	421.5	10	0	-103	7778.19
10/12/09 03:08:16	59.977	3715.631104	350	223.015732	16	422	10	0	-103	7778.52
10/12/09 03:08:20	59.976	3715.567383	350	223.015732	16	422.5	10	0	-103	7778.85
10/12/09 03:08:24	59.98	3714.848145	350	223.015732	16	423	10	0	-103	7779.18
10/12/09 03:08:28	59.978	3713.358398	350	223.015732	16	423.5	10	0	-103	7779.51
10/12/09 03:08:32	59.982	3712.619385	350	223.015732	16	424	10	0	-103	7779.84
10/12/09 03:08:36	59.987	3710.050293	350	223.015732	16	424.5	10	0	-103	7780.17
10/12/09 03:08:40	59.984	3710.471924	350	223.015732	16	425	10	0	-103	7780.5
10/12/09 03:08:44	59.979	3710.946289	350	223.015732	16	425.5	10	0	-103	7780.83
10/12/09 03:08:48	59.979	3710.474609	350	223.015732	16	426	10	0	-103	7781.16
10/12/09 03:08:52	59.975	3710.802979	350	223.015732	16	426.5	10	0	-103	7781.49
10/12/09 03:08:56	59.982	3710.572998	350	223.015732	16	427	10	0	-103	7781.82
10/12/09 03:09:00	59.983	3708.371094	350	223.015732	16	427.5	10	0	-103	7782.15
10/12/09 03:09:04	59.99	3706.511963	350	223.015732	16	428	10	0	-103	7782.48
10/12/09 03:09:08	59.984	3708.962402	350	223.015732	16	428.5	10	0	-103	7782.81
10/12/09 03:09:12	59.979	3712.303467	350	223.015732	16	429	10	0	-103	7783.14
10/12/09 03:09:16	59.983	3711.627197	350	223.015732	16	429.5	10	0	-103	7783.47
10/12/09 03:09:20	59.981	3712.392578	350	223.015732	16	430	10	0	-103	7783.8
10/12/09 03:09:24	59.975	3713.510254	350	223.015732	16	430.5	10	0	-103	7784.13
10/12/09 03:09:28	59.989	3715.442871	350	223.015732	16	431	10	0	-103	7784.46
10/12/09 03:09:32	59.994	3713.906006	350	223.015732	16	431.5	10	0	-103	7784.79
10/12/09 03:09:36	59.986	3714.953125	350	223.015732	16	432	10	0	-103	7785.12
10/12/09 03:09:40	59.983	3716.30835	350	223.015732	16	432.5	10	0	-103	7785.45
10/12/09 03:09:44	59.98	3714.763672	350	223.015732	16	433	10	0	-103	7785.78
10/12/09 03:09:48	59.995	3715.067627	350	223.015732	16	433.5	10	0	-103	7786.11
10/12/09 03:09:52	59.99	3715.79126	350	223.015732	16	434	10	0	-103	7786.44
10/12/09 03:09:56	59.991	3715.324463	350	223.015732	16	434.5	10	0	-103	7786.77
10/12/09 03:10:00	60	3711.708496	350	223.015732	16	435	10	0	-103	7787.1
10/12/09 03:10:04	60.004	3712.850586	350	223.015732	16	435.5	10	0	-103	7787.43
10/12/09 03:10:08	60.002	3716.641357	350	223.015732	16	436	10	0	-103	7787.76
10/12/09 03:10:12	59.998	3719.079102	350	223.015732	16	436.5	10	0	-103	7788.09
10/12/09 03:10:16	59.996	3717.815186	350	223.015732	16	437	10	0	-103	7788.42

10/12/09 03:10:20	60.002	3718.560303	350	223.015732	16	437.5	10	0	-103	7788.75
10/12/09 03:10:24	60.003	3719.02124	350	223.015732	16	438	10	0	-103	7789.08
10/12/09 03:10:28	60.004	3719.897461	350	223.015732	16	438.5	10	0	-103	7789.41
10/12/09 03:10:32	60.004	3719.642822	350	223.015732	16	439	10	0	-103	7789.74
10/12/09 03:10:36	60.003	3719.730957	350	223.015732	16	439.5	10	0	-103	7790.07
10/12/09 03:10:40	60.006	3718.57959	350	223.015732	16	440	10	0	-103	7790.4
10/12/09 03:10:44	60.009	3718.982178	350	223.015732	16	440.5	10	0	-103	7790.73
10/12/09 03:10:48	60.009	3720.608887	350	223.015732	16	441	10	0	-103	7791.06
10/12/09 03:10:52	60.015	3721.23877	350	223.015732	16	441.5	10	0	-103	7791.39
10/12/09 03:10:56	60.009	3719.447266	350	223.015732	16	442	10	0	-103	7791.72
10/12/09 03:11:00	60.008	3721.272217	350	223.015732	16	442.5	10	0	-103	7792.05
10/12/09 03:11:04	60.01	3721.244629	350	223.015732	16	443	10	0	-103	7792.38
10/12/09 03:11:08	60.013	3722.17627	350	223.015732	16	443.5	10	0	-103	7792.71
10/12/09 03:11:12	60.014	3721.645996	350	223.015732	16	444	10	0	-103	7793.04
10/12/09 03:11:16	60.012	3720.859619	350	223.015732	16	444.5	10	0	-103	7793.37
10/12/09 03:11:20	60.011	3723.815674	350	223.015732	16	445	10	0	-103	7793.7
10/12/09 03:11:24	60.003	3724.656006	350	223.015732	16	445.5	10	0	-103	7794.03
10/12/09 03:11:28	60	3724.660645	350	223.015732	16	446	10	0	-103	7794.36
10/12/09 03:11:32	59.998	3723.580078	350	223.015732	16	446.5	10	0	-103	7794.69
10/12/09 03:11:36	60.002	3721.878906	350	223.015732	16	447	10	0	-103	7795.02
10/12/09 03:11:40	60.003	3722.906494	350	223.015732	16	447.5	10	0	-103	7795.35
10/12/09 03:11:44	59.998	3723.650391	350	223.015732	16	448	10	0	-103	7795.68
10/12/09 03:11:48	59.995	3723.638916	350	223.015732	16	448.5	10	0	-103	7796.01
10/12/09 03:11:52	59.987	3724.654297	350	223.015732	16	449	10	0	-103	7796.34
10/12/09 03:11:56	59.988	3724.943848	350	223.015732	16	449.5	10	0	-103	7796.67
10/12/09 03:12:00	59.992	3723.692627	350	223.015732	16	450	10	0	-103	7797

Balancing Authority Name:	My BA
Balancing Authority Frequency Response Obligation (FRO from FRS Form 1)	-80

Note: See "Instruction" tab for more detailed instructions.

Step 1.	Copy and Paste Event Data into the appropriate cells of the "Data" worksheet. Maintain date and time format of mm/dd/yy hh:mm:ss.	
Step 2.	Determine Time of T(0) and edit formula in cell "C8" to reference the correct row of the "Data" worksheet. T(0) is the first change in frequency of about 0.010 Hz (10 mHz) which should be the first scan of frequency data of the event.	2:27:24
Step 3.	Time of Frequency Recovery to 60 Hz or Pre-Perturbation Hz	2:33:08
Step 4.	Enter MW output of generator or load that caused event (+ for gen loss, - for load loss) (Value from NERC Event List. If multiple units, enter total MW loss.) If MW loss value is not known, enter a default 1000 MW.	633 MW
Step 5.	Hit the big blue button to copy your data for pasting into FRS Form 1 "BA Event Data" worksheet.	Copy Form 2 Data for Pasting into Form 1
Step 6.	Paste data into "FRS Form 1" in the appropriate row on the "BA Event Data" worksheet.	



Step 7. Save this workbook using the following file name format:MyBA_yymmdd_hhmm_FRS_Form2.xlsm

09/10/12 Date yymmdd

2:27 Time hh:ss of T(0)

Where "MyBA" = your BA mnemonic

scan rate	2 seconds	Date:	Monday, October 12, 2009		Balancing Authority	My BA	
		Time of T(0)	2:27:24		Grid Nominal Frequency	60.000	Hz
		Time of Frequency Recovery to 60 Hz or Pre-Perturbation Hz	2:33:08		Capacity @ Droop for Minimum Performance	2400.0	MW
		Value A Pre-Perturbation Average Frequency [T(-2) to T(-16)]	60.0420	Hz	Droop Setting	5.00%	3.00000 Hz
		Value B Post-Perturbation Average Frequency [T(+20 to T(+52)]	59.8888	Hz	Deadband Setting	0.000	Hz
		Pre to Post Perturbation Delta Frequency Actual	-0.153	Hz	Hz Span	3.00000	Hz
		Value A Pre-Perturbation Average Interchange MW [T(-2) to T(-16)]	3645.30	MW	Frequency Response Obligation (FRO)	-80	MW/0.1 Hz
		Value B Post-Perturbation Average Interchange MW [T(+20 to T(+52)]	3788.85	MW			
		Pre to Post Perturbation Interchange Delta MW Actual	143.54	MW			
		Initial Performance Ramp Magnitude Adjustment	-17.26	MW			
		EPFR Pre-Perturbation Average	-33.60	MW			
		EPFR Post-Perturbation Average	88.99	MW			
		EPFR Delta	122.59	MW	TC (frequency response filter constant)	0.350	Time Constant for delayed delivery of PFR during Sustained Measure
						Low Hz	Delta Hz Event
						3765.22	Actual Interchange MW Average during frequency recovery period
						3779.78	Target Interchange MW Average during frequency recovery period
EPFR = Expected Primary Frequency Response		EPFR(Final)	105.32	MW		3727.48	Interchange Average Ramp MW during frequency recovery period
		MW Response in right direction for frequency delta	Yes			3641.19	Actual MW @ T(-4)
						107.36	Starting and Ending Difference in Interchange MW during frequency recovery pe
						0:05:44	Event Duration (h:mm:ss)
						No	Target MW Average minus MW @ T(-4) less than zero
						138.59	Interchange Target Relative Average Change - MW (Low Frequency Event)
						124.03	Interchange Actual Relative Average Change - MW (Low Frequency Event)
						No	Interchange Actual Average minus MW @ T(-4) less than zero
						Yes	Interchange Average MW minus MW @ T(-4) greater than zero
						Yes	Interchange Target MW Average minus MW @ T(-4) greater than zero
						31.23	Interchange Target Relative Average Change - MW (High Frequency Event)
						16.68	Interchange Actual Relative Average Change - MW (High Frequency Event)
						Up	Ramp Direction during frequency recovery period
		Initial Response P.U. Performance	1.363	P.U.		0.895	P.U. Sustianed Response P.U. Performance

	T	Frequency Hz	Interchange MW	Value B 20 to 52 sec Average Frequency	Average MW	FRO (EPFR) Expected Primary Frequency Response	(TC) Delayed Delivery Frequency Response	Initial Measure Final Expected Primary Frequency Response	Average Ramp MW/scan	Recovery Period Target MW	Average Output During Recovery Period MW	Average Target During Recovery Period MW	Recovery Period Ramp MW	Average Ramp During Recovery Period MW	Generator Trip MW
T-72 sec	2:26:12	60.027	3668.611			-21.600	-7.560								633
T-70 sec	2:26:14	60.027	3668.611			-21.600	-12.474								
T-68 sec	2:26:16	60.026	3664.495			-20.801	-15.389								

T-66 sec	2:26:18	60.026	3664.495			-20.801	-17.283										
T-64 sec	2:26:20	60.019	3666.821			-15.201	-16.554										
T-62 sec	2:26:22	60.019	3666.821			-15.201	-16.080										
T-60 sec	2:26:24	60.019	3670.454			-15.201	-15.773		-0.410	3670.454							
T-58 sec	2:26:26	60.019	3670.454			-15.201	-15.572		-0.410	3670.244							
T-56 sec	2:26:28	60.019	3671.668			-15.201	-15.442		-0.410	3669.964							
T-54 sec	2:26:30	60.019	3671.668			-15.201	-15.358		-0.410	3669.639							
T-52 sec	2:26:32	60.021	3672.685			-16.800	-15.863		-0.410	3668.724							
T-50 sec	2:26:34	60.021	3672.685			-16.800	-16.191		-0.410	3667.986							
T-48 sec	2:26:36	60.019	3672.164			-15.201	-15.844		-0.410	3667.923							
T-46 sec	2:26:38	60.019	3672.164			-15.201	-15.619		-0.410	3667.738							
T-44 sec	2:26:40	60.022	3669.983			-17.599	-16.312		-0.410	3666.635							
T-42 sec	2:26:42	60.022	3669.983			-17.599	-16.763		-0.410	3665.774							
T-40 sec	2:26:44	60.037	3663.758			-29.599	-21.255		-0.410	3660.872							
T-38 sec	2:26:46	60.037	3663.758			-29.599	-24.176		-0.410	3657.542							
T-36 sec	2:26:48	60.036	3660.672			-28.799	-25.794		-0.410	3655.513							
T-34 sec	2:26:50	60.036	3660.672			-28.799	-26.846		-0.410	3654.052							
T-32 sec	2:26:52	60.046	3649.190			-36.801	-30.330		-0.410	3650.157							
T-30 sec	2:26:54	60.046	3649.190			-36.801	-32.595		-0.410	3647.483							
T-28 sec	2:26:56	60.048	3648.246			-38.400	-34.627		-0.410	3645.041							
T-26 sec	2:26:58	60.048	3648.246			-38.400	-35.948		-0.410	3643.310							
T-24 sec	2:27:00	60.041	3654.294			-32.800	-34.846		-0.410	3644.002							
T-22 sec	2:27:02	60.041	3654.294			-32.800	-34.130		-0.410	3644.308							
T-20 sec	2:27:04	60.041	3651.874			-32.800	-33.665		-0.410	3644.364							
T-18 sec	2:27:06	60.041	3651.874			-32.800	-33.362		-0.410	3644.256							
T-16 sec	2:27:08	60.041	3649.187	60.042	3645.303	-32.800	-33.165		-0.410	3644.043							
T-14 sec	2:27:10	60.041	3649.187	60.042	3645.303	-32.800	-33.038		-0.410	3643.761							
T-12 sec	2:27:12	60.045	3645.387	60.042	3645.303	-35.999	-34.074		-0.410	3642.315							
T-10 sec	2:27:14	60.045	3645.387	60.042	3645.303	-35.999	-34.748		-0.410	3641.231							
T-08 sec	2:27:16	60.041	3645.446	60.042	3645.303	-32.800	-34.066		-0.410	3641.503							
T-06 sec	2:27:18	60.041	3645.446	60.042	3645.303	-32.800	-33.623		-0.410	3641.536							
T-04 sec	2:27:20	60.041	3641.191	60.042	3645.303	-32.800	-33.335		-0.410	3641.414							
T-02 sec	2:27:22	60.041	3641.191	60.042	3645.303	-32.800	-33.148		-0.410	3641.191							
T+0 sec	2:27:24	59.978	3696.362			17.599	-15.386		0.000	3658.953							633
T+02 sec	2:27:26	59.978	3696.362			17.599	-3.841		0.624	3671.122	3696.362	3665.037	3674.116	3674.116			633
T+04 sec	2:27:28	59.978	3696.362			17.599	3.663		0.624	3679.250	3696.362	3669.775	3674.740	3674.428			633
T+06 sec	2:27:30	59.836	3734.673			131.201	48.301		0.624	3724.513	3705.940	3683.459	3675.365	3674.740			633
T+08 sec	2:27:32	59.836	3734.673			131.201	77.316		0.624	3754.152	3711.686	3697.598	3675.989	3675.053			633
T+10 sec	2:27:34	59.892	3761.250			86.401	80.496		0.624	3757.956	3719.947	3707.658	3676.613	3675.365			633
T+12 sec	2:27:36	59.892	3761.250			86.401	82.563		0.624	3760.647	3725.847	3715.228	3677.237	3675.677			633
T+14 sec	2:27:38	59.88	3766.194			95.999	87.266		0.624	3765.974	3730.891	3721.571	3677.861	3675.989			633
T+16 sec	2:27:40	59.88	3766.194			95.999	90.322		0.624	3769.655	3734.813	3726.914	3678.486	3676.301			633
T+18 sec	2:27:42	59.875	3769.925			100.000	93.710		0.624	3773.666	3738.324	3731.589	3679.110	3676.613			633
T+20 sec	2:27:44	59.875	3769.925	59.889	3788.847	100.000	95.911	3750.626	0.624	3776.492	3741.197	3735.671	3679.734	3676.925			633
T+22 sec	2:27:46	59.887	3781.592	59.889	3788.847	90.399	93.982	3750.626	0.624	3775.187	3744.563	3738.964	3680.358	3677.237			633
T+24 sec	2:27:48	59.887	3781.592	59.889	3788.847	90.399	92.728	3750.626	0.624	3774.557	3747.412	3741.702	3680.982	3677.549			633

T+26 sec	2:27:50	59.885	3784.962	59.889	3788.847	92.001	92.474	3750.626	0.624	3774.927	3750.094	3744.075	3681.606	3677.861	633
T+28 sec	2:27:52	59.885	3784.962	59.889	3788.847	92.001	92.308	3750.626	0.624	3775.386	3752.418	3746.162	3682.231	3678.173	633
T+30 sec	2:27:54	59.888	3784.419	59.889	3788.847	89.600	91.360	3750.626	0.624	3775.062	3754.418	3747.969	3682.855	3678.486	633
T+32 sec	2:27:56	59.888	3784.419	59.889	3788.847	89.600	90.744	3750.626	0.624	3775.070	3756.183	3749.563	3683.479	3678.798	633
T+34 sec	2:27:58	59.895	3788.328	59.889	3788.847	84.000	88.384	3750.626	0.624	3773.333	3757.969	3750.883	3684.103	3679.110	633
T+36 sec	2:28:00	59.895	3788.328	59.889	3788.847	84.000	86.849	3750.626	0.624	3772.423	3759.567	3752.017	3684.727	3679.422	633
T+38 sec	2:28:02	59.893	3788.472	59.889	3788.847	85.599	86.412	3750.626	0.624	3772.610	3761.012	3753.047	3685.351	3679.734	633
T+40 sec	2:28:04	59.893	3788.472	59.889	3788.847	85.599	86.127	3750.626	0.624	3772.950	3762.320	3753.994	3685.976	3680.046	633
T+42 sec	2:28:06	59.894	3793.074	59.889	3788.847	84.799	85.662	3750.626	0.624	3773.109	3763.718	3754.863	3686.600	3680.358	633
T+44 sec	2:28:08	59.894	3793.074	59.889	3788.847	84.799	85.360	3750.626	0.624	3773.431	3764.994	3755.671	3687.224	3680.670	633
T+46 sec	2:28:10	59.89	3799.428	59.889	3788.847	88.000	86.284	3750.626	0.624	3774.979	3766.429	3756.475	3687.848	3680.982	633
T+48 sec	2:28:12	59.89	3799.428	59.889	3788.847	88.000	86.885	3750.626	0.624	3776.204	3767.749	3757.264	3688.472	3681.294	633
T+50 sec	2:28:14	59.885	3799.959	59.889	3788.847	92.001	88.676	3750.626	0.624	3778.619	3768.988	3758.086	3689.096	3681.606	633
T+52 sec	2:28:16	59.885	3799.959	59.889	3788.847	92.001	89.840	3750.626	0.624	3780.407	3770.135	3758.912	3689.721	3681.918	633
T+54 sec	2:28:18	59.887	3802.925			90.399	90.035		0.624	3781.227	3771.306	3759.709	3690.345	3682.231	633
T+56 sec	2:28:20	59.887	3802.925			90.399	90.163		0.624	3781.979	3772.396	3760.477	3690.969	3682.543	633
T+58 sec	2:28:22	59.888	3804.388			89.600	89.966		0.624	3782.406	3773.462	3761.208	3691.593	3682.855	633
T+60 sec	2:28:24	59.888	3804.388			89.600	89.838		0.624	3782.902	3774.460	3761.908	3692.217	3683.167	633
T+62 sec	2:28:26	59.889	3805.617			88.800	89.474		0.624	3783.163	3775.434	3762.572	3692.841	3683.479	633
T+64 sec	2:28:28	59.889	3805.617			88.800	89.238		0.624	3783.551	3776.348	3763.208	3693.466	3683.791	633
T+66 sec	2:28:30	59.873	3811.503			101.599	93.565		0.624	3788.501	3777.382	3763.952	3694.090	3684.103	633
T+68 sec	2:28:32	59.873	3811.503			101.599	96.377		0.624	3791.938	3778.357	3764.751	3694.714	3684.415	633
T+70 sec	2:28:34	59.849	3815.889			120.801	104.925		0.624	3801.110	3779.400	3765.761	3695.338	3684.727	633
T+72 sec	2:28:36	59.849	3815.889			120.801	110.482		0.624	3807.291	3780.386	3766.884	3695.962	3685.039	633
T+74 sec	2:28:38	59.858	3826.053			113.599	111.573		0.624	3809.006	3781.588	3767.992	3696.586	3685.351	633
T+76 sec	2:28:40	59.858	3826.053			113.599	112.282		0.624	3810.339	3782.728	3769.078	3697.211	3685.663	633
T+78 sec	2:28:42	59.866	3827.524			107.199	110.503		0.624	3809.184	3783.848	3770.081	3697.835	3685.976	633
T+80 sec	2:28:44	59.866	3827.524			107.199	109.346		0.624	3808.652	3784.913	3771.022	3698.459	3686.288	633
	2:28:46	59.867	3826.783			106.400	108.315		0.624	3808.245	3785.910	3771.908	3699.083	3686.600	633
	2:28:48	59.867	3826.783			106.400	107.645		0.624	3808.199	3786.860	3772.752	3699.707	3686.912	633
	2:28:50	59.871	3825.713			103.201	106.089		0.624	3807.268	3787.743	3773.536	3700.331	3687.224	633
	2:28:52	59.871	3825.713			103.201	105.079		0.624	3806.881	3788.587	3774.277	3700.956	3687.536	633
	2:28:54	59.879	3822.505			96.799	102.181		0.624	3804.607	3789.325	3774.937	3701.580	3687.848	633
	2:28:56	59.879	3822.505			96.799	100.297		0.624	3803.348	3790.031	3775.541	3702.204	3688.160	633
	2:28:58	59.883	3818.055			93.600	97.953		0.624	3801.628	3790.614	3776.085	3702.828	3688.472	633
	2:29:00	59.883	3818.055			93.600	96.430		0.624	3800.729	3791.174	3776.588	3703.452	3688.784	633
	2:29:02	59.89	3815.010			88.000	93.479		0.624	3798.403	3791.651	3777.024	3704.077	3689.096	633
	2:29:04	59.89	3815.010			88.000	91.562		0.624	3797.109	3792.109	3777.418	3704.701	3689.408	633
	2:29:06	59.889	3811.838			88.800	90.595		0.624	3796.767	3792.489	3777.790	3705.325	3689.721	633
	2:29:08	59.889	3811.838			88.800	89.967		0.624	3796.763	3792.854	3778.148	3705.949	3690.033	633
	2:29:10	59.899	3806.972			80.801	86.759		0.624	3794.179	3793.115	3778.445	3706.573	3690.345	633
	2:29:12	59.899	3806.972			80.801	84.674		0.624	3792.718	3793.367	3778.704	3707.197	3690.657	633
	2:29:14	59.902	3804.188			78.400	82.478		0.624	3791.146	3793.560	3778.926	3707.822	3690.969	633
	2:29:16	59.902	3804.188			78.400	81.050		0.624	3790.343	3793.747	3779.127	3708.446	3691.281	633
	2:29:18	59.904	3793.975			76.801	79.563		0.624	3789.480	3793.751	3779.305	3709.070	3691.593	633

2:29:20	59.904	3793.975	76.801	78.596	0.624	3789.137	3793.755	3779.472	3709.694	3691.905	633
2:29:22	59.911	3791.502	71.201	76.008	0.624	3787.173	3793.717	3779.600	3710.318	3692.217	633
2:29:24	59.911	3791.502	71.201	74.325	0.624	3786.114	3793.681	3779.707	3710.942	3692.529	633
2:29:26	59.916	3788.132	67.200	71.831	0.624	3784.245	3793.591	3779.780	3711.567	3692.841	633
2:29:28	59.916	3788.132	67.200	70.210	0.624	3783.248	3793.505	3779.835	3712.191	3693.154	633
2:29:30	59.918	3783.028	65.601	68.597	0.624	3782.259	3793.341	3779.873	3712.815	3693.466	633
2:29:32	59.918	3783.028	65.601	67.548	0.624	3781.834	3793.182	3779.903	3713.439	3693.778	633
2:29:34	59.921	3776.358	63.199	66.026	0.624	3780.936	3792.927	3779.919	3714.063	3694.090	633
2:29:36	59.921	3776.358	63.199	65.036	0.624	3780.571	3792.680	3779.929	3714.687	3694.402	633
2:29:38	59.917	3774.604	66.400	65.514	0.624	3781.672	3792.414	3779.954	3715.312	3694.714	633
2:29:40	59.917	3774.604	66.400	65.824	0.624	3782.607	3792.156	3779.993	3715.936	3695.026	633
2:29:42	59.921	3773.958	63.199	64.905	0.624	3782.312	3791.896	3780.026	3716.560	3695.338	633
2:29:44	59.921	3773.958	63.199	64.308	0.624	3782.339	3791.643	3780.058	3717.184	3695.650	633
2:29:46	59.926	3771.670	59.201	62.521	0.624	3781.176	3791.366	3780.074	3717.808	3695.962	633
2:29:48	59.926	3771.670	59.201	61.359	0.624	3780.638	3791.096	3780.082	3718.432	3696.274	633
2:29:50	59.928	3768.707	57.599	60.043	0.624	3779.946	3790.794	3780.080	3719.057	3696.586	633
2:29:52	59.928	3768.707	57.599	59.187	0.624	3779.715	3790.499	3780.075	3719.681	3696.899	633
2:29:54	59.932	3767.021	54.401	57.512	0.624	3778.664	3790.190	3780.056	3720.305	3697.211	633
2:29:56	59.932	3767.021	54.401	56.423	0.624	3778.199	3789.889	3780.032	3720.929	3697.523	633
2:29:58	59.928	3766.788	57.599	56.835	0.624	3779.235	3789.593	3780.022	3721.553	3697.835	633
2:30:00	59.928	3766.788	57.599	57.102	0.624	3780.126	3789.304	3780.023	3722.177	3698.147	633
2:30:02	59.929	3765.672	56.799	56.996	0.624	3780.645	3789.009	3780.031	3722.802	3698.459	633
2:30:04	59.929	3765.672	56.799	56.927	0.624	3781.200	3788.721	3780.046	3723.426	3698.771	633
2:30:06	59.933	3764.243	53.601	55.763	0.624	3780.660	3788.422	3780.053	3724.050	3699.083	633
2:30:08	59.933	3764.243	53.601	55.006	0.624	3780.527	3788.131	3780.059	3724.674	3699.395	633
2:30:10	59.937	3762.935	50.400	53.394	0.624	3779.539	3787.831	3780.053	3725.298	3699.707	633
2:30:12	59.937	3762.935	50.400	52.346	0.624	3779.115	3787.538	3780.042	3725.922	3700.019	633
2:30:14	59.949	3753.922	40.799	48.305	0.624	3775.698	3787.147	3779.991	3726.547	3700.331	633
2:30:16	59.949	3753.922	40.799	45.678	0.624	3773.695	3786.766	3779.919	3727.171	3700.644	633
2:30:18	59.942	3746.889	46.399	45.930	0.624	3774.572	3786.312	3779.858	3727.795	3700.956	633
2:30:20	59.942	3746.889	46.399	46.094	0.624	3775.360	3785.869	3779.807	3728.419	3701.268	633
2:30:22	59.942	3749.593	46.399	46.201	0.624	3776.091	3785.466	3779.766	3729.043	3701.580	633
2:30:24	59.942	3749.593	46.399	46.270	0.624	3776.785	3785.072	3779.733	3729.667	3701.892	633
2:30:26	59.948	3746.706	41.599	44.635	0.624	3775.774	3784.655	3779.690	3730.292	3702.204	633
2:30:28	59.948	3746.706	41.599	43.572	0.624	3775.335	3784.247	3779.643	3730.916	3702.516	633
2:30:30	59.949	3742.741	40.799	42.602	0.624	3774.989	3783.805	3779.594	3731.540	3702.828	633
2:30:32	59.949	3742.741	40.799	41.971	0.624	3774.982	3783.373	3779.545	3732.164	3703.140	633
2:30:34	59.952	3736.139	38.400	40.721	0.624	3774.356	3782.881	3779.491	3732.788	3703.452	633
2:30:36	59.952	3736.139	38.400	39.909	0.624	3774.168	3782.399	3779.436	3733.413	3703.764	633
2:30:38	59.951	3727.838	39.200	39.661	0.624	3774.544	3781.843	3779.387	3734.037	3704.077	633
2:30:40	59.951	3727.838	39.200	39.499	0.624	3775.007	3781.297	3779.342	3734.661	3704.389	633
2:30:42	59.952	3722.649	38.400	39.115	0.624	3775.247	3780.711	3779.301	3735.285	3704.701	633
2:30:44	59.952	3722.649	38.400	38.865	0.624	3775.621	3780.136	3779.265	3735.909	3705.013	633
2:30:46	59.955	3717.996	35.999	37.861	0.624	3775.242	3779.527	3779.225	3736.533	3705.325	633
2:30:48	59.955	3717.996	35.999	37.209	0.624	3775.214	3778.929	3779.186	3737.158	3705.637	633
2:30:50	59.954	3715.753	36.801	37.067	0.624	3775.695	3778.322	3779.153	3737.782	3705.949	633

2:30:52	59.954	3715.753	36.801	36.974	0.624	3776.226	3777.726	3779.125	3738.406	3706.261	633
2:30:54	59.953	3713.484	37.601	37.193	0.624	3777.070	3777.120	3779.106	3739.030	3706.573	633
2:30:56	59.953	3713.484	37.601	37.336	0.624	3777.837	3776.525	3779.094	3739.654	3706.885	633
2:30:58	59.952	3710.810	38.400	37.708	0.624	3778.834	3775.917	3779.091	3740.278	3707.197	633
2:31:00	59.952	3710.810	38.400	37.951	0.624	3779.700	3775.319	3779.097	3740.903	3707.509	633
2:31:02	59.954	3714.623	36.801	37.548	0.624	3779.922	3774.767	3779.104	3741.527	3707.822	633
2:31:04	59.954	3714.623	36.801	37.287	0.624	3780.285	3774.226	3779.115	3742.151	3708.134	633
2:31:06	59.957	3716.168	34.399	36.276	0.624	3779.898	3773.707	3779.122	3742.775	3708.446	633
2:31:08	59.957	3716.168	34.399	35.619	0.624	3779.865	3773.198	3779.129	3743.399	3708.758	633
2:31:10	59.954	3716.980	36.801	36.033	0.624	3780.903	3772.705	3779.144	3744.023	3709.070	633
2:31:12	59.954	3716.980	36.801	36.302	0.624	3781.796	3772.220	3779.167	3744.648	3709.382	633
2:31:14	59.955	3722.361	35.999	36.196	0.624	3782.314	3771.791	3779.194	3745.272	3709.694	633
2:31:16	59.955	3722.361	35.999	36.127	0.624	3782.869	3771.368	3779.226	3745.896	3710.006	633
2:31:18	59.961	3722.658	31.201	34.403	0.624	3781.770	3770.955	3779.247	3746.520	3710.318	633
2:31:20	59.961	3722.658	31.201	33.282	0.624	3781.273	3770.549	3779.264	3747.144	3710.630	633
2:31:22	59.962	3722.278	30.399	32.273	0.624	3780.888	3770.147	3779.278	3747.768	3710.942	633
2:31:24	59.962	3722.278	30.399	31.617	0.624	3780.856	3769.751	3779.291	3748.393	3711.254	633
2:31:26	59.966	3723.091	27.200	30.071	0.624	3779.935	3769.369	3779.296	3749.017	3711.567	633
2:31:28	59.966	3723.091	27.200	29.066	0.624	3779.554	3768.993	3779.298	3749.641	3711.879	633
2:31:30	59.968	3723.435	25.601	27.854	0.624	3778.966	3768.625	3779.296	3750.265	3712.191	633
2:31:32	59.968	3723.435	25.601	27.065	0.624	3778.801	3768.264	3779.292	3750.889	3712.503	633
2:31:34	59.974	3725.403	20.801	24.873	0.624	3777.233	3767.924	3779.275	3751.513	3712.815	633
2:31:36	59.974	3725.403	20.801	23.448	0.624	3776.432	3767.589	3779.253	3752.138	3713.127	633
2:31:38	59.969	3728.053	24.799	23.920	0.624	3777.529	3767.280	3779.240	3752.762	3713.439	633
2:31:40	59.969	3728.053	24.799	24.228	0.624	3778.461	3766.976	3779.233	3753.386	3713.751	633
2:31:42	59.97	3732.530	23.999	24.148	0.624	3779.005	3766.711	3779.232	3754.010	3714.063	633
2:31:44	59.97	3732.530	23.999	24.096	0.624	3779.577	3766.450	3779.234	3754.634	3714.375	633
2:31:46	59.973	3736.535	21.600	23.222	0.624	3779.328	3766.223	3779.235	3755.258	3714.687	633
2:31:48	59.973	3736.535	21.600	22.655	0.624	3779.384	3766.000	3779.236	3755.883	3714.999	633
2:31:50	59.976	3736.822	19.199	21.445	0.624	3778.799	3765.782	3779.233	3756.507	3715.312	633
2:31:52	59.976	3736.822	19.199	20.659	0.624	3778.637	3765.568	3779.229	3757.131	3715.624	633
2:31:54	59.978	3739.944	17.599	19.588	0.624	3778.190	3765.379	3779.221	3757.755	3715.936	633
2:31:56	59.978	3739.944	17.599	18.892	0.624	3778.118	3765.194	3779.213	3758.379	3716.248	633
2:31:58	59.978	3741.794	17.599	18.440	0.624	3778.290	3765.024	3779.206	3759.003	3716.560	633
2:32:00	59.978	3741.794	17.599	18.146	0.624	3778.620	3764.857	3779.202	3759.628	3716.872	633
2:32:02	59.978	3746.608	17.599	17.954	0.624	3779.053	3764.727	3779.201	3760.252	3717.184	633
2:32:04	59.978	3746.608	17.599	17.830	0.624	3779.553	3764.598	3779.203	3760.876	3717.496	633
2:32:06	59.98	3750.716	16.000	17.190	0.624	3779.537	3764.501	3779.206	3761.500	3717.808	633
2:32:08	59.98	3750.716	16.000	16.773	0.624	3779.745	3764.404	3779.209	3762.124	3718.120	633
2:32:10	59.981	3752.748	15.201	16.223	0.624	3779.818	3764.323	3779.214	3762.749	3718.432	633
2:32:12	59.981	3752.748	15.201	15.865	0.624	3780.085	3764.243	3779.220	3763.373	3718.745	633
2:32:14	59.979	3756.407	16.800	16.192	0.624	3781.036	3764.190	3779.232	3763.997	3719.057	633
2:32:16	59.979	3756.407	16.800	16.405	0.624	3781.873	3764.137	3779.250	3764.621	3719.369	633
2:32:18	59.979	3760.405	16.800	16.543	0.624	3782.635	3764.112	3779.273	3765.245	3719.681	633
2:32:20	59.979	3760.405	16.800	16.633	0.624	3783.349	3764.087	3779.300	3765.869	3719.993	633
2:32:22	59.983	3761.407	13.599	15.571	0.624	3782.911	3764.069	3779.324	3766.494	3720.305	633

2:32:24	59.983	3761.407	13.599	14.881	0.624	3782.845	3764.051	3779.348	3767.118	3720.617	633
2:32:26	59.988	3763.212	9.601	13.033	0.624	3781.622	3764.046	3779.363	3767.742	3720.929	633
2:32:28	59.988	3763.212	9.601	11.832	0.624	3781.045	3764.040	3779.374	3768.366	3721.241	633
2:32:30	59.987	3766.085	10.400	11.331	0.624	3781.168	3764.053	3779.385	3768.990	3721.553	633
2:32:32	59.987	3766.085	10.400	11.005	0.624	3781.466	3764.067	3779.399	3769.614	3721.865	633
2:32:34	59.991	3767.251	7.199	9.673	0.624	3780.758	3764.087	3779.407	3770.239	3722.177	633
2:32:36	59.991	3767.251	7.199	8.807	0.624	3780.517	3764.107	3779.415	3770.863	3722.490	633
2:32:38	59.992	3768.634	6.400	7.964	0.624	3780.298	3764.136	3779.420	3771.487	3722.802	633
2:32:40	59.992	3768.634	6.400	7.417	0.624	3780.375	3764.164	3779.426	3772.111	3723.114	633
2:32:42	59.989	3772.445	8.801	7.901	0.624	3781.483	3764.216	3779.439	3772.735	3723.426	633
2:32:44	59.989	3772.445	8.801	8.216	0.624	3782.423	3764.267	3779.458	3773.359	3723.738	633
2:32:46	59.983	3774.668	13.599	10.100	0.624	3784.931	3764.331	3779.491	3773.984	3724.050	633
2:32:48	59.983	3774.668	13.599	11.325	0.624	3786.779	3764.395	3779.536	3774.608	3724.362	633
2:32:50	59.988	3775.363	9.601	10.721	0.624	3786.800	3764.461	3779.580	3775.232	3724.674	633
2:32:52	59.988	3775.363	9.601	10.329	0.624	3787.032	3764.528	3779.625	3775.856	3724.986	633
2:32:54	59.996	3775.492	3.201	7.834	0.624	3785.162	3764.594	3779.659	3776.480	3725.298	633
2:32:56	59.996	3775.492	3.201	6.213	0.624	3784.164	3764.659	3779.686	3777.104	3725.610	633
2:32:58	59.999	3778.554	0.800	4.318	0.624	3782.894	3764.742	3779.705	3777.729	3725.922	633
2:33:00	59.999	3778.554	0.800	3.087	0.624	3782.286	3764.823	3779.720	3778.353	3726.235	633
2:33:02	59.999	3781.256	0.800	2.286	0.624	3782.110	3764.920	3779.734	3778.977	3726.547	633
2:33:04	59.999	3781.256	0.800	1.766	0.624	3782.214	3765.015	3779.749	3779.601	3726.859	633
2:33:06	59.999	3783.092	0.800	1.428	0.624	3782.500	3765.121	3779.765	3780.225	3727.171	633
2:33:08	59.999	3783.092	0.800	1.208	0.624	3782.904	3765.224	3779.783	3780.849	3727.483	633
2:33:10	60.005	3784.421	-4.001	-0.615	0.000	3781.081	3765.335	3779.790	3780.849	3727.791	633
2:33:12	60.005	3784.421	-4.001	-1.800	0.000	3779.896	3765.444	3779.791	3780.849	3728.096	633
2:33:14	60.008	3785.463	-6.400	-3.410	0.000	3778.286	3765.558	3779.782	3780.849	3728.398	633
2:33:16	60.008	3785.463	-6.400	-4.456	0.000	3777.240	3765.670	3779.768	3780.849	3728.696	633
2:33:18	60.014	3786.304	-11.200	-6.817	0.000	3774.880	3765.786	3779.741	3780.849	3728.990	633
2:33:20	60.014	3786.304	-11.200	-8.351	0.000	3773.346	3765.901	3779.705	3780.849	3729.282	633
2:33:22	60.019	3787.516	-15.201	-10.748	0.000	3770.948	3766.021	3779.656	3780.849	3729.570	633
2:33:24	60.019	3787.516	-15.201	-12.307	0.000	3769.390	3766.139	3779.599	3780.849	3729.855	633
2:33:26	60.017	3788.030	-13.599	-12.759	0.000	3768.938	3766.260	3779.541	3780.849	3730.136	633
2:33:28	60.017	3788.030	-13.599	-13.053	0.000	3768.644	3766.379	3779.481	3780.849	3730.415	633
2:33:30	60.019	3789.216	-15.201	-13.805	0.000	3767.892	3766.503	3779.418	3780.849	3730.691	633
2:33:32	60.019	3789.216	-15.201	-14.293	0.000	3767.403	3766.626	3779.353	3780.849	3730.963	633
2:33:34	60.024	3785.842	-19.199	-16.010	0.000	3765.686	3766.729	3779.280	3780.849	3731.233	633
2:33:36	60.024	3785.842	-19.199	-17.126	0.000	3764.570	3766.831	3779.201	3780.849	3731.500	633
2:33:38	60.021	3787.930	-16.800	-17.012	0.000	3764.684	3766.943	3779.124	3780.849	3731.764	633
2:33:40	60.021	3787.930	-16.800	-16.938	0.000	3764.759	3767.054	3779.048	3780.849	3732.025	633
2:33:42	60.024	3786.875	-19.199	-17.729	0.000	3763.967	3767.159	3778.969	3780.849	3732.283	633
2:33:44	60.024	3786.875	-19.199	-18.243	0.000	3763.453	3767.262	3778.887	3780.849	3732.539	633
2:33:46	60.021	3787.358	-16.800	-17.738	0.000	3763.958	3767.367	3778.810	3780.849	3732.792	633
2:33:48	60.021	3787.358	-16.800	-17.410	0.000	3764.287	3767.470	3778.734	3780.849	3733.042	633
2:33:50	60.025	3785.614	-20.001	-18.317	0.000	3763.380	3767.564	3778.655	3780.849	3733.290	633
2:33:52	60.025	3785.614	-20.001	-18.906	0.000	3762.790	3767.656	3778.574	3780.849	3733.535	633
2:33:54	60.02	3785.804	-16.000	-17.889	0.000	3763.807	3767.749	3778.499	3780.849	3733.777	633

2:33:56	60.02	3785.804	-16.000	-17.228	0.000	3764.468	3767.840	3778.427	3780.849	3734.018	633
2:33:58	60.022	3786.877	-17.599	-17.358	0.000	3764.338	3767.937	3778.356	3780.849	3734.255	633
2:34:00	60.022	3786.877	-17.599	-17.443	0.000	3764.254	3768.032	3778.285	3780.849	3734.491	633
2:34:02	60.022	3785.726	-17.599	-17.498	0.000	3764.199	3768.120	3778.215	3780.849	3734.724	633
2:34:04	60.022	3785.726	-17.599	-17.533	0.000	3764.163	3768.208	3778.145	3780.849	3734.954	633
2:34:06	60.021	3785.821	-16.800	-17.277	0.000	3764.420	3768.295	3778.077	3780.849	3735.183	633
2:34:08	60.021	3785.821	-16.800	-17.110	0.000	3764.587	3768.381	3778.011	3780.849	3735.409	633
2:34:10	60.023	3786.284	-18.399	-17.561	0.000	3764.135	3768.469	3777.943	3780.849	3735.632	633
2:34:12	60.023	3786.284	-18.399	-17.854	0.000	3763.842	3768.556	3777.874	3780.849	3735.854	633
2:34:14	60.019	3787.627	-15.201	-16.926	0.000	3764.771	3768.649	3777.810	3780.849	3736.074	633
2:34:16	60.019	3787.627	-15.201	-16.322	0.000	3765.374	3768.740	3777.750	3780.849	3736.291	633
2:34:18	60.018	3789.673	-14.401	-15.650	0.000	3766.047	3768.841	3777.694	3780.849	3736.506	633
2:34:20	60.018	3789.673	-14.401	-15.213	0.000	3766.484	3768.941	3777.640	3780.849	3736.719	633
2:34:22	60.018	3788.479	-14.401	-14.929	0.000	3766.768	3769.034	3777.588	3780.849	3736.931	633
2:34:24	60.018	3788.479	-14.401	-14.744	0.000	3766.952	3769.126	3777.538	3780.849	3737.140	633
2:34:26	60.019	3789.369	-15.201	-14.904	0.000	3766.792	3769.221	3777.487	3780.849	3737.347	633
2:34:28	60.019	3789.369	-15.201	-15.008	0.000	3766.689	3769.316	3777.437	3780.849	3737.552	633
2:34:30	60.015	3788.665	-12.000	-13.955	0.000	3767.741	3769.406	3777.391	3780.849	3737.755	633
2:34:32	60.015	3788.665	-12.000	-13.271	0.000	3768.426	3769.496	3777.350	3780.849	3737.957	633
2:34:34	60.014	3790.667	-11.200	-12.546	0.000	3769.151	3769.594	3777.312	3780.849	3738.156	633
2:34:36	60.014	3790.667	-11.200	-12.075	0.000	3769.622	3769.691	3777.276	3780.849	3738.354	633
2:34:38	60.012	3790.411	-9.601	-11.209	0.000	3770.487	3769.786	3777.245	3780.849	3738.550	633
2:34:40	60.012	3790.411	-9.601	-10.646	0.000	3771.050	3769.880	3777.217	3780.849	3738.744	633
2:34:42	60.01	3791.540	-7.999	-9.719	0.000	3771.977	3769.979	3777.193	3780.849	3738.936	633
2:34:44	60.01	3791.540	-7.999	-9.117	0.000	3772.579	3770.076	3777.172	3780.849	3739.127	633
2:34:46	60.007	3791.027	-5.600	-7.886	0.000	3773.810	3770.171	3777.157	3780.849	3739.315	633
2:34:48	60.007	3791.027	-5.600	-7.086	0.000	3774.610	3770.264	3777.146	3780.849	3739.502	633
2:34:50	60.009	3791.426	-7.199	-7.126	0.000	3774.571	3770.359	3777.134	3780.849	3739.688	633
2:34:52	60.009	3791.426	-7.199	-7.151	0.000	3774.545	3770.452	3777.123	3780.849	3739.872	633
2:34:54	60.003	3790.457	-2.399	-5.488	0.000	3776.208	3770.541	3777.119	3780.849	3740.054	633
2:34:56	60.003	3790.457	-2.399	-4.407	0.000	3777.290	3770.629	3777.119	3780.849	3740.234	633
2:34:58	59.995	3789.585	4.001	-1.464	0.000	3780.232	3770.712	3777.133	3780.849	3740.413	633
2:35:00	59.995	3789.585	4.001	0.449	0.000	3782.145	3770.794	3777.155	3780.849	3740.590	633
2:35:02	59.991	3788.105	7.199	2.811	0.000	3784.508	3770.869	3777.187	3780.849	3740.766	633
2:35:04	59.991	3788.105	7.199	4.347	0.000	3786.043	3770.944	3777.225	3780.849	3740.941	633
2:35:06	59.992	3788.189	6.400	5.065	0.000	3786.762	3771.018	3777.266	3780.849	3741.113	633
2:35:08	59.992	3788.189	6.400	5.532	0.000	3787.229	3771.092	3777.309	3780.849	3741.285	633
2:35:10	59.986	3788.540	11.200	7.516	0.000	3789.212	3771.167	3777.360	3780.849	3741.454	633
2:35:12	59.986	3788.540	11.200	8.805	0.000	3790.502	3771.240	3777.416	3780.849	3741.623	633
2:35:14	59.984	3788.101	12.799	10.203	0.000	3791.900	3771.312	3777.477	3780.849	3741.790	633
2:35:16	59.984	3788.101	12.799	11.112	0.000	3792.808	3771.383	3777.542	3780.849	3741.955	633
2:35:18	59.984	3786.453	12.799	11.702	0.000	3793.399	3771.446	3777.608	3780.849	3742.119	633
2:35:20	59.984	3786.453	12.799	12.086	0.000	3793.783	3771.509	3777.676	3780.849	3742.282	633
2:35:22	59.981	3788.813	15.201	13.176	0.000	3794.873	3771.581	3777.748	3780.849	3742.443	633
2:35:24	59.981	3788.813	15.201	13.885	0.000	3795.581	3771.652	3777.822	3780.849	3742.603	633
2:35:26	59.979	3788.256	16.800	14.905	0.000	3796.602	3771.721	3777.899	3780.849	3742.762	633

2:35:28	59.979	3788.256	16.800	15.568	0.000	3797.265	3771.789	3777.979	3780.849	3742.920	633
2:35:30	59.976	3790.467	19.199	16.839	0.000	3798.535	3771.866	3778.063	3780.849	3743.076	633
2:35:32	59.976	3790.467	19.199	17.665	0.000	3799.361	3771.942	3778.150	3780.849	3743.230	633
2:35:34	59.979	3790.420	16.800	17.362	0.000	3799.058	3772.017	3778.235	3780.849	3743.384	633
2:35:36	59.979	3790.420	16.800	17.165	0.000	3798.862	3772.091	3778.319	3780.849	3743.536	633
2:35:38	59.978	3789.267	17.599	17.317	0.000	3799.014	3772.160	3778.402	3780.849	3743.687	633
2:35:40	59.978	3789.267	17.599	17.416	0.000	3799.112	3772.229	3778.485	3780.849	3743.837	633
2:35:42	59.974	3790.430	20.801	18.601	0.000	3800.297	3772.302	3778.573	3780.849	3743.986	633
2:35:44	59.974	3790.430	20.801	19.371	0.000	3801.067	3772.374	3778.662	3780.849	3744.133	633
2:35:46	59.977	3786.243	18.399	19.031	0.000	3800.727	3772.429	3778.750	3780.849	3744.280	633
2:35:48	59.977	3786.243	18.399	18.810	0.000	3800.506	3772.484	3778.836	3780.849	3744.425	633
2:35:50	59.975	3788.963	20.001	19.227	0.000	3800.923	3772.549	3778.923	3780.849	3744.569	633
2:35:52	59.975	3788.963	20.001	19.498	0.000	3801.194	3772.613	3779.010	3780.849	3744.711	633
2:35:54	59.969	3791.877	24.799	21.353	0.000	3803.049	3772.688	3779.104	3780.849	3744.853	633
2:35:56	59.969	3791.877	24.799	22.559	0.000	3804.255	3772.763	3779.202	3780.849	3744.994	633
2:35:58	59.971	3792.311	23.199	22.783	0.000	3804.480	3772.839	3779.300	3780.849	3745.133	633
2:36:00	59.971	3792.311	23.199	22.929	0.000	3804.625	3772.914	3779.398	3780.849	3745.272	633
2:36:02	59.978	3788.080	17.599	21.064	0.000	3802.760	3772.972	3779.487	3780.849	3745.409	633
2:36:04	59.978	3788.080	17.599	19.851	0.000	3801.548	3773.030	3779.572	3780.849	3745.545	633
2:36:06	59.978	3787.135	17.599	19.063	0.000	3800.759	3773.084	3779.653	3780.849	3745.681	633
2:36:08	59.978	3787.135	17.599	18.551	0.000	3800.247	3773.137	3779.731	3780.849	3745.815	633
2:36:10	59.972	3786.996	22.400	19.898	0.000	3801.594	3773.190	3779.814	3780.849	3745.948	633
2:36:12	59.972	3786.996	22.400	20.774	0.000	3802.470	3773.242	3779.899	3780.849	3746.080	633
2:36:14	59.975	3786.487	20.001	20.503	0.000	3802.200	3773.292	3779.983	3780.849	3746.212	633
2:36:16	59.975	3786.487	20.001	20.328	0.000	3802.024	3773.341	3780.066	3780.849	3746.342	633
2:36:18	59.969	3789.214	24.799	21.892	0.000	3803.589	3773.400	3780.154	3780.849	3746.471	633
2:36:20	59.969	3789.214	24.799	22.910	0.000	3804.606	3773.459	3780.245	3780.849	3746.599	633
2:36:22	59.965	3791.221	28.000	24.691	0.000	3806.388	3773.525	3780.341	3780.849	3746.727	633
2:36:24	59.965	3791.221	28.000	25.849	0.000	3807.546	3773.590	3780.442	3780.849	3746.853	633
2:36:26	59.969	3790.959	24.799	25.482	0.000	3807.178	3773.654	3780.540	3780.849	3746.978	633
2:36:28	59.969	3790.959	24.799	25.242	0.000	3806.939	3773.718	3780.637	3780.849	3747.103	633
2:36:30	59.968	3789.026	25.601	25.368	0.000	3807.064	3773.773	3780.733	3780.849	3747.227	633
2:36:32	59.968	3789.026	25.601	25.450	0.000	3807.146	3773.829	3780.829	3780.849	3747.349	633
2:36:34	59.964	3787.394	28.799	26.622	0.000	3808.318	3773.878	3780.929	3780.849	3747.471	633
2:36:36	59.964	3787.394	28.799	27.384	0.000	3809.081	3773.927	3781.030	3780.849	3747.592	633
2:36:38	59.972	3784.831	22.400	25.640	0.000	3807.336	3773.966	3781.125	3780.849	3747.712	633
2:36:40	59.972	3784.831	22.400	24.506	0.000	3806.202	3774.005	3781.215	3780.849	3747.831	633
2:36:42	59.967	3784.320	26.401	25.169	0.000	3806.865	3774.042	3781.307	3780.849	3747.950	633
2:36:44	59.967	3784.320	26.401	25.600	0.000	3807.296	3774.078	3781.399	3780.849	3748.067	633
2:36:46	59.968	3782.110	25.601	25.600	0.000	3807.297	3774.107	3781.491	3780.849	3748.184	633
2:36:48	59.968	3782.110	25.601	25.601	0.000	3807.297	3774.135	3781.582	3780.849	3748.300	633
2:36:50	59.967	3779.056	26.401	25.881	0.000	3807.577	3774.153	3781.674	3780.849	3748.415	633
2:36:52	59.967	3779.056	26.401	26.063	0.000	3807.759	3774.170	3781.765	3780.849	3748.529	633
2:36:54	59.966	3779.212	27.200	26.461	0.000	3808.157	3774.187	3781.857	3780.849	3748.642	633
2:36:56	59.966	3779.212	27.200	26.720	0.000	3808.416	3774.205	3781.950	3780.849	3748.755	633
2:36:58	59.971	3776.429	23.199	25.488	0.000	3807.184	3774.213	3782.038	3780.849	3748.867	633

2:37:00	59.971	3776.429	23.199	24.687	0.000	3806.383	3774.220	3782.122	3780.849	3748.978	633
2:37:02	59.965	3776.597	28.000	25.846	0.000	3807.543	3774.228	3782.209	3780.849	3749.088	633
2:37:04	59.965	3776.597	28.000	26.600	0.000	3808.296	3774.237	3782.299	3780.849	3749.198	633
2:37:06	59.964	3776.023	28.799	27.370	0.000	3809.066	3774.243	3782.391	3780.849	3749.306	633
2:37:08	59.964	3776.023	28.799	27.870	0.000	3809.567	3774.249	3782.484	3780.849	3749.414	633
2:37:10	59.967	3771.730	26.401	27.356	0.000	3809.052	3774.240	3782.574	3780.849	3749.522	633
2:37:12	59.967	3771.730	26.401	27.022	0.000	3808.718	3774.232	3782.663	3780.849	3749.628	633
2:37:14	59.968	3768.503	25.601	26.524	0.000	3808.221	3774.212	3782.749	3780.849	3749.734	633
2:37:16	59.968	3768.503	25.601	26.201	0.000	3807.898	3774.193	3782.834	3780.849	3749.839	633
2:37:18	59.965	3767.366	28.000	26.831	0.000	3808.527	3774.170	3782.920	3780.849	3749.944	633
2:37:20	59.965	3767.366	28.000	27.240	0.000	3808.936	3774.147	3783.007	3780.849	3750.047	633
2:37:22	59.973	3760.295	21.600	25.266	0.000	3806.962	3774.101	3783.087	3780.849	3750.150	633
2:37:24	59.973	3760.295	21.600	23.983	0.000	3805.679	3774.055	3783.162	3780.849	3750.253	633
2:37:26	59.965	3761.894	28.000	25.389	0.000	3807.085	3774.015	3783.241	3780.849	3750.354	633
2:37:28	59.965	3761.894	28.000	26.303	0.000	3807.999	3773.975	3783.323	3780.849	3750.455	633
2:37:30	59.969	3760.583	24.799	25.776	0.000	3807.473	3773.931	3783.402	3780.849	3750.556	633
2:37:32	59.969	3760.583	24.799	25.434	0.000	3807.130	3773.887	3783.480	3780.849	3750.655	633
2:37:34	59.964	3759.781	28.799	26.612	0.000	3808.308	3773.841	3783.561	3780.849	3750.754	633
2:37:36	59.964	3759.781	28.799	27.378	0.000	3809.074	3773.795	3783.644	3780.849	3750.853	633
2:37:38	59.979	3757.773	16.800	23.675	0.000	3805.372	3773.743	3783.715	3780.849	3750.950	633
2:37:40	59.979	3757.773	16.800	21.269	0.000	3802.965	3773.692	3783.777	3780.849	3751.047	633
2:37:42	59.983	3753.087	13.599	18.584	0.000	3800.281	3773.625	3783.830	3780.849	3751.144	633
2:37:44	59.983	3753.087	13.599	16.839	0.000	3798.536	3773.559	3783.877	3780.849	3751.240	633
2:37:46	59.967	3753.751	26.401	20.186	0.000	3801.882	3773.496	3783.935	3780.849	3751.335	633
2:37:48	59.967	3753.751	26.401	22.361	0.000	3804.057	3773.433	3783.999	3780.849	3751.429	633
2:37:50	59.962	3759.250	30.399	25.174	0.000	3806.871	3773.387	3784.072	3780.849	3751.523	633
2:37:52	59.962	3759.250	30.399	27.003	0.000	3808.699	3773.343	3784.151	3780.849	3751.617	633
2:37:54	59.961	3760.965	31.201	28.472	0.000	3810.169	3773.303	3784.233	3780.849	3751.710	633
2:37:56	59.961	3760.965	31.201	29.427	0.000	3811.124	3773.265	3784.318	3780.849	3751.802	633
2:37:58	59.96	3763.822	32.001	30.328	0.000	3812.024	3773.235	3784.405	3780.849	3751.893	633
2:38:00	59.96	3763.822	32.001	30.913	0.000	3812.610	3773.205	3784.493	3780.849	3751.985	633
2:38:02	59.959	3763.858	32.800	31.574	0.000	3813.270	3773.176	3784.583	3780.849	3752.075	633
2:38:04	59.959	3763.858	32.800	32.003	0.000	3813.699	3773.147	3784.674	3780.849	3752.165	633
2:38:06	59.951	3766.127	39.200	34.522	0.000	3816.218	3773.125	3784.772	3780.849	3752.254	633
2:38:08	59.951	3766.127	39.200	36.159	0.000	3817.856	3773.104	3784.874	3780.849	3752.343	633
2:38:10	59.954	3767.972	36.801	36.384	0.000	3818.080	3773.088	3784.977	3780.849	3752.431	633
2:38:12	59.954	3767.972	36.801	36.530	0.000	3818.226	3773.072	3785.079	3780.849	3752.519	633
2:38:14	59.956	3765.606	35.199	36.064	0.000	3817.760	3773.049	3785.179	3780.849	3752.606	633
2:38:16	59.956	3765.606	35.199	35.761	0.000	3817.458	3773.026	3785.278	3780.849	3752.693	633
2:38:18	59.963	3761.570	29.599	33.604	0.000	3815.301	3772.991	3785.370	3780.849	3752.779	633
2:38:20	59.963	3761.570	29.599	32.203	0.000	3813.899	3772.957	3785.456	3780.849	3752.865	633
2:38:22	59.959	3759.627	32.800	32.412	0.000	3814.108	3772.916	3785.543	3780.849	3752.950	633
2:38:24	59.959	3759.627	32.800	32.548	0.000	3814.244	3772.876	3785.630	3780.849	3753.034	633
2:38:26	59.963	3752.429	29.599	31.516	0.000	3813.212	3772.815	3785.713	3780.849	3753.118	633
2:38:28	59.963	3752.429	29.599	30.845	0.000	3812.541	3772.753	3785.793	3780.849	3753.202	633
2:38:30	59.968	3753.830	25.601	29.010	0.000	3810.706	3772.697	3785.868	3780.849	3753.285	633

2:38:32	59.968	3753.830	25.601	27.817	0.000	3809.513	3772.640	3785.939	3780.849	3753.367	633
2:38:34	59.968	3753.523	25.601	27.041	0.000	3808.738	3772.584	3786.006	3780.849	3753.449	633
2:38:36	59.968	3753.523	25.601	26.537	0.000	3808.234	3772.527	3786.072	3780.849	3753.531	633
2:38:38	59.973	3753.178	21.600	24.809	0.000	3806.506	3772.470	3786.133	3780.849	3753.612	633
2:38:40	59.973	3753.178	21.600	23.686	0.000	3805.383	3772.413	3786.190	3780.849	3753.693	633
2:38:42	59.965	3753.291	28.000	25.196	0.000	3806.892	3772.357	3786.251	3780.849	3753.773	633
2:38:44	59.965	3753.291	28.000	26.177	0.000	3807.874	3772.301	3786.314	3780.849	3753.852	633
2:38:46	59.967	3752.359	26.401	26.256	0.000	3807.952	3772.242	3786.377	3780.849	3753.931	633
2:38:48	59.967	3752.359	26.401	26.306	0.000	3808.003	3772.184	3786.440	3780.849	3754.010	633
2:38:50	59.976	3747.476	19.199	23.819	0.000	3805.515	3772.113	3786.496	3780.849	3754.088	633
2:38:52	59.976	3747.476	19.199	22.202	0.000	3803.898	3772.041	3786.546	3780.849	3754.166	633
2:38:54	59.969	3741.285	24.799	23.111	0.000	3804.807	3771.952	3786.599	3780.849	3754.244	633
2:38:56	59.969	3741.285	24.799	23.701	0.000	3805.398	3771.864	3786.653	3780.849	3754.320	633
2:38:58	59.974	3745.738	20.801	22.686	0.000	3804.383	3771.789	3786.704	3780.849	3754.397	633
2:39:00	59.974	3745.738	20.801	22.026	0.000	3803.723	3771.714	3786.753	3780.849	3754.473	633
2:39:02	59.981	3741.618	15.201	19.637	0.000	3801.334	3771.628	3786.794	3780.849	3754.548	633
2:39:04	59.981	3741.618	15.201	18.085	0.000	3799.781	3771.543	3786.831	3780.849	3754.624	633
2:39:06	59.981	3738.484	15.201	17.075	0.000	3798.772	3771.449	3786.865	3780.849	3754.698	633
2:39:08	59.981	3738.484	15.201	16.419	0.000	3798.116	3771.355	3786.897	3780.849	3754.773	633
2:39:10	59.982	3737.404	14.401	15.713	0.000	3797.409	3771.259	3786.927	3780.849	3754.846	633
2:39:12	59.982	3737.404	14.401	15.254	0.000	3796.950	3771.164	3786.955	3780.849	3754.920	633
2:39:14	59.982	3736.308	14.401	14.955	0.000	3796.652	3771.066	3786.982	3780.849	3754.993	633
2:39:16	59.982	3736.308	14.401	14.761	0.000	3796.458	3770.969	3787.009	3780.849	3755.066	633
2:39:18	59.979	3735.448	16.800	15.475	0.000	3797.171	3770.870	3787.037	3780.849	3755.138	633
2:39:20	59.979	3735.448	16.800	15.939	0.000	3797.635	3770.771	3787.067	3780.849	3755.210	633
2:39:22	59.978	3737.541	17.599	16.520	0.000	3798.216	3770.679	3787.098	3780.849	3755.281	633
2:39:24	59.978	3737.541	17.599	16.898	0.000	3798.594	3770.587	3787.130	3780.849	3755.352	633
2:39:26	59.98	3736.748	16.000	16.584	0.000	3798.280	3770.493	3787.160	3780.849	3755.423	633
2:39:28	59.98	3736.748	16.000	16.380	0.000	3798.076	3770.400	3787.191	3780.849	3755.493	633
2:39:30	59.98	3736.067	16.000	16.247	0.000	3797.943	3770.306	3787.220	3780.849	3755.563	633
2:39:32	59.98	3736.067	16.000	16.161	0.000	3797.857	3770.212	3787.249	3780.849	3755.632	633
2:39:34	59.976	3736.575	19.199	17.224	0.000	3798.920	3770.120	3787.281	3780.849	3755.701	633
2:39:36	59.976	3736.575	19.199	17.915	0.000	3799.611	3770.029	3787.315	3780.849	3755.770	633
2:39:38	59.971	3738.875	23.199	19.765	0.000	3801.461	3769.944	3787.353	3780.849	3755.838	633
2:39:40	59.971	3738.875	23.199	20.967	0.000	3802.663	3769.860	3787.395	3780.849	3755.906	633
2:39:42	59.974	3738.647	20.801	20.909	0.000	3802.605	3769.776	3787.436	3780.849	3755.974	633
2:39:44	59.974	3738.647	20.801	20.871	0.000	3802.567	3769.692	3787.477	3780.849	3756.041	633
2:39:46	59.976	3737.382	19.199	20.286	0.000	3801.982	3769.605	3787.516	3780.849	3756.108	633
2:39:48	59.976	3737.382	19.199	19.905	0.000	3801.602	3769.519	3787.553	3780.849	3756.175	633
2:39:50	59.969	3740.017	24.799	21.618	0.000	3803.314	3769.440	3787.595	3780.849	3756.241	633
2:39:52	59.969	3740.017	24.799	22.731	0.000	3804.427	3769.361	3787.640	3780.849	3756.307	633
2:39:54	59.974	3742.053	20.801	22.055	0.000	3803.752	3769.289	3787.683	3780.849	3756.372	633
2:39:56	59.974	3742.053	20.801	21.616	0.000	3803.313	3769.216	3787.725	3780.849	3756.437	633
2:39:58	59.972	3742.524	22.400	21.891	0.000	3803.587	3769.146	3787.767	3780.849	3756.502	633
2:40:00	59.972	3742.524	22.400	22.069	0.000	3803.765	3769.076	3787.809	3780.849	3756.566	633
2:40:02	59.977	3741.723	18.399	20.784	0.000	3802.481	3769.004	3787.847	3780.849	3756.630	633

2:40:04	59.977	3741.723	18.399	19.950	0.000	3801.646	3768.932	3787.884	3780.849	3756.694	633
2:40:06	59.978	3740.629	17.599	19.127	0.000	3800.823	3768.858	3787.918	3780.849	3756.757	633
2:40:08	59.978	3740.629	17.599	18.592	0.000	3800.289	3768.784	3787.950	3780.849	3756.821	633
2:40:10	59.973	3740.775	21.600	19.645	0.000	3801.342	3768.711	3787.985	3780.849	3756.883	633
2:40:12	59.973	3740.775	21.600	20.329	0.000	3802.026	3768.639	3788.021	3780.849	3756.946	633
2:40:14	59.977	3741.268	18.399	19.654	0.000	3801.350	3768.568	3788.056	3780.849	3757.008	633
2:40:16	59.977	3741.268	18.399	19.215	0.000	3800.911	3768.497	3788.089	3780.849	3757.070	633
2:40:18	59.978	3738.966	17.599	18.649	0.000	3800.346	3768.421	3788.121	3780.849	3757.131	633
2:40:20	59.978	3738.966	17.599	18.282	0.000	3799.978	3768.345	3788.151	3780.849	3757.192	633
2:40:22	59.981	3738.879	15.201	17.204	0.000	3798.900	3768.270	3788.179	3780.849	3757.253	633
2:40:24	59.981	3738.879	15.201	16.503	0.000	3798.199	3768.195	3788.204	3780.849	3757.313	633
2:40:26	59.974	3738.102	20.801	18.007	0.000	3799.703	3768.118	3788.234	3780.849	3757.374	633
2:40:28	59.974	3738.102	20.801	18.985	0.000	3800.681	3768.041	3788.265	3780.849	3757.434	633
2:40:30	59.971	3743.507	23.199	20.460	0.000	3802.156	3767.979	3788.300	3780.849	3757.493	633
2:40:32	59.971	3743.507	23.199	21.419	0.000	3803.115	3767.917	3788.338	3780.849	3757.552	633
2:40:34	59.972	3745.251	22.400	21.762	0.000	3803.459	3767.860	3788.376	3780.849	3757.611	633
2:40:36	59.972	3745.251	22.400	21.985	0.000	3803.682	3767.803	3788.415	3780.849	3757.670	633
2:40:38	59.966	3747.340	27.200	23.811	0.000	3805.507	3767.752	3788.458	3780.849	3757.728	633
2:40:40	59.966	3747.340	27.200	24.997	0.000	3806.693	3767.700	3788.503	3780.849	3757.787	633
2:40:42	59.971	3749.750	23.199	24.368	0.000	3806.064	3767.656	3788.547	3780.849	3757.844	633
2:40:44	59.971	3749.750	23.199	23.959	0.000	3805.655	3767.611	3788.590	3780.849	3757.902	633
2:40:46	59.972	3744.683	22.400	23.413	0.000	3805.110	3767.554	3788.631	3780.849	3757.959	633
2:40:48	59.972	3744.683	22.400	23.059	0.000	3804.755	3767.497	3788.671	3780.849	3758.016	633
2:40:50	59.972	3743.149	22.400	22.828	0.000	3804.524	3767.437	3788.710	3780.849	3758.073	633
2:40:52	59.972	3743.149	22.400	22.678	0.000	3804.375	3767.377	3788.749	3780.849	3758.129	633
2:40:54	59.973	3739.453	21.600	22.301	0.000	3803.997	3767.308	3788.786	3780.849	3758.185	633
2:40:56	59.973	3739.453	21.600	22.056	0.000	3803.752	3767.240	3788.823	3780.849	3758.241	633
2:40:58	59.971	3731.830	23.199	22.456	0.000	3804.152	3767.153	3788.861	3780.849	3758.297	633
2:41:00	59.971	3731.830	23.199	22.716	0.000	3804.413	3767.067	3788.899	3780.849	3758.352	633
2:41:02	59.982	3736.229	14.401	19.806	0.000	3801.502	3766.991	3788.930	3780.849	3758.407	633
2:41:04	59.982	3736.229	14.401	17.914	0.000	3799.611	3766.916	3788.956	3780.849	3758.462	633
2:41:06	59.985	3733.434	12.000	15.844	0.000	3797.541	3766.835	3788.976	3780.849	3758.516	633
2:41:08	59.985	3733.434	12.000	14.499	0.000	3796.195	3766.754	3788.994	3780.849	3758.570	633
2:41:10	59.987	3730.510	10.400	13.064	0.000	3794.761	3766.667	3789.008	3780.849	3758.624	633
2:41:12	59.987	3730.510	10.400	12.132	0.000	3793.828	3766.580	3789.019	3780.849	3758.678	633
2:41:14	59.989	3725.459	8.801	10.966	0.000	3792.663	3766.481	3789.028	3780.849	3758.731	633
2:41:16	59.989	3725.459	8.801	10.208	0.000	3791.905	3766.382	3789.035	3780.849	3758.784	633
2:41:18	59.987	3720.108	10.400	10.276	0.000	3791.972	3766.272	3789.042	3780.849	3758.837	633
2:41:20	59.987	3720.108	10.400	10.319	0.000	3792.016	3766.162	3789.049	3780.849	3758.890	633
2:41:22	59.994	3725.661	4.800	8.388	0.000	3790.084	3766.065	3789.052	3780.849	3758.942	633
2:41:24	59.994	3725.661	4.800	7.132	0.000	3788.829	3765.969	3789.051	3780.849	3758.995	633
2:41:26	60.001	3727.754	-0.800	4.356	0.000	3786.052	3765.879	3789.044	3780.849	3759.046	633
2:41:28	60.001	3727.754	-0.800	2.552	0.000	3784.248	3765.788	3789.033	3780.849	3759.098	633
2:41:30	60.004	3727.683	-3.201	0.538	0.000	3782.234	3765.699	3789.017	3780.849	3759.150	633
2:41:32	60.004	3727.683	-3.201	-0.771	0.000	3780.926	3765.609	3788.998	3780.849	3759.201	633
2:41:34	60.012	3725.012	-9.601	-3.861	0.000	3777.835	3765.514	3788.971	3780.849	3759.252	633

2:41:36	60.012	3725.012	-9.601	-5.870	0.000	3775.826	3765.419	3788.941	3780.849	3759.302	633
2:41:38	60.019	3726.016	-15.201	-9.136	0.000	3772.561	3765.327	3788.902	3780.849	3759.353	633
2:41:40	60.019	3726.016	-15.201	-11.259	0.000	3770.438	3765.235	3788.859	3780.849	3759.403	633
2:41:42	60.025	3716.375	-20.001	-14.319	0.000	3767.378	3765.122	3788.809	3780.849	3759.453	633
2:41:44	60.025	3716.375	-20.001	-16.307	0.000	3765.389	3765.009	3788.755	3780.849	3759.503	633
2:41:46	60.027	3717.560	-21.600	-18.160	0.000	3763.536	3764.899	3788.697	3780.849	3759.552	633
2:41:48	60.027	3717.560	-21.600	-19.364	0.000	3762.332	3764.789	3788.636	3780.849	3759.602	633
2:41:50	60.029	3715.166	-23.199	-20.706	0.000	3760.990	3764.675	3788.572	3780.849	3759.651	633
2:41:52	60.029	3715.166	-23.199	-21.579	0.000	3760.117	3764.561	3788.507	3780.849	3759.700	633
2:41:54	60.036	3710.283	-28.799	-24.106	0.000	3757.590	3764.437	3788.436	3780.849	3759.748	633
2:41:56	60.036	3710.283	-28.799	-25.749	0.000	3755.948	3764.313	3788.361	3780.849	3759.797	633
2:41:58	60.037	3699.356	-29.599	-27.096	0.000	3754.600	3764.165	3788.284	3780.849	3759.845	633
2:42:00	60.037	3699.356	-29.599	-27.972	0.000	3753.724	3764.017	3788.206	3780.849	3759.893	633
2:42:02	60.041	3704.591	-32.800	-29.662	0.000	3752.034	3763.882	3788.123	3780.849	3759.940	633
2:42:04	60.041	3704.591	-32.800	-30.760	0.000	3750.936	3763.747	3788.039	3780.849	3759.988	633
2:42:06	60.044	3702.482	-35.199	-32.314	0.000	3749.382	3763.609	3787.952	3780.849	3760.035	633
2:42:08	60.044	3702.482	-35.199	-33.324	0.000	3748.373	3763.471	3787.862	3780.849	3760.082	633
2:42:10	60.046	3700.826	-36.801	-34.541	0.000	3747.156	3763.330	3787.771	3780.849	3760.129	633
2:42:12	60.046	3700.826	-36.801	-35.332	0.000	3746.364	3763.189	3787.678	3780.849	3760.176	633
2:42:14	60.046	3699.726	-36.801	-35.846	0.000	3745.850	3763.047	3787.584	3780.849	3760.222	633
2:42:16	60.046	3699.726	-36.801	-36.180	0.000	3745.516	3762.905	3787.490	3780.849	3760.269	633
2:42:18	60.043	3690.477	-34.399	-35.557	0.000	3746.139	3762.744	3787.397	3780.849	3760.315	633
2:42:20	60.043	3690.477	-34.399	-35.152	0.000	3746.544	3762.583	3787.306	3780.849	3760.361	633
2:42:22	60.044	3696.877	-35.199	-35.168	0.000	3746.528	3762.437	3787.216	3780.849	3760.406	633
2:42:24	60.044	3696.877	-35.199	-35.179	0.000	3746.517	3762.291	3787.125	3780.849	3760.452	633

A Point	2:27:22		
FPointA	60.0410	2:27:22 AM	
A Value	60.0420		
C Value	59.8360	2:27:32 AM	
Delta FCA	-0.206001282		
FR C	-307.3	MW/0.1 Hz	
Slope A-C dF/dT	-0.020500	Hz/second	
C Value Maximum Resource Loss	633		
Secondary C Value	No	n/a	Time

A Point	2:27:22		
FPointA	60.04100037	2:27:22	
A Value	60.04199982		
C Value	59.83599854	#N/A	
Delta FC			

	Value B 12 to 24 sec	FR B 12 to 24 sec	Value B 18 to 30 sec	FR B 18 to 30 sec	Value B 20 to 40 sec	FR B 20 to 40 sec	Value B 18 to 52 sec	FR B 18 to 52 sec	Value B 20 to 52 sec
B Frequency Value	59.8823		59.8831		59.8888		59.8880		59.8888
Delta FB	-0.1597	-396.907	-0.1589	-398.895	-0.1532	-412.288	-0.1540	-411.604	-0.1532
Slope B dF/dT	-0.00798569		-0.00794285		-0.0076618		-0.0077		-0.0076618
RatioB-C	77.5305		77.1146		74.3855		74.7567		74.3855
Sustainability Index	-0.0153		-0.0161		-0.0218		-0.0210		-0.0218

Tzero	2:27:22
FT+4	59.97800064
FT+10	59.89199829
FT+20	59.875
FT+60	59.88800049

Interconnection Evaluation

riod (indicates ramp direction during recovery period)

B Value Average Resource Loss	633	
B Value Average LaaR Loss	0	
B Value Average Net Loss	633	
		Interconnection Bias Total
		EI ERCOT WECC
Interconnection Bias Setting	-660	-6349 -660 -2024
IPFR as a % of Bias Setting	0.00%	
Interconnection Total Energy	37446	60.07%
Interconnection Peak Energy	62339	

Frequency and Interconnection Frequency Response @ different Average periods of B

Generator Trip MW	Generator Trip MW	Generator Trip MW	Generator Trip MW	Generator Trip MW	Generator Trip MW	LaaR Trip MW	Total Generation Trip MW	Interconne Primary Frequency Response	FR B 20 to 52 sec Average MW
								MW/0.1 Hz	
							0		
							0		
							0		
							0		

	Value B 12 to 24 sec Average Frequency	FR B 12 to 24 sec Average MW	Value B 18 to 30 sec Average Frequency	FR B 18 to 30 sec Average MW	Value B 20 to 40 sec Average Frequency	FR B 20 to 40 sec Average MW	Value B 18 to 52 sec Average Frequency	FR B 18 to 52 sec Average MW	Value B 20 to 52 sec Average Frequency
T-72 sec									
T-70 sec									
T-68 sec									

	0			T-66 sec									
	0			T-64 sec									
	0			T-62 sec									
	0			T-60 sec									
	0			T-58 sec									
	0			T-56 sec									
	0			T-54 sec									
	0			T-52 sec									
	0			T-50 sec									
	0			T-48 sec									
	0			T-46 sec									
	0			T-44 sec									
	0			T-42 sec									
	0			T-40 sec									
	0			T-38 sec									
	0			T-36 sec									
	0			T-34 sec									
	0			T-32 sec									
	0			T-30 sec									
	0			T-28 sec									
	0			T-26 sec									
	0			T-24 sec									
	0			T-22 sec									
	0			T-20 sec									
	0			T-18 sec									
	0			T-16 sec	60.042								
	0			T-14 sec	60.042								
	0			T-12 sec	60.042								
	0			T-10 sec	60.042								
	0			T-08 sec	60.042								
	0			T-06 sec	60.042								
	0			T-04 sec	60.042								
	0			T-02 sec	60.042								
	633	-989.075		T+0 sec									
	633	-989.075		T+02 sec									
	633	-989.075		T+04 sec									
0	633	-307.28		T+06 sec									
0	633	-307.28		T+08 sec									
0	633	-421.996		T+10 sec									
0	633	-421.996		T+12 sec	59.8823	-396.907							
0	633	-390.744		T+14 sec	59.8823	-396.907							
0	633	-390.744		T+16 sec	59.8823	-396.907							
0	633	-379.042		T+18 sec	59.8823	-396.907	59.8831	-398.895			59.8880	-411.604	
0	633	-379.042	-413.5197194	T+20 sec	59.8823	-396.907	59.8831	-398.895	59.8888	-412.288	59.8880	-411.604	59.8888
0	633	-408.39	-413.5197194	T+22 sec	59.8823	-396.907	59.8831	-398.895	59.8888	-412.288	59.8880	-411.604	59.8888
0	633	-408.39	-413.5197194	T+24 sec	59.8823	-396.907	59.8831	-398.895	59.8888	-412.288	59.8880	-411.604	59.8888

0	633	-403.181	-413.5197194	T+26 sec		59.8831	-398.895	59.8888	-412.288	59.8880	-411.604	59.8888
0	633	-403.181	-413.5197194	T+28 sec		59.8831	-398.895	59.8888	-412.288	59.8880	-411.604	59.8888
0	633	-411.041	-413.5197194	T+30 sec		59.8831	-398.895	59.8888	-412.288	59.8880	-411.604	59.8888
0	633	-411.041	-413.5197194	T+32 sec				59.8888	-412.288	59.8880	-411.604	59.8888
0	633	-430.614	-413.5197194	T+34 sec				59.8888	-412.288	59.8880	-411.604	59.8888
0	633	-430.614	-413.5197194	T+36 sec				59.8888	-412.288	59.8880	-411.604	59.8888
0	633	-424.837	-413.5197194	T+38 sec				59.8888	-412.288	59.8880	-411.604	59.8888
0	633	-424.837	-413.5197194	T+40 sec				59.8888	-412.288	59.8880	-411.604	59.8888
0	633	-427.706	-413.5197194	T+42 sec						59.8880	-411.604	59.8888
0	633	-427.706	-413.5197194	T+44 sec						59.8880	-411.604	59.8888
0	633	-416.446	-413.5197194	T+46 sec						59.8880	-411.604	59.8888
0	633	-416.446	-413.5197194	T+48 sec						59.8880	-411.604	59.8888
0	633	-403.181	-413.5197194	T+50 sec						59.8880	-411.604	59.8888
0	633	-403.181	-413.5197194	T+52 sec						59.8880	-411.604	59.8888
0	633	-408.39		T+54 sec								
0	633	-408.39		T+56 sec								
0	633	-411.041		T+58 sec								
0	633	-411.041		T+60 sec								
0	633	-413.726		T+62 sec								
0	633	-413.726		T+64 sec								
0	633	-374.559		T+66 sec								
0	633	-374.559		T+68 sec								
0	633	-327.978		T+70 sec								
0	633	-327.978		T+72 sec								
0	633	-344.025		T+74 sec								
0	633	-344.025		T+76 sec								
0	633	-359.662		T+78 sec								
0	633	-359.662		T+80 sec								
0	633	-361.716										
0	633	-361.716										
0	633	-370.172										
0	633	-370.172										
0	633	-388.348										
0	633	-388.348										
0	633	-398.112										
0	633	-398.112										
0	633	-416.446										
0	633	-416.446										
0	633	-413.726										
0	633	-413.726										
0	633	-442.653										
0	633	-442.653										
0	633	-452.145										
0	633	-452.145										
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0	633	-703.332
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0	633	-989.075
0	633	-989.075
0	633	-989.075
0	633	-989.075
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0	633	-891.56
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0	633	-843.991
0	633	-832.892
0	633	-832.892
0	633	-891.56

0	633	-891.56
0	633	-822.082
0	633	-822.082
0	633	-811.548
0	633	-811.548
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0	633	-843.991
0	633	-855.39
0	633	-855.39
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0	633	-822.082
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0	633	-822.082
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0	633	-762.649
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0	633	-855.39
0	633	-855.39
0	633	-917.388
0	633	-917.388
0	633	-822.082
0	633	-822.082
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0	633	-1020.96
0	633	-1020.96
0	633	-959.119
0	633	-959.119
0	633	-891.56
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0	633	-867.146
0	633	-930.871
0	633	-930.871
0	633	-904.29
0	633	-904.29
0	633	-973.867

0	633	-973.867
0	633	-989.075
0	633	-989.075
0	633	-917.388
0	633	-917.388
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0	633	-1150.9
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0	633	-1665.87
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0	633	-2752.32
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0	633	15818.6
0	633	15818.6
0	633	15818.6
0	633	15818.6
0	633	63334.79
0	633	63334.79
0	633	31667.4
0	633	31667.4

Non-Conforming Load sign convention | + | (If Data is positive for Load then enter "+" else "-")

FR B 20 to 52 sec Average MW																
-413.520		T	Frequency Hz	Net Actual Interchange MW	JOU Dynamic Schedules Imp(-) Exp (+) MW	Non-Conforming Load Load (-) MW	Pumped Hydro Load (-) Gen (+) MW	Ramping Units Gen (+) MW	Transferred Frequency Response Rec (-) Del (+) MW/0.1 Hz	Contingent BA Lost Generation Load (-) Gen (+) MW	BA Bias Setting MW/0.1 Hz	BA Load MW	Expected Primary Freq Response MW		T	Frequency Hz
	T-72 sec	2:26:12	60.0270	3668.61	350.00	-257.42	0.00	106.50	10.00	15.00	-103.00	7570.29	-21.600	T-72 sec	2:26:12	
	T-70 sec	2:26:14	60.0270	3668.61	350.00	-257.42	0.00	106.50	10.00	15.00	-103.00	7570.29	-21.600	T-70 sec	2:26:14	
	T-68 sec	2:26:16	60.0260	3664.50	350.00	-257.42	0.00	107.00	10.00	15.00	-103.00	7570.62	-20.801	T-68 sec	2:26:16	

Time of Frequer
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Value B Post-Perturbatio
Pre to Pos

Frequency, Actual Interchange, Adjustment Data, Bias and Load used in the evaluation

12 to 24 second

	T-66 sec	2:26:18	60.0260	3664.50	350.00	-257.42	0.00	107.00	10.00	15.00	-103.00	7570.62	-20.801	T-66 sec	2:26:18	
	T-64 sec	2:26:20	60.0190	3666.82	350.00	-257.42	0.00	107.50	10.00	15.00	-103.00	7570.95	-15.201	T-64 sec	2:26:20	
	T-62 sec	2:26:22	60.0190	3666.82	350.00	-257.42	0.00	107.50	10.00	15.00	-103.00	7570.95	-15.201	T-62 sec	2:26:22	
	T-60 sec	2:26:24	60.0190	3670.45	350.00	-257.42	0.00	108.00	10.00	15.00	-103.00	7571.28	-15.201	T-60 sec	2:26:24	
	T-58 sec	2:26:26	60.0190	3670.45	350.00	-257.42	0.00	108.00	10.00	15.00	-103.00	7571.28	-15.201	T-58 sec	2:26:26	
	T-56 sec	2:26:28	60.0190	3671.67	350.00	-257.42	0.00	108.50	10.00	15.00	-103.00	7571.61	-15.201	T-56 sec	2:26:28	
	T-54 sec	2:26:30	60.0190	3671.67	350.00	-257.42	0.00	108.50	10.00	15.00	-103.00	7571.61	-15.201	T-54 sec	2:26:30	
	T-52 sec	2:26:32	60.0210	3672.69	350.00	-261.74	0.00	109.00	10.00	15.00	-103.00	7571.94	-16.800	T-52 sec	2:26:32	
	T-50 sec	2:26:34	60.0210	3672.69	350.00	-261.74	0.00	109.00	10.00	15.00	-103.00	7571.94	-16.800	T-50 sec	2:26:34	
	T-48 sec	2:26:36	60.0190	3672.16	350.00	-261.74	0.00	109.50	10.00	15.00	-103.00	7572.27	-15.201	T-48 sec	2:26:36	
	T-46 sec	2:26:38	60.0190	3672.16	350.00	-261.74	0.00	109.50	10.00	15.00	-103.00	7572.27	-15.201	T-46 sec	2:26:38	
	T-44 sec	2:26:40	60.0220	3669.98	350.00	-165.10	0.00	110.00	10.00	15.00	-103.00	7572.60	-17.599	T-44 sec	2:26:40	
	T-42 sec	2:26:42	60.0220	3669.98	350.00	-165.10	0.00	110.00	10.00	15.00	-103.00	7572.60	-17.599	T-42 sec	2:26:42	
	T-40 sec	2:26:44	60.0370	3663.76	350.00	-165.48	0.00	110.50	10.00	15.00	-103.00	7572.93	-29.599	T-40 sec	2:26:44	
	T-38 sec	2:26:46	60.0370	3663.76	350.00	-165.48	0.00	110.50	10.00	15.00	-103.00	7572.93	-29.599	T-38 sec	2:26:46	
	T-36 sec	2:26:48	60.0360	3660.67	350.00	-165.48	0.00	111.00	10.00	15.00	-103.00	7573.26	-28.799	T-36 sec	2:26:48	
	T-34 sec	2:26:50	60.0360	3660.67	350.00	-165.48	0.00	111.00	10.00	15.00	-103.00	7573.26	-28.799	T-34 sec	2:26:50	
	T-32 sec	2:26:52	60.0460	3649.19	350.00	-165.48	0.00	111.50	10.00	15.00	-103.00	7573.59	-36.801	T-32 sec	2:26:52	
	T-30 sec	2:26:54	60.0460	3649.19	350.00	-165.48	0.00	111.50	10.00	15.00	-103.00	7573.59	-36.801	T-30 sec	2:26:54	
	T-28 sec	2:26:56	60.0480	3648.25	350.00	-165.48	0.00	112.00	10.00	15.00	-103.00	7573.92	-38.400	T-28 sec	2:26:56	
	T-26 sec	2:26:58	60.0480	3648.25	350.00	-165.48	0.00	112.00	10.00	15.00	-103.00	7573.92	-38.400	T-26 sec	2:26:58	
	T-24 sec	2:27:00	60.0410	3654.29	350.00	-165.10	0.00	112.50	10.00	15.00	-103.00	7574.25	-32.800	T-24 sec	2:27:00	
	T-22 sec	2:27:02	60.0410	3654.29	350.00	-165.10	0.00	112.50	10.00	15.00	-103.00	7574.25	-32.800	T-22 sec	2:27:02	
	T-20 sec	2:27:04	60.0410	3651.87	350.00	-165.48	0.00	113.00	10.00	15.00	-103.00	7574.58	-32.800	T-20 sec	2:27:04	
	T-18 sec	2:27:06	60.0410	3651.87	350.00	-165.48	0.00	113.00	10.00	15.00	-103.00	7574.58	-32.800	T-18 sec	2:27:06	
	T-16 sec	2:27:08	60.0410	3649.19	350.00	-165.48	0.00	113.50	10.00	15.00	-103.00	7574.91	-32.800	T-16 sec	2:27:08	60.042
	T-14 sec	2:27:10	60.0410	3649.19	350.00	-165.48	0.00	113.50	10.00	15.00	-103.00	7574.91	-32.800	T-14 sec	2:27:10	60.042
	T-12 sec	2:27:12	60.0450	3645.39	350.00	-165.48	0.00	114.00	10.00	15.00	-103.00	7575.24	-35.999	T-12 sec	2:27:12	60.042
	T-10 sec	2:27:14	60.0450	3645.39	350.00	-165.48	0.00	114.00	10.00	15.00	-103.00	7575.24	-35.999	T-10 sec	2:27:14	60.042
	T-08 sec	2:27:16	60.0410	3645.45	350.00	-165.48	0.00	114.50	10.00	15.00	-103.00	7575.57	-32.800	T-08 sec	2:27:16	60.042
	T-06 sec	2:27:18	60.0410	3645.45	350.00	-165.48	0.00	114.50	10.00	15.00	-103.00	7575.57	-32.800	T-06 sec	2:27:18	60.042
	T-04 sec	2:27:20	60.0410	3641.19	350.00	-165.48	0.00	115.00	10.00	15.00	-103.00	7575.90	-32.800	T-04 sec	2:27:20	60.042
	T-02 sec	2:27:22	60.0410	3641.19	350.00	-165.48	0.00	115.00	10.00	15.00	-103.00	7575.90	-32.800	T-02 sec	2:27:22	60.042
	T+0 sec	2:27:24	59.9780	3696.36	350.00	-206.46	1.00	115.50	10.00	15.00	-103.00	7576.23	17.599	T+0 sec	2:27:24	
	T+02 sec	2:27:26	59.9780	3696.36	350.00	-206.46	1.00	115.50	10.00	15.00	-103.00	7576.23	17.599	T+02 sec	2:27:26	
	T+04 sec	2:27:28	59.9780	3696.36	350.00	-206.46	1.00	115.50	10.00	15.00	-103.00	7576.23	17.599	T+04 sec	2:27:28	
	T+06 sec	2:27:30	59.8360	3734.67	335.00	-206.46	1.00	116.00	10.00	0.00	-103.00	7576.56	131.201	T+06 sec	2:27:30	
	T+08 sec	2:27:32	59.8360	3734.67	335.00	-206.46	1.00	116.00	10.00	0.00	-103.00	7576.56	131.201	T+08 sec	2:27:32	
	T+10 sec	2:27:34	59.8920	3761.25	335.00	-206.46	1.00	116.50	10.00	0.00	-103.00	7576.89	86.401	T+10 sec	2:27:34	
	T+12 sec	2:27:36	59.8920	3761.25	335.00	-206.46	1.00	116.50	10.00	0.00	-103.00	7576.89	86.401	T+12 sec	2:27:36	59.882
	T+14 sec	2:27:38	59.8800	3766.19	335.00	-206.46	1.00	117.00	10.00	0.00	-103.00	7577.22	95.999	T+14 sec	2:27:38	59.882
	T+16 sec	2:27:40	59.8800	3766.19	335.00	-206.46	1.00	117.00	10.00	0.00	-103.00	7577.22	95.999	T+16 sec	2:27:40	59.882
	T+18 sec	2:27:42	59.8750	3769.93	335.00	-206.46	1.00	117.50	10.00	0.00	-103.00	7577.55	100.000	T+18 sec	2:27:42	59.882
-413.520	T+20 sec	2:27:44	59.8750	3769.93	335.00	-206.46	1.00	117.50	10.00	0.00	-103.00	7577.55	100.000	T+20 sec	2:27:44	59.882
-413.520	T+22 sec	2:27:46	59.8870	3781.59	335.00	-211.26	1.00	118.00	10.00	0.00	-103.00	7577.88	90.399	T+22 sec	2:27:46	59.882
-413.520	T+24 sec	2:27:48	59.8870	3781.59	335.00	-211.26	1.00	118.00	10.00	0.00	-103.00	7577.88	90.399	T+24 sec	2:27:48	59.882

-413.520	T+26 sec	2:27:50	59.8850	3784.96	335.00	-211.26	1.00	118.50	10.00	0.00	-103.00	7578.21	92.001	T+26 sec	2:27:50
-413.520	T+28 sec	2:27:52	59.8850	3784.96	335.00	-211.26	1.00	118.50	10.00	0.00	-103.00	7578.21	92.001	T+28 sec	2:27:52
-413.520	T+30 sec	2:27:54	59.8880	3784.42	335.00	-211.26	2.00	119.00	10.00	0.00	-103.00	7578.54	89.600	T+30 sec	2:27:54
-413.520	T+32 sec	2:27:56	59.8880	3784.42	335.00	-211.26	2.00	119.00	10.00	0.00	-103.00	7578.54	89.600	T+32 sec	2:27:56
-413.520	T+34 sec	2:27:58	59.8950	3788.33	335.00	-211.26	3.00	119.50	10.00	0.00	-103.00	7578.87	84.000	T+34 sec	2:27:58
-413.520	T+36 sec	2:28:00	59.8950	3788.33	335.00	-211.26	3.00	119.50	10.00	0.00	-103.00	7578.87	84.000	T+36 sec	2:28:00
-413.520	T+38 sec	2:28:02	59.8930	3788.47	335.00	-211.26	4.00	120.00	10.00	0.00	-103.00	7579.20	85.599	T+38 sec	2:28:02
-413.520	T+40 sec	2:28:04	59.8930	3788.47	335.00	-211.26	4.00	120.00	10.00	0.00	-103.00	7579.20	85.599	T+40 sec	2:28:04
-413.520	T+42 sec	2:28:06	59.8940	3793.07	335.00	-214.35	5.00	120.50	10.00	0.00	-103.00	7579.53	84.799	T+42 sec	2:28:06
-413.520	T+44 sec	2:28:08	59.8940	3793.07	335.00	-214.35	5.00	120.50	10.00	0.00	-103.00	7579.53	84.799	T+44 sec	2:28:08
-413.520	T+46 sec	2:28:10	59.8900	3799.43	335.00	-214.35	6.00	121.00	10.00	0.00	-103.00	7579.86	88.000	T+46 sec	2:28:10
-413.520	T+48 sec	2:28:12	59.8900	3799.43	335.00	-214.35	6.00	121.00	10.00	0.00	-103.00	7579.86	88.000	T+48 sec	2:28:12
-413.520	T+50 sec	2:28:14	59.8850	3799.96	335.00	-214.35	7.00	121.50	10.00	0.00	-103.00	7580.19	92.001	T+50 sec	2:28:14
-413.520	T+52 sec	2:28:16	59.8850	3799.96	335.00	-214.35	7.00	121.50	10.00	0.00	-103.00	7580.19	92.001	T+52 sec	2:28:16
	T+54 sec	2:28:18	59.8870	3802.93	335.00	-214.35	8.00	122.00	10.00	0.00	-103.00	7580.52	90.399	T+54 sec	2:28:18
	T+56 sec	2:28:20	59.8870	3802.93	335.00	-214.35	8.00	122.00	10.00	0.00	-103.00	7580.52	90.399	T+56 sec	2:28:20
	T+58 sec	2:28:22	59.8880	3804.39	335.00	-214.35	9.00	122.50	10.00	0.00	-103.00	7580.85	89.600	T+58 sec	2:28:22
	T+60 sec	2:28:24	59.8880	3804.39	335.00	-214.35	9.00	122.50	10.00	0.00	-103.00	7580.85	89.600	T+60 sec	2:28:24
	T+62 sec	2:28:26	59.8890	3805.62	335.00	-212.17	10.00	123.00	10.00	0.00	-103.00	7581.18	88.800	T+62 sec	2:28:26
	T+64 sec	2:28:28	59.8890	3805.62	335.00	-212.17	10.00	123.00	10.00	0.00	-103.00	7581.18	88.800	T+64 sec	2:28:28
	T+66 sec	2:28:30	59.8730	3811.50	335.00	-212.17	11.00	123.50	10.00	0.00	-103.00	7581.51	101.599	T+66 sec	2:28:30
	T+68 sec	2:28:32	59.8730	3811.50	335.00	-212.17	11.00	123.50	10.00	0.00	-103.00	7581.51	101.599	T+68 sec	2:28:32
	T+70 sec	2:28:34	59.8490	3815.89	335.00	-212.17	12.00	124.00	10.00	0.00	-103.00	7581.84	120.801	T+70 sec	2:28:34
	T+72 sec	2:28:36	59.8490	3815.89	335.00	-212.17	12.00	124.00	10.00	0.00	-103.00	7581.84	120.801	T+72 sec	2:28:36
	T+74 sec	2:28:38	59.8580	3826.05	335.00	-212.17	13.00	124.50	10.00	0.00	-103.00	7582.17	113.599	T+74 sec	2:28:38
	T+76 sec	2:28:40	59.8580	3826.05	335.00	-212.17	13.00	124.50	10.00	0.00	-103.00	7582.17	113.599	T+76 sec	2:28:40
	T+78 sec	2:28:42	59.8660	3827.52	335.00	-212.17	14.00	125.00	10.00	0.00	-103.00	7582.50	107.199	T+78 sec	2:28:42
	T+80 sec	2:28:44	59.8660	3827.52	335.00	-212.17	14.00	125.00	10.00	0.00	-103.00	7582.50	107.199	T+80 sec	2:28:44
		2:28:46	59.8670	3826.78	335.00	-215.60	15.00	125.50	10.00	0.00	-103.00	7582.83	106.400		
		2:28:48	59.8670	3826.78	335.00	-215.60	15.00	125.50	10.00	0.00	-103.00	7582.83	106.400		
		2:28:50	59.8710	3825.71	335.00	-215.60	16.00	126.00	10.00	0.00	-103.00	7583.16	103.201		
		2:28:52	59.8710	3825.71	335.00	-215.60	16.00	126.00	10.00	0.00	-103.00	7583.16	103.201		
		2:28:54	59.8790	3822.51	335.00	-215.60	16.00	126.50	10.00	0.00	-103.00	7583.49	96.799		
		2:28:56	59.8790	3822.51	335.00	-215.60	16.00	126.50	10.00	0.00	-103.00	7583.49	96.799		
		2:28:58	59.8830	3818.06	335.00	-215.60	16.00	127.00	10.00	0.00	-103.00	7583.82	93.600		
		2:29:00	59.8830	3818.06	335.00	-215.60	16.00	127.00	10.00	0.00	-103.00	7583.82	93.600		
		2:29:02	59.8900	3815.01	335.00	-215.60	16.00	127.50	10.00	0.00	-103.00	7584.15	88.000		
		2:29:04	59.8900	3815.01	335.00	-215.60	16.00	127.50	10.00	0.00	-103.00	7584.15	88.000		
		2:29:06	59.8890	3811.84	335.00	-218.33	16.00	128.00	10.00	0.00	-103.00	7584.48	88.800		
		2:29:08	59.8890	3811.84	335.00	-218.33	16.00	128.00	10.00	0.00	-103.00	7584.48	88.800		
		2:29:10	59.8990	3806.97	335.00	-218.33	16.00	128.50	10.00	0.00	-103.00	7584.81	80.801		
		2:29:12	59.8990	3806.97	335.00	-218.33	16.00	128.50	10.00	0.00	-103.00	7584.81	80.801		
		2:29:14	59.9020	3804.19	335.00	-218.33	16.00	129.00	10.00	0.00	-103.00	7585.14	78.400		
		2:29:16	59.9020	3804.19	335.00	-218.33	16.00	129.00	10.00	0.00	-103.00	7585.14	78.400		
		2:29:18	59.9040	3793.98	335.00	-218.33	16.00	129.50	10.00	0.00	-103.00	7585.47	76.801		

2:29:20	59.9040	3793.98	335.00	-218.33	16.00	129.50	10.00	0.00	-103.00	7585.47	76.801
2:29:22	59.9110	3791.50	335.00	-218.33	16.00	130.00	10.00	0.00	-103.00	7585.80	71.201
2:29:24	59.9110	3791.50	335.00	-218.33	16.00	130.00	10.00	0.00	-103.00	7585.80	71.201
2:29:26	59.9160	3788.13	335.00	-217.38	16.00	130.50	10.00	0.00	-103.00	7586.13	67.200
2:29:28	59.9160	3788.13	335.00	-217.38	16.00	130.50	10.00	0.00	-103.00	7586.13	67.200
2:29:30	59.9180	3783.03	335.00	-217.38	16.00	131.00	10.00	0.00	-103.00	7586.46	65.601
2:29:32	59.9180	3783.03	335.00	-217.38	16.00	131.00	10.00	0.00	-103.00	7586.46	65.601
2:29:34	59.9210	3776.36	335.00	-217.38	16.00	131.50	10.00	0.00	-103.00	7586.79	63.199
2:29:36	59.9210	3776.36	335.00	-217.38	16.00	131.50	10.00	0.00	-103.00	7586.79	63.199
2:29:38	59.9170	3774.60	335.00	-217.38	16.00	132.00	10.00	0.00	-103.00	7587.12	66.400
2:29:40	59.9170	3774.60	335.00	-217.38	16.00	132.00	10.00	0.00	-103.00	7587.12	66.400
2:29:42	59.9210	3773.96	335.00	-217.38	16.00	132.50	10.00	0.00	-103.00	7587.45	63.199
2:29:44	59.9210	3773.96	335.00	-217.38	16.00	132.50	10.00	0.00	-103.00	7587.45	63.199
2:29:46	59.9260	3771.67	335.00	-214.83	16.00	133.00	10.00	0.00	-103.00	7587.78	59.201
2:29:48	59.9260	3771.67	335.00	-214.83	16.00	133.00	10.00	0.00	-103.00	7587.78	59.201
2:29:50	59.9280	3768.71	335.00	-214.83	16.00	133.50	10.00	0.00	-103.00	7588.11	57.599
2:29:52	59.9280	3768.71	335.00	-214.83	16.00	133.50	10.00	0.00	-103.00	7588.11	57.599
2:29:54	59.9320	3767.02	335.00	-214.83	16.00	134.00	10.00	0.00	-103.00	7588.44	54.401
2:29:56	59.9320	3767.02	335.00	-214.83	16.00	134.00	10.00	0.00	-103.00	7588.44	54.401
2:29:58	59.9280	3766.79	335.00	-214.83	16.00	134.50	10.00	0.00	-103.00	7588.77	57.599
2:30:00	59.9280	3766.79	335.00	-214.83	16.00	134.50	10.00	0.00	-103.00	7588.77	57.599
2:30:02	59.9290	3765.67	335.00	-214.83	16.00	135.00	10.00	0.00	-103.00	7589.10	56.799
2:30:04	59.9290	3765.67	335.00	-214.83	16.00	135.00	10.00	0.00	-103.00	7589.10	56.799
2:30:06	59.9330	3764.24	335.00	-227.66	16.00	135.50	10.00	0.00	-103.00	7589.43	53.601
2:30:08	59.9330	3764.24	335.00	-227.66	16.00	135.50	10.00	0.00	-103.00	7589.43	53.601
2:30:10	59.9370	3762.94	335.00	-227.66	16.00	136.00	10.00	0.00	-103.00	7589.76	50.400
2:30:12	59.9370	3762.94	335.00	-227.66	16.00	136.00	10.00	0.00	-103.00	7589.76	50.400
2:30:14	59.9490	3753.92	335.00	-227.66	0.00	136.50	10.00	0.00	-103.00	7590.09	40.799
2:30:16	59.9490	3753.92	335.00	-227.66	0.00	136.50	10.00	0.00	-103.00	7590.09	40.799
2:30:18	59.9420	3746.89	335.00	-227.66	0.00	137.00	10.00	0.00	-103.00	7590.42	46.399
2:30:20	59.9420	3746.89	335.00	-227.66	0.00	137.00	10.00	0.00	-103.00	7590.42	46.399
2:30:22	59.9420	3749.59	335.00	-227.66	0.00	137.50	10.00	0.00	-103.00	7590.75	46.399
2:30:24	59.9420	3749.59	335.00	-227.66	0.00	137.50	10.00	0.00	-103.00	7590.75	46.399
2:30:26	59.9480	3746.71	335.00	-225.02	0.00	138.00	10.00	0.00	-103.00	7591.08	41.599
2:30:28	59.9480	3746.71	335.00	-225.02	0.00	138.00	10.00	0.00	-103.00	7591.08	41.599
2:30:30	59.9490	3742.74	335.00	-225.02	0.00	138.50	10.00	0.00	-103.00	7591.41	40.799
2:30:32	59.9490	3742.74	335.00	-225.02	0.00	138.50	10.00	0.00	-103.00	7591.41	40.799
2:30:34	59.9520	3736.14	335.00	-225.02	0.00	139.00	10.00	0.00	-103.00	7591.74	38.400
2:30:36	59.9520	3736.14	335.00	-225.02	0.00	139.00	10.00	0.00	-103.00	7591.74	38.400
2:30:38	59.9510	3727.84	335.00	-225.02	0.00	139.50	10.00	0.00	-103.00	7592.07	39.200
2:30:40	59.9510	3727.84	335.00	-225.02	0.00	139.50	10.00	0.00	-103.00	7592.07	39.200
2:30:42	59.9520	3722.65	335.00	-225.02	0.00	140.00	10.00	0.00	-103.00	7592.40	38.400
2:30:44	59.9520	3722.65	335.00	-225.02	0.00	140.00	10.00	0.00	-103.00	7592.40	38.400
2:30:46	59.9550	3718.00	335.00	-228.37	0.00	140.50	10.00	0.00	-103.00	7592.73	35.999
2:30:48	59.9550	3718.00	335.00	-228.37	0.00	140.50	10.00	0.00	-103.00	7592.73	35.999
2:30:50	59.9540	3715.75	335.00	-228.37	0.00	141.00	10.00	0.00	-103.00	7593.06	36.801

2:30:52	59.9540	3715.75	335.00	-228.37	0.00	141.00	10.00	0.00	-103.00	7593.06	36.801
2:30:54	59.9530	3713.48	335.00	-228.37	0.00	141.50	10.00	0.00	-103.00	7593.39	37.601
2:30:56	59.9530	3713.48	335.00	-228.37	0.00	141.50	10.00	0.00	-103.00	7593.39	37.601
2:30:58	59.9520	3710.81	335.00	-228.37	0.00	142.00	10.00	0.00	-103.00	7593.72	38.400
2:31:00	59.9520	3710.81	335.00	-228.37	0.00	142.00	10.00	0.00	-103.00	7593.72	38.400
2:31:02	59.9540	3714.62	335.00	-228.37	0.00	142.50	10.00	0.00	-103.00	7594.05	36.801
2:31:04	59.9540	3714.62	335.00	-228.37	0.00	142.50	10.00	0.00	-103.00	7594.05	36.801
2:31:06	59.9570	3716.17	335.00	-234.08	0.00	143.00	10.00	0.00	-103.00	7594.38	34.399
2:31:08	59.9570	3716.17	335.00	-234.08	0.00	143.00	10.00	0.00	-103.00	7594.38	34.399
2:31:10	59.9540	3716.98	335.00	-234.08	0.00	143.50	10.00	0.00	-103.00	7594.71	36.801
2:31:12	59.9540	3716.98	335.00	-234.08	0.00	143.50	10.00	0.00	-103.00	7594.71	36.801
2:31:14	59.9550	3722.36	335.00	-234.08	0.00	144.00	10.00	0.00	-103.00	7595.04	35.999
2:31:16	59.9550	3722.36	335.00	-234.08	0.00	144.00	10.00	0.00	-103.00	7595.04	35.999
2:31:18	59.9610	3722.66	335.00	-234.08	0.00	144.50	10.00	0.00	-103.00	7595.37	31.201
2:31:20	59.9610	3722.66	335.00	-234.08	0.00	144.50	10.00	0.00	-103.00	7595.37	31.201
2:31:22	59.9620	3722.28	335.00	-234.08	0.00	145.00	10.00	0.00	-103.00	7595.70	30.399
2:31:24	59.9620	3722.28	335.00	-234.08	0.00	145.00	10.00	0.00	-103.00	7595.70	30.399
2:31:26	59.9660	3723.09	335.00	-228.80	0.00	145.50	10.00	0.00	-103.00	7596.03	27.200
2:31:28	59.9660	3723.09	335.00	-228.80	0.00	145.50	10.00	0.00	-103.00	7596.03	27.200
2:31:30	59.9680	3723.43	335.00	-228.80	0.00	146.00	10.00	0.00	-103.00	7596.36	25.601
2:31:32	59.9680	3723.43	335.00	-228.80	0.00	146.00	10.00	0.00	-103.00	7596.36	25.601
2:31:34	59.9740	3725.40	335.00	-228.80	0.00	146.50	10.00	0.00	-103.00	7596.69	20.801
2:31:36	59.9740	3725.40	335.00	-228.80	0.00	146.50	10.00	0.00	-103.00	7596.69	20.801
2:31:38	59.9690	3728.05	335.00	-228.80	0.00	147.00	10.00	0.00	-103.00	7597.02	24.799
2:31:40	59.9690	3728.05	335.00	-228.80	0.00	147.00	10.00	0.00	-103.00	7597.02	24.799
2:31:42	59.9700	3732.53	335.00	-228.80	0.00	147.50	10.00	0.00	-103.00	7597.35	23.999
2:31:44	59.9700	3732.53	335.00	-228.80	0.00	147.50	10.00	0.00	-103.00	7597.35	23.999
2:31:46	59.9730	3736.54	335.00	-229.47	0.00	148.00	10.00	0.00	-103.00	7597.68	21.600
2:31:48	59.9730	3736.54	335.00	-229.47	0.00	148.00	10.00	0.00	-103.00	7597.68	21.600
2:31:50	59.9760	3736.82	335.00	-229.47	0.00	148.50	10.00	0.00	-103.00	7598.01	19.199
2:31:52	59.9760	3736.82	335.00	-229.47	0.00	148.50	10.00	0.00	-103.00	7598.01	19.199
2:31:54	59.9780	3739.94	335.00	-229.47	0.00	149.00	10.00	0.00	-103.00	7598.34	17.599
2:31:56	59.9780	3739.94	335.00	-229.47	0.00	149.00	10.00	0.00	-103.00	7598.34	17.599
2:31:58	59.9780	3741.79	335.00	-229.47	0.00	149.50	10.00	0.00	-103.00	7598.67	17.599
2:32:00	59.9780	3741.79	335.00	-229.47	0.00	149.50	10.00	0.00	-103.00	7598.67	17.599
2:32:02	59.9780	3746.61	335.00	-229.47	0.00	150.00	10.00	0.00	-103.00	7599.00	17.599
2:32:04	59.9780	3746.61	335.00	-229.47	0.00	150.00	10.00	0.00	-103.00	7599.00	17.599
2:32:06	59.9800	3750.72	335.00	-228.98	0.00	150.50	10.00	0.00	-103.00	7599.33	16.000
2:32:08	59.9800	3750.72	335.00	-228.98	0.00	150.50	10.00	0.00	-103.00	7599.33	16.000
2:32:10	59.9810	3752.75	335.00	-228.98	0.00	151.00	10.00	0.00	-103.00	7599.66	15.201
2:32:12	59.9810	3752.75	335.00	-228.98	0.00	151.00	10.00	0.00	-103.00	7599.66	15.201
2:32:14	59.9790	3756.41	335.00	-228.98	0.00	151.50	10.00	0.00	-103.00	7599.99	16.800
2:32:16	59.9790	3756.41	335.00	-228.98	0.00	151.50	10.00	0.00	-103.00	7599.99	16.800
2:32:18	59.9790	3760.41	335.00	-228.98	0.00	152.00	10.00	0.00	-103.00	7600.32	16.800
2:32:20	59.9790	3760.41	335.00	-228.98	0.00	152.00	10.00	0.00	-103.00	7600.32	16.800
2:32:22	59.9830	3761.41	335.00	-228.98	0.00	152.50	10.00	0.00	-103.00	7600.65	13.599

2:32:24	59.9830	3761.41	335.00	-228.98	0.00	152.50	10.00	0.00	-103.00	7600.65	13.599
2:32:26	59.9880	3763.21	335.00	-219.98	0.00	153.00	10.00	0.00	-103.00	7600.98	9.601
2:32:28	59.9880	3763.21	335.00	-219.98	0.00	153.00	10.00	0.00	-103.00	7600.98	9.601
2:32:30	59.9870	3766.09	335.00	-219.98	0.00	153.50	10.00	0.00	-103.00	7601.31	10.400
2:32:32	59.9870	3766.09	335.00	-219.98	0.00	153.50	10.00	0.00	-103.00	7601.31	10.400
2:32:34	59.9910	3767.25	335.00	-219.98	0.00	154.00	10.00	0.00	-103.00	7601.64	7.199
2:32:36	59.9910	3767.25	335.00	-219.98	0.00	154.00	10.00	0.00	-103.00	7601.64	7.199
2:32:38	59.9920	3768.63	335.00	-219.98	0.00	154.50	10.00	0.00	-103.00	7601.97	6.400
2:32:40	59.9920	3768.63	335.00	-219.98	0.00	154.50	10.00	0.00	-103.00	7601.97	6.400
2:32:42	59.9890	3772.44	335.00	-219.98	0.00	155.00	10.00	0.00	-103.00	7602.30	8.801
2:32:44	59.9890	3772.44	335.00	-219.98	0.00	155.00	10.00	0.00	-103.00	7602.30	8.801
2:32:46	59.9830	3774.67	335.00	-229.09	0.00	155.50	10.00	0.00	-103.00	7602.63	13.599
2:32:48	59.9830	3774.67	335.00	-229.09	0.00	155.50	10.00	0.00	-103.00	7602.63	13.599
2:32:50	59.9880	3775.36	335.00	-229.09	0.00	156.00	10.00	0.00	-103.00	7602.96	9.601
2:32:52	59.9880	3775.36	335.00	-229.09	0.00	156.00	10.00	0.00	-103.00	7602.96	9.601
2:32:54	59.9960	3775.49	335.00	-229.09	0.00	156.50	10.00	0.00	-103.00	7603.29	3.201
2:32:56	59.9960	3775.49	335.00	-229.09	0.00	156.50	10.00	0.00	-103.00	7603.29	3.201
2:32:58	59.9990	3778.55	335.00	-229.09	0.00	157.00	10.00	0.00	-103.00	7603.62	0.800
2:33:00	59.9990	3778.55	335.00	-229.09	0.00	157.00	10.00	0.00	-103.00	7603.62	0.800
2:33:02	59.9990	3781.26	335.00	-229.09	0.00	157.50	10.00	0.00	-103.00	7603.95	0.800
2:33:04	59.9990	3781.26	335.00	-229.09	0.00	157.50	10.00	0.00	-103.00	7603.95	0.800
2:33:06	59.9990	3783.09	335.00	-229.66	0.00	158.00	10.00	0.00	-103.00	7604.28	0.800
2:33:08	59.9990	3783.09	335.00	-229.66	0.00	158.00	10.00	0.00	-103.00	7604.28	0.800
2:33:10	60.0050	3784.42	335.00	-229.66	0.00	158.50	10.00	0.00	-103.00	7604.61	-4.001
2:33:12	60.0050	3784.42	335.00	-229.66	0.00	158.50	10.00	0.00	-103.00	7604.61	-4.001
2:33:14	60.0080	3785.46	335.00	-229.66	0.00	159.00	10.00	0.00	-103.00	7604.94	-6.400
2:33:16	60.0080	3785.46	335.00	-229.66	0.00	159.00	10.00	0.00	-103.00	7604.94	-6.400
2:33:18	60.0140	3786.30	335.00	-229.66	0.00	159.50	10.00	0.00	-103.00	7605.27	-11.200
2:33:20	60.0140	3786.30	335.00	-229.66	0.00	159.50	10.00	0.00	-103.00	7605.27	-11.200
2:33:22	60.0190	3787.52	335.00	-229.66	0.00	160.00	10.00	0.00	-103.00	7605.60	-15.201
2:33:24	60.0190	3787.52	335.00	-229.66	0.00	160.00	10.00	0.00	-103.00	7605.60	-15.201
2:33:26	60.0170	3788.03	335.00	-229.23	0.00	160.50	10.00	0.00	-103.00	7605.93	-13.599
2:33:28	60.0170	3788.03	335.00	-229.23	0.00	160.50	10.00	0.00	-103.00	7605.93	-13.599
2:33:30	60.0190	3789.22	335.00	-229.23	0.00	161.00	10.00	0.00	-103.00	7606.26	-15.201
2:33:32	60.0190	3789.22	335.00	-229.23	0.00	161.00	10.00	0.00	-103.00	7606.26	-15.201
2:33:34	60.0240	3785.84	335.00	-229.23	0.00	161.50	10.00	0.00	-103.00	7606.59	-19.199
2:33:36	60.0240	3785.84	335.00	-229.23	0.00	161.50	10.00	0.00	-103.00	7606.59	-19.199
2:33:38	60.0210	3787.93	335.00	-229.23	0.00	162.00	10.00	0.00	-103.00	7606.92	-16.800
2:33:40	60.0210	3787.93	335.00	-229.23	0.00	162.00	10.00	0.00	-103.00	7606.92	-16.800
2:33:42	60.0240	3786.87	335.00	-262.10	0.00	162.50	10.00	0.00	-103.00	7607.25	-19.199
2:33:44	60.0240	3786.87	335.00	-262.10	0.00	162.50	10.00	0.00	-103.00	7607.25	-19.199
2:33:46	60.0210	3787.36	335.00	-262.10	0.00	163.00	10.00	0.00	-103.00	7607.58	-16.800
2:33:48	60.0210	3787.36	335.00	-262.10	0.00	163.00	10.00	0.00	-103.00	7607.58	-16.800
2:33:50	60.0250	3785.61	335.00	-262.10	0.00	163.50	10.00	0.00	-103.00	7607.91	-20.001
2:33:52	60.0250	3785.61	335.00	-262.10	0.00	163.50	10.00	0.00	-103.00	7607.91	-20.001
2:33:54	60.0200	3785.80	335.00	-262.72	0.00	164.00	10.00	0.00	-103.00	7608.24	-16.000

2:33:56	60.0200	3785.80	335.00	-262.72	0.00	164.00	10.00	0.00	-103.00	7608.24	-16.000
2:33:58	60.0220	3786.88	335.00	-262.72	0.00	164.50	10.00	0.00	-103.00	7608.57	-17.599
2:34:00	60.0220	3786.88	335.00	-262.72	0.00	164.50	10.00	0.00	-103.00	7608.57	-17.599
2:34:02	60.0220	3785.73	335.00	-262.72	0.00	165.00	10.00	0.00	-103.00	7608.90	-17.599
2:34:04	60.0220	3785.73	335.00	-262.72	0.00	165.00	10.00	0.00	-103.00	7608.90	-17.599
2:34:06	60.0210	3785.82	335.00	-262.72	0.00	165.50	10.00	0.00	-103.00	7609.23	-16.800
2:34:08	60.0210	3785.82	335.00	-262.72	0.00	165.50	10.00	0.00	-103.00	7609.23	-16.800
2:34:10	60.0230	3786.28	335.00	-262.72	0.00	166.00	10.00	0.00	-103.00	7609.56	-18.399
2:34:12	60.0230	3786.28	335.00	-262.72	0.00	166.00	10.00	0.00	-103.00	7609.56	-18.399
2:34:14	60.0190	3787.63	335.00	-260.02	0.00	166.50	10.00	0.00	-103.00	7609.89	-15.201
2:34:16	60.0190	3787.63	335.00	-260.02	0.00	166.50	10.00	0.00	-103.00	7609.89	-15.201
2:34:18	60.0180	3789.67	335.00	-260.02	0.00	167.00	10.00	0.00	-103.00	7610.22	-14.401
2:34:20	60.0180	3789.67	335.00	-260.02	0.00	167.00	10.00	0.00	-103.00	7610.22	-14.401
2:34:22	60.0180	3788.48	335.00	-260.02	0.00	167.50	10.00	0.00	-103.00	7610.55	-14.401
2:34:24	60.0180	3788.48	335.00	-260.02	0.00	167.50	10.00	0.00	-103.00	7610.55	-14.401
2:34:26	60.0190	3789.37	335.00	-260.02	0.00	168.00	10.00	0.00	-103.00	7610.88	-15.201
2:34:28	60.0190	3789.37	335.00	-260.02	0.00	168.00	10.00	0.00	-103.00	7610.88	-15.201
2:34:30	60.0150	3788.66	335.00	-260.02	0.00	168.50	10.00	0.00	-103.00	7611.21	-12.000
2:34:32	60.0150	3788.66	335.00	-260.02	0.00	168.50	10.00	0.00	-103.00	7611.21	-12.000
2:34:34	60.0140	3790.67	335.00	-263.87	0.00	169.00	10.00	0.00	-103.00	7611.54	-11.200
2:34:36	60.0140	3790.67	335.00	-263.87	0.00	169.00	10.00	0.00	-103.00	7611.54	-11.200
2:34:38	60.0120	3790.41	335.00	-263.87	0.00	169.50	10.00	0.00	-103.00	7611.87	-9.601
2:34:40	60.0120	3790.41	335.00	-263.87	0.00	169.50	10.00	0.00	-103.00	7611.87	-9.601
2:34:42	60.0100	3791.54	335.00	-263.87	0.00	170.00	10.00	0.00	-103.00	7612.20	-7.999
2:34:44	60.0100	3791.54	335.00	-263.87	0.00	170.00	10.00	0.00	-103.00	7612.20	-7.999
2:34:46	60.0070	3791.03	335.00	-263.87	0.00	170.50	10.00	0.00	-103.00	7612.53	-5.600
2:34:48	60.0070	3791.03	335.00	-263.87	0.00	170.50	10.00	0.00	-103.00	7612.53	-5.600
2:34:50	60.0090	3791.43	335.00	-263.87	0.00	171.00	10.00	0.00	-103.00	7612.86	-7.199
2:34:52	60.0090	3791.43	335.00	-263.87	0.00	171.00	10.00	0.00	-103.00	7612.86	-7.199
2:34:54	60.0030	3790.46	335.00	-264.60	0.00	171.50	10.00	0.00	-103.00	7613.19	-2.399
2:34:56	60.0030	3790.46	335.00	-264.60	0.00	171.50	10.00	0.00	-103.00	7613.19	-2.399
2:34:58	59.9950	3789.58	335.00	-264.60	0.00	172.00	10.00	0.00	-103.00	7613.52	4.001
2:35:00	59.9950	3789.58	335.00	-264.60	0.00	172.00	10.00	0.00	-103.00	7613.52	4.001
2:35:02	59.9910	3788.10	335.00	-264.60	0.00	172.50	10.00	0.00	-103.00	7613.85	7.199
2:35:04	59.9910	3788.10	335.00	-264.60	0.00	172.50	10.00	0.00	-103.00	7613.85	7.199
2:35:06	59.9920	3788.19	335.00	-264.60	0.00	173.00	10.00	0.00	-103.00	7614.18	6.400
2:35:08	59.9920	3788.19	335.00	-264.60	0.00	173.00	10.00	0.00	-103.00	7614.18	6.400
2:35:10	59.9860	3788.54	335.00	-264.60	0.00	173.50	10.00	0.00	-103.00	7614.51	11.200
2:35:12	59.9860	3788.54	335.00	-264.60	0.00	173.50	10.00	0.00	-103.00	7614.51	11.200
2:35:14	59.9840	3788.10	335.00	-262.42	0.00	174.00	10.00	0.00	-103.00	7614.84	12.799
2:35:16	59.9840	3788.10	335.00	-262.42	0.00	174.00	10.00	0.00	-103.00	7614.84	12.799
2:35:18	59.9840	3786.45	335.00	-262.42	0.00	174.50	10.00	0.00	-103.00	7615.17	12.799
2:35:20	59.9840	3786.45	335.00	-262.42	0.00	174.50	10.00	0.00	-103.00	7615.17	12.799
2:35:22	59.9810	3788.81	335.00	-262.42	0.00	175.00	10.00	0.00	-103.00	7615.50	15.201
2:35:24	59.9810	3788.81	335.00	-262.42	0.00	175.00	10.00	0.00	-103.00	7615.50	15.201
2:35:26	59.9790	3788.26	335.00	-262.42	0.00	175.50	10.00	0.00	-103.00	7615.83	16.800

2:35:28	59.9790	3788.26	335.00	-262.42	0.00	175.50	10.00	0.00	-103.00	7615.83	16.800
2:35:30	59.9760	3790.47	335.00	-262.42	0.00	176.00	10.00	0.00	-103.00	7616.16	19.199
2:35:32	59.9760	3790.47	335.00	-262.42	0.00	176.00	10.00	0.00	-103.00	7616.16	19.199
2:35:34	59.9790	3790.42	335.00	-259.69	0.00	176.50	10.00	0.00	-103.00	7616.49	16.800
2:35:36	59.9790	3790.42	335.00	-259.69	0.00	176.50	10.00	0.00	-103.00	7616.49	16.800
2:35:38	59.9780	3789.27	335.00	-259.69	0.00	177.00	10.00	0.00	-103.00	7616.82	17.599
2:35:40	59.9780	3789.27	335.00	-259.69	0.00	177.00	10.00	0.00	-103.00	7616.82	17.599
2:35:42	59.9740	3790.43	335.00	-259.69	0.00	177.50	10.00	0.00	-103.00	7617.15	20.801
2:35:44	59.9740	3790.43	335.00	-259.69	0.00	177.50	10.00	0.00	-103.00	7617.15	20.801
2:35:46	59.9770	3786.24	335.00	-259.69	0.00	178.00	10.00	0.00	-103.00	7617.48	18.399
2:35:48	59.9770	3786.24	335.00	-259.69	0.00	178.00	10.00	0.00	-103.00	7617.48	18.399
2:35:50	59.9750	3788.96	335.00	-259.69	0.00	178.50	10.00	0.00	-103.00	7617.81	20.001
2:35:52	59.9750	3788.96	335.00	-259.69	0.00	178.50	10.00	0.00	-103.00	7617.81	20.001
2:35:54	59.9690	3791.88	335.00	-255.91	0.00	179.00	10.00	0.00	-103.00	7618.14	24.799
2:35:56	59.9690	3791.88	335.00	-255.91	0.00	179.00	10.00	0.00	-103.00	7618.14	24.799
2:35:58	59.9710	3792.31	335.00	-255.91	0.00	179.50	10.00	0.00	-103.00	7618.47	23.199
2:36:00	59.9710	3792.31	335.00	-255.91	0.00	179.50	10.00	0.00	-103.00	7618.47	23.199
2:36:02	59.9780	3788.08	335.00	-255.91	0.00	180.00	10.00	0.00	-103.00	7618.80	17.599
2:36:04	59.9780	3788.08	335.00	-255.91	0.00	180.00	10.00	0.00	-103.00	7618.80	17.599
2:36:06	59.9780	3787.14	335.00	-255.91	0.00	180.50	10.00	0.00	-103.00	7619.13	17.599
2:36:08	59.9780	3787.14	335.00	-255.91	0.00	180.50	10.00	0.00	-103.00	7619.13	17.599
2:36:10	59.9720	3787.00	335.00	-255.91	0.00	181.00	10.00	0.00	-103.00	7619.46	22.400
2:36:12	59.9720	3787.00	335.00	-255.91	0.00	181.00	10.00	0.00	-103.00	7619.46	22.400
2:36:14	59.9750	3786.49	335.00	-258.15	0.00	181.50	10.00	0.00	-103.00	7619.79	20.001
2:36:16	59.9750	3786.49	335.00	-258.15	0.00	181.50	10.00	0.00	-103.00	7619.79	20.001
2:36:18	59.9690	3789.21	335.00	-258.15	0.00	182.00	10.00	0.00	-103.00	7620.12	24.799
2:36:20	59.9690	3789.21	335.00	-258.15	0.00	182.00	10.00	0.00	-103.00	7620.12	24.799
2:36:22	59.9650	3791.22	335.00	-258.15	0.00	182.50	10.00	0.00	-103.00	7620.45	28.000
2:36:24	59.9650	3791.22	335.00	-258.15	0.00	182.50	10.00	0.00	-103.00	7620.45	28.000
2:36:26	59.9690	3790.96	335.00	-258.15	0.00	183.00	10.00	0.00	-103.00	7620.78	24.799
2:36:28	59.9690	3790.96	335.00	-258.15	0.00	183.00	10.00	0.00	-103.00	7620.78	24.799
2:36:30	59.9680	3789.03	335.00	-258.15	0.00	183.50	10.00	0.00	-103.00	7621.11	25.601
2:36:32	59.9680	3789.03	335.00	-258.15	0.00	183.50	10.00	0.00	-103.00	7621.11	25.601
2:36:34	59.9640	3787.39	335.00	-258.87	0.00	184.00	10.00	0.00	-103.00	7621.44	28.799
2:36:36	59.9640	3787.39	335.00	-258.87	0.00	184.00	10.00	0.00	-103.00	7621.44	28.799
2:36:38	59.9720	3784.83	335.00	-258.87	0.00	184.50	10.00	0.00	-103.00	7621.77	22.400
2:36:40	59.9720	3784.83	335.00	-258.87	0.00	184.50	10.00	0.00	-103.00	7621.77	22.400
2:36:42	59.9670	3784.32	335.00	-258.87	0.00	185.00	10.00	0.00	-103.00	7622.10	26.401
2:36:44	59.9670	3784.32	335.00	-258.87	0.00	185.00	10.00	0.00	-103.00	7622.10	26.401
2:36:46	59.9680	3782.11	335.00	-258.87	0.00	185.50	10.00	0.00	-103.00	7622.43	25.601
2:36:48	59.9680	3782.11	335.00	-258.87	0.00	185.50	10.00	0.00	-103.00	7622.43	25.601
2:36:50	59.9670	3779.06	335.00	-258.87	0.00	186.00	10.00	0.00	-103.00	7622.76	26.401
2:36:52	59.9670	3779.06	335.00	-258.87	0.00	186.00	10.00	0.00	-103.00	7622.76	26.401
2:36:54	59.9660	3779.21	335.00	-249.34	0.00	186.50	10.00	0.00	-103.00	7623.09	27.200
2:36:56	59.9660	3779.21	335.00	-249.34	0.00	186.50	10.00	0.00	-103.00	7623.09	27.200
2:36:58	59.9710	3776.43	335.00	-249.34	0.00	187.00	10.00	0.00	-103.00	7623.42	23.199

2:37:00	59.9710	3776.43	335.00	-249.34	0.00	187.00	10.00	0.00	-103.00	7623.42	23.199
2:37:02	59.9650	3776.60	335.00	-249.34	0.00	187.50	10.00	0.00	-103.00	7623.75	28.000
2:37:04	59.9650	3776.60	335.00	-249.34	0.00	187.50	10.00	0.00	-103.00	7623.75	28.000
2:37:06	59.9640	3776.02	335.00	-249.34	0.00	188.00	10.00	0.00	-103.00	7624.08	28.799
2:37:08	59.9640	3776.02	335.00	-249.34	0.00	188.00	10.00	0.00	-103.00	7624.08	28.799
2:37:10	59.9670	3771.73	335.00	-249.34	0.00	188.50	10.00	0.00	-103.00	7624.41	26.401
2:37:12	59.9670	3771.73	335.00	-249.34	0.00	188.50	10.00	0.00	-103.00	7624.41	26.401
2:37:14	59.9680	3768.50	335.00	-258.28	0.00	189.00	10.00	0.00	-103.00	7624.74	25.601
2:37:16	59.9680	3768.50	335.00	-258.28	0.00	189.00	10.00	0.00	-103.00	7624.74	25.601
2:37:18	59.9650	3767.37	335.00	-258.28	0.00	189.50	10.00	0.00	-103.00	7625.07	28.000
2:37:20	59.9650	3767.37	335.00	-258.28	0.00	189.50	10.00	0.00	-103.00	7625.07	28.000
2:37:22	59.9730	3760.30	335.00	-258.28	0.00	190.00	10.00	0.00	-103.00	7625.40	21.600
2:37:24	59.9730	3760.30	335.00	-258.28	0.00	190.00	10.00	0.00	-103.00	7625.40	21.600
2:37:26	59.9650	3761.89	335.00	-258.28	0.00	190.50	10.00	0.00	-103.00	7625.73	28.000
2:37:28	59.9650	3761.89	335.00	-258.28	0.00	190.50	10.00	0.00	-103.00	7625.73	28.000
2:37:30	59.9690	3760.58	335.00	-258.28	0.00	191.00	10.00	0.00	-103.00	7626.06	24.799
2:37:32	59.9690	3760.58	335.00	-258.28	0.00	191.00	10.00	0.00	-103.00	7626.06	24.799
2:37:34	59.9640	3759.78	335.00	-258.41	0.00	191.50	10.00	0.00	-103.00	7626.39	28.799
2:37:36	59.9640	3759.78	335.00	-258.41	0.00	191.50	10.00	0.00	-103.00	7626.39	28.799
2:37:38	59.9790	3757.77	335.00	-258.41	0.00	192.00	10.00	0.00	-103.00	7626.72	16.800
2:37:40	59.9790	3757.77	335.00	-258.41	0.00	192.00	10.00	0.00	-103.00	7626.72	16.800
2:37:42	59.9830	3753.09	335.00	-258.41	0.00	192.50	10.00	0.00	-103.00	7627.05	13.599
2:37:44	59.9830	3753.09	335.00	-258.41	0.00	192.50	10.00	0.00	-103.00	7627.05	13.599
2:37:46	59.9670	3753.75	335.00	-258.41	0.00	193.00	10.00	0.00	-103.00	7627.38	26.401
2:37:48	59.9670	3753.75	335.00	-258.41	0.00	193.00	10.00	0.00	-103.00	7627.38	26.401
2:37:50	59.9620	3759.25	335.00	-258.41	0.00	193.50	10.00	0.00	-103.00	7627.71	30.399
2:37:52	59.9620	3759.25	335.00	-258.41	0.00	193.50	10.00	0.00	-103.00	7627.71	30.399
2:37:54	59.9610	3760.96	335.00	-260.54	0.00	194.00	10.00	0.00	-103.00	7628.04	31.201
2:37:56	59.9610	3760.96	335.00	-260.54	0.00	194.00	10.00	0.00	-103.00	7628.04	31.201
2:37:58	59.9600	3763.82	335.00	-260.54	0.00	194.50	10.00	0.00	-103.00	7628.37	32.001
2:38:00	59.9600	3763.82	335.00	-260.54	0.00	194.50	10.00	0.00	-103.00	7628.37	32.001
2:38:02	59.9590	3763.86	335.00	-260.54	0.00	195.00	10.00	0.00	-103.00	7628.70	32.800
2:38:04	59.9590	3763.86	335.00	-260.54	0.00	195.00	10.00	0.00	-103.00	7628.70	32.800
2:38:06	59.9510	3766.13	335.00	-260.54	0.00	195.50	10.00	0.00	-103.00	7629.03	39.200
2:38:08	59.9510	3766.13	335.00	-260.54	0.00	195.50	10.00	0.00	-103.00	7629.03	39.200
2:38:10	59.9540	3767.97	335.00	-260.54	0.00	196.00	10.00	0.00	-103.00	7629.36	36.801
2:38:12	59.9540	3767.97	335.00	-260.54	0.00	196.00	10.00	0.00	-103.00	7629.36	36.801
2:38:14	59.9560	3765.61	335.00	-257.88	0.00	196.50	10.00	0.00	-103.00	7629.69	35.199
2:38:16	59.9560	3765.61	335.00	-257.88	0.00	196.50	10.00	0.00	-103.00	7629.69	35.199
2:38:18	59.9630	3761.57	335.00	-257.88	0.00	197.00	10.00	0.00	-103.00	7630.02	29.599
2:38:20	59.9630	3761.57	335.00	-257.88	0.00	197.00	10.00	0.00	-103.00	7630.02	29.599
2:38:22	59.9590	3759.63	335.00	-257.88	0.00	197.50	10.00	0.00	-103.00	7630.35	32.800
2:38:24	59.9590	3759.63	335.00	-257.88	0.00	197.50	10.00	0.00	-103.00	7630.35	32.800
2:38:26	59.9630	3752.43	335.00	-257.88	0.00	198.00	10.00	0.00	-103.00	7630.68	29.599
2:38:28	59.9630	3752.43	335.00	-257.88	0.00	198.00	10.00	0.00	-103.00	7630.68	29.599
2:38:30	59.9680	3753.83	335.00	-257.88	0.00	198.50	10.00	0.00	-103.00	7631.01	25.601

2:38:32	59.9680	3753.83	335.00	-257.88	0.00	198.50	10.00	0.00	-103.00	7631.01	25.601
2:38:34	59.9680	3753.52	335.00	-258.59	0.00	199.00	10.00	0.00	-103.00	7631.34	25.601
2:38:36	59.9680	3753.52	335.00	-258.59	0.00	199.00	10.00	0.00	-103.00	7631.34	25.601
2:38:38	59.9730	3753.18	335.00	-258.59	0.00	199.50	10.00	0.00	-103.00	7631.67	21.600
2:38:40	59.9730	3753.18	335.00	-258.59	0.00	199.50	10.00	0.00	-103.00	7631.67	21.600
2:38:42	59.9650	3753.29	335.00	-258.59	0.00	200.00	10.00	0.00	-103.00	7632.00	28.000
2:38:44	59.9650	3753.29	335.00	-258.59	0.00	200.00	10.00	0.00	-103.00	7632.00	28.000
2:38:46	59.9670	3752.36	335.00	-258.59	0.00	200.50	10.00	0.00	-103.00	7632.33	26.401
2:38:48	59.9670	3752.36	335.00	-258.59	0.00	200.50	10.00	0.00	-103.00	7632.33	26.401
2:38:50	59.9760	3747.48	335.00	-258.59	0.00	201.00	10.00	0.00	-103.00	7632.66	19.199
2:38:52	59.9760	3747.48	335.00	-258.59	0.00	201.00	10.00	0.00	-103.00	7632.66	19.199
2:38:54	59.9690	3741.29	335.00	-261.91	0.00	201.50	10.00	0.00	-103.00	7632.99	24.799
2:38:56	59.9690	3741.29	335.00	-261.91	0.00	201.50	10.00	0.00	-103.00	7632.99	24.799
2:38:58	59.9740	3745.74	335.00	-261.91	0.00	202.00	10.00	0.00	-103.00	7633.32	20.801
2:39:00	59.9740	3745.74	335.00	-261.91	0.00	202.00	10.00	0.00	-103.00	7633.32	20.801
2:39:02	59.9810	3741.62	335.00	-261.91	0.00	202.50	10.00	0.00	-103.00	7633.65	15.201
2:39:04	59.9810	3741.62	335.00	-261.91	0.00	202.50	10.00	0.00	-103.00	7633.65	15.201
2:39:06	59.9810	3738.48	335.00	-261.91	0.00	203.00	10.00	0.00	-103.00	7633.98	15.201
2:39:08	59.9810	3738.48	335.00	-261.91	0.00	203.00	10.00	0.00	-103.00	7633.98	15.201
2:39:10	59.9820	3737.40	335.00	-261.91	0.00	203.50	10.00	0.00	-103.00	7634.31	14.401
2:39:12	59.9820	3737.40	335.00	-261.91	0.00	203.50	10.00	0.00	-103.00	7634.31	14.401
2:39:14	59.9820	3736.31	335.00	-256.75	0.00	204.00	10.00	0.00	-103.00	7634.64	14.401
2:39:16	59.9820	3736.31	335.00	-256.75	0.00	204.00	10.00	0.00	-103.00	7634.64	14.401
2:39:18	59.9790	3735.45	335.00	-256.75	0.00	204.50	10.00	0.00	-103.00	7634.97	16.800
2:39:20	59.9790	3735.45	335.00	-256.75	0.00	204.50	10.00	0.00	-103.00	7634.97	16.800
2:39:22	59.9780	3737.54	335.00	-256.75	0.00	205.00	10.00	0.00	-103.00	7635.30	17.599
2:39:24	59.9780	3737.54	335.00	-256.75	0.00	205.00	10.00	0.00	-103.00	7635.30	17.599
2:39:26	59.9800	3736.75	350.00	-256.75	0.00	205.50	10.00	0.00	-103.00	7635.63	16.000
2:39:28	59.9800	3736.75	350.00	-256.75	0.00	205.50	10.00	0.00	-103.00	7635.63	16.000
2:39:30	59.9800	3736.07	350.00	-256.75	0.00	206.00	10.00	0.00	-103.00	7635.96	16.000
2:39:32	59.9800	3736.07	350.00	-256.75	0.00	206.00	10.00	0.00	-103.00	7635.96	16.000
2:39:34	59.9760	3736.57	350.00	-167.43	0.00	206.50	10.00	0.00	-103.00	7636.29	19.199
2:39:36	59.9760	3736.57	350.00	-167.43	0.00	206.50	10.00	0.00	-103.00	7636.29	19.199
2:39:38	59.9710	3738.87	350.00	-167.43	0.00	207.00	10.00	0.00	-103.00	7636.62	23.199
2:39:40	59.9710	3738.87	350.00	-167.43	0.00	207.00	10.00	0.00	-103.00	7636.62	23.199
2:39:42	59.9740	3738.65	350.00	-167.43	0.00	207.50	10.00	0.00	-103.00	7636.95	20.801
2:39:44	59.9740	3738.65	350.00	-167.43	0.00	207.50	10.00	0.00	-103.00	7636.95	20.801
2:39:46	59.9760	3737.38	350.00	-167.43	0.00	208.00	10.00	0.00	-103.00	7637.28	19.199
2:39:48	59.9760	3737.38	350.00	-167.43	0.00	208.00	10.00	0.00	-103.00	7637.28	19.199
2:39:50	59.9690	3740.02	350.00	-167.43	0.00	208.50	10.00	0.00	-103.00	7637.61	24.799
2:39:52	59.9690	3740.02	350.00	-167.43	0.00	208.50	10.00	0.00	-103.00	7637.61	24.799
2:39:54	59.9740	3742.05	350.00	-164.97	0.00	209.00	10.00	0.00	-103.00	7637.94	20.801
2:39:56	59.9740	3742.05	350.00	-164.97	0.00	209.00	10.00	0.00	-103.00	7637.94	20.801
2:39:58	59.9720	3742.52	350.00	-164.97	0.00	209.50	10.00	0.00	-103.00	7638.27	22.400
2:40:00	59.9720	3742.52	350.00	-164.97	0.00	209.50	10.00	0.00	-103.00	7638.27	22.400
2:40:02	59.9770	3741.72	350.00	-164.97	0.00	210.00	10.00	0.00	-103.00	7638.60	18.399

2:40:04	59.9770	3741.72	350.00	-164.97	0.00	210.00	10.00	0.00	-103.00	7638.60	18.399
2:40:06	59.9780	3740.63	350.00	-164.97	0.00	210.50	10.00	0.00	-103.00	7638.93	17.599
2:40:08	59.9780	3740.63	350.00	-164.97	0.00	210.50	10.00	0.00	-103.00	7638.93	17.599
2:40:10	59.9730	3740.78	350.00	-164.97	0.00	211.00	10.00	0.00	-103.00	7639.26	21.600
2:40:12	59.9730	3740.78	350.00	-164.97	0.00	211.00	10.00	0.00	-103.00	7639.26	21.600
2:40:14	59.9770	3741.27	350.00	-157.63	0.00	211.50	10.00	0.00	-103.00	7639.59	18.399
2:40:16	59.9770	3741.27	350.00	-157.63	0.00	211.50	10.00	0.00	-103.00	7639.59	18.399
2:40:18	59.9780	3738.97	350.00	-157.63	0.00	212.00	10.00	0.00	-103.00	7639.92	17.599
2:40:20	59.9780	3738.97	350.00	-157.63	0.00	212.00	10.00	0.00	-103.00	7639.92	17.599
2:40:22	59.9810	3738.88	350.00	-157.63	0.00	212.50	10.00	0.00	-103.00	7640.25	15.201
2:40:24	59.9810	3738.88	350.00	-157.63	0.00	212.50	10.00	0.00	-103.00	7640.25	15.201
2:40:26	59.9740	3738.10	350.00	-157.63	0.00	213.00	10.00	0.00	-103.00	7640.58	20.801
2:40:28	59.9740	3738.10	350.00	-157.63	0.00	213.00	10.00	0.00	-103.00	7640.58	20.801
2:40:30	59.9710	3743.51	350.00	-157.63	0.00	213.50	10.00	0.00	-103.00	7640.91	23.199
2:40:32	59.9710	3743.51	350.00	-157.63	0.00	213.50	10.00	0.00	-103.00	7640.91	23.199
2:40:34	59.9720	3745.25	350.00	-155.53	0.00	214.00	10.00	0.00	-103.00	7641.24	22.400
2:40:36	59.9720	3745.25	350.00	-155.53	0.00	214.00	10.00	0.00	-103.00	7641.24	22.400
2:40:38	59.9660	3747.34	350.00	-155.53	0.00	214.50	10.00	0.00	-103.00	7641.57	27.200
2:40:40	59.9660	3747.34	350.00	-155.53	0.00	214.50	10.00	0.00	-103.00	7641.57	27.200
2:40:42	59.9710	3749.75	350.00	-155.53	0.00	215.00	10.00	0.00	-103.00	7641.90	23.199
2:40:44	59.9710	3749.75	350.00	-155.53	0.00	215.00	10.00	0.00	-103.00	7641.90	23.199
2:40:46	59.9720	3744.68	350.00	-155.53	0.00	215.50	10.00	0.00	-103.00	7642.23	22.400
2:40:48	59.9720	3744.68	350.00	-155.53	0.00	215.50	10.00	0.00	-103.00	7642.23	22.400
2:40:50	59.9720	3743.15	350.00	-155.53	0.00	216.00	10.00	0.00	-103.00	7642.56	22.400
2:40:52	59.9720	3743.15	350.00	-155.53	0.00	216.00	10.00	0.00	-103.00	7642.56	22.400
2:40:54	59.9730	3739.45	350.00	-160.45	0.00	216.50	10.00	0.00	-103.00	7642.89	21.600
2:40:56	59.9730	3739.45	350.00	-160.45	0.00	216.50	10.00	0.00	-103.00	7642.89	21.600
2:40:58	59.9710	3731.83	350.00	-160.45	0.00	217.00	10.00	0.00	-103.00	7643.22	23.199
2:41:00	59.9710	3731.83	350.00	-160.45	0.00	217.00	10.00	0.00	-103.00	7643.22	23.199
2:41:02	59.9820	3736.23	350.00	-160.45	0.00	217.50	10.00	0.00	-103.00	7643.55	14.401
2:41:04	59.9820	3736.23	350.00	-160.45	0.00	217.50	10.00	0.00	-103.00	7643.55	14.401
2:41:06	59.9850	3733.43	350.00	-160.45	0.00	218.00	10.00	0.00	-103.00	7643.88	12.000
2:41:08	59.9850	3733.43	350.00	-160.45	0.00	218.00	10.00	0.00	-103.00	7643.88	12.000
2:41:10	59.9870	3730.51	350.00	-160.45	0.00	218.50	10.00	0.00	-103.00	7644.21	10.400
2:41:12	59.9870	3730.51	350.00	-160.45	0.00	218.50	10.00	0.00	-103.00	7644.21	10.400
2:41:14	59.9890	3725.46	350.00	-163.96	0.00	219.00	10.00	0.00	-103.00	7644.54	8.801
2:41:16	59.9890	3725.46	350.00	-163.96	0.00	219.00	10.00	0.00	-103.00	7644.54	8.801
2:41:18	59.9870	3720.11	350.00	-163.96	0.00	219.50	10.00	0.00	-103.00	7644.87	10.400
2:41:20	59.9870	3720.11	350.00	-163.96	0.00	219.50	10.00	0.00	-103.00	7644.87	10.400
2:41:22	59.9940	3725.66	350.00	-163.96	0.00	220.00	10.00	0.00	-103.00	7645.20	4.800
2:41:24	59.9940	3725.66	350.00	-163.96	0.00	220.00	10.00	0.00	-103.00	7645.20	4.800
2:41:26	60.0010	3727.75	350.00	-163.96	0.00	220.50	10.00	0.00	-103.00	7645.53	-0.800
2:41:28	60.0010	3727.75	350.00	-163.96	0.00	220.50	10.00	0.00	-103.00	7645.53	-0.800
2:41:30	60.0040	3727.68	350.00	-163.96	0.00	221.00	10.00	0.00	-103.00	7645.86	-3.201
2:41:32	60.0040	3727.68	350.00	-163.96	0.00	221.00	10.00	0.00	-103.00	7645.86	-3.201
2:41:34	60.0120	3725.01	350.00	-166.07	0.00	221.50	10.00	0.00	-103.00	7646.19	-9.601

2:41:36	60.0120	3725.01	350.00	-166.07	0.00	221.50	10.00	0.00	-103.00	7646.19	-9.601
2:41:38	60.0190	3726.02	350.00	-166.07	0.00	222.00	10.00	0.00	-103.00	7646.52	-15.201
2:41:40	60.0190	3726.02	350.00	-166.07	0.00	222.00	10.00	0.00	-103.00	7646.52	-15.201
2:41:42	60.0250	3716.37	350.00	-166.07	0.00	222.50	10.00	0.00	-103.00	7646.85	-20.001
2:41:44	60.0250	3716.37	350.00	-166.07	0.00	222.50	10.00	0.00	-103.00	7646.85	-20.001
2:41:46	60.0270	3717.56	350.00	-166.07	0.00	223.00	10.00	0.00	-103.00	7647.18	-21.600
2:41:48	60.0270	3717.56	350.00	-166.07	0.00	223.00	10.00	0.00	-103.00	7647.18	-21.600
2:41:50	60.0290	3715.17	350.00	-166.07	0.00	223.50	10.00	0.00	-103.00	7647.51	-23.199
2:41:52	60.0290	3715.17	350.00	-166.07	0.00	223.50	10.00	0.00	-103.00	7647.51	-23.199
2:41:54	60.0360	3710.28	350.00	-163.77	0.00	224.00	10.00	0.00	-103.00	7647.84	-28.799
2:41:56	60.0360	3710.28	350.00	-163.77	0.00	224.00	10.00	0.00	-103.00	7647.84	-28.799
2:41:58	60.0370	3699.36	350.00	-163.77	0.00	224.50	10.00	0.00	-103.00	7648.17	-29.599
2:42:00	60.0370	3699.36	350.00	-163.77	0.00	224.50	10.00	0.00	-103.00	7648.17	-29.599
2:42:02	60.0410	3704.59	350.00	-163.77	0.00	225.00	10.00	0.00	-103.00	7648.50	-32.800
2:42:04	60.0410	3704.59	350.00	-163.77	0.00	225.00	10.00	0.00	-103.00	7648.50	-32.800
2:42:06	60.0440	3702.48	350.00	-163.77	0.00	225.50	10.00	0.00	-103.00	7648.83	-35.199
2:42:08	60.0440	3702.48	350.00	-163.77	0.00	225.50	10.00	0.00	-103.00	7648.83	-35.199
2:42:10	60.0460	3700.83	350.00	-163.77	0.00	226.00	10.00	0.00	-103.00	7649.16	-36.801
2:42:12	60.0460	3700.83	350.00	-163.77	0.00	226.00	10.00	0.00	-103.00	7649.16	-36.801
2:42:14	60.0460	3699.73	350.00	-165.10	0.00	226.50	10.00	0.00	-103.00	7649.49	-36.801
2:42:16	60.0460	3699.73	350.00	-165.10	0.00	226.50	10.00	0.00	-103.00	7649.49	-36.801
2:42:18	60.0430	3690.48	350.00	-165.10	0.00	227.00	10.00	0.00	-103.00	7649.82	-34.399
2:42:20	60.0430	3690.48	350.00	-165.10	0.00	227.00	10.00	0.00	-103.00	7649.82	-34.399
2:42:22	60.0440	3696.88	350.00	-165.10	0.00	227.50	10.00	0.00	-103.00	7650.15	-35.199
2:42:24	60.0440	3696.88	350.00	-165.10	0.00	227.50	10.00	0.00	-103.00	7650.15	-35.199

Date:	Monday, October 12, 2009				
Time of T(0)	2:27:24				
ncy Recovery to 60 Hz or Pre-Perturbation Hz	2:33:08				
urbation Average Frequency [T(-2) to T(-16)]	60.0420	Hz			
rbation Average Frequency [T(+12 to T(+24)]	59.8823	Hz			
to Post Perturbation Delta Frequency Actual	-0.160	Hz			
on Average Interchange MW [T(-2) to T(-16)]	3645.30	MW			
n Average Interchange MW [T(+12 to T(+24)]	3770.95	MW			
st Perturbation Interchange Delta MW Actual	125.65	MW			
Net Total Adjustments	-52.27	MW			
EPFR for FRO Pre-Perturbation Average	-33.60	MW			
EPFR for FRO Post-Perturbation Average	94.17	MW			
EPFR for FRO Delta	127.77	MW			
EPFR for FRO Adjusted	75.50	MW			
Pre JOU Dynamic Schedules MW	350.00		Pre-Perturbation Bias Setting	-103.000	MW/0.1 Hz
Pre Non-Conforming Load MW	-165.48		Post-Perturbation Bias Setting	-103.000	MW/0.1 Hz
Pre Pumped Hydro MW	0.00		EPFR for Bias Setting Pre-Perturbation Average	-43.2598	MW
Pre Ramping Units MW	114.25		EPFR for Bias Setting Post-Perturbation Average	121.2453	MW
Pre Transferred Frequency Response MW	-4.20		EPFR for Bias Setting Delta	164.5052	MW
Pre Contingent BA Lost Generation MW	15.00		Primary Frequency Response Delivery of Bias	76.38%	
Sum of Pre Perturbation Adjustments	309.57				
Post JOU Dynamic Schedules MW	335.00		Pre-Perturbation BA Load	7575.405	MW
Post Non-Conforming Load MW	-207.83		Post-Perturbation BA Load	7577.456	MW
Post Pumped Hydro MW	1.00		Pre to Post Perturbation BA Load Change	2.051	MW
Post Ramping Units MW	117.36		Load Dampening Frequency Response	1.284	MW/0.1 Hz
Post Transferred Frequency Response MW	11.77		Load Dampening % of Total BA Frequency Response	-1.63%	
Post Contingent BA Lost Generation MW	0.00				
Sum of Post Perturbation Adjustments	257.30				
Net Total Adjustments MW	-52.27				

Average Period Evaluation

Initial P.U. Performance for FRO	0.983	P.U.
Initial P.U. Performance Adjusted for FRO	1.393	P.U.

Net Actual Interchange MW	JOU Dynamic Schedules Imp(-) Exp (+) MW	Non-Conforming Load Load (-) MW	Pumped Hydro Load (-) Gen (+) MW	Ramping Units Gen (+) MW	Transferred Frequency Response Rec (-) Del (+) MW/0.1 Hz	Contingent BA Lost Generation Load (-) Gen (+) MW	BA Bias Setting MW/0.1 Hz	BA Load MW	EPFR MW	Expected Net Actual Interchange MW

18 to 30 second Average Period Evalu

Initial P.U. Perfor	
Initial P.U. Performance Ac	

T	Frequency Hz	Net Actual Interchange MW	JOU Dynamic Schedules Imp(-) Exp (+) MW
T-72 sec	2:26:12		
T-70 sec	2:26:14		
T-68 sec	2:26:16		

Time of Frequency Recovery to 60 Hz or Pre-P	
Value A Pre-Perturbation Average Frequency [T	
Value B Post-Perturbation Average Frequency [T	
Pre to Post Perturbation Delta Fre	
Value A Pre-Perturbation Average Interchange MW [T	
Value B Post-Perturbation Average Interchange MW [T	
Pre to Post Perturbation Interchange De	
Net Tot	
EPFR for FRO Pre-Perturl	
EPFR for FRO Post-Perturl	
EPFI	
EPFR fo	
Pre JOU Dynamic	
Pre Non-Confor	
Pre Pump	
Pre Ram	
Pre Transferred Frequency	
Pre Contingent BA Lost G	
Sum of Pre Perturbatio	
Post JOU Dynamic	
Post Non-Confor	
Post Pump	
Post Ram	
Post Transferred Frequency	
Post Contingent BA Lost G	
Sum of Post Perturbatio	
Net Total Ad	

										T-66 sec	2:26:18				
										T-64 sec	2:26:20				
										T-62 sec	2:26:22				
										T-60 sec	2:26:24				
										T-58 sec	2:26:26				
										T-56 sec	2:26:28				
										T-54 sec	2:26:30				
										T-52 sec	2:26:32				
										T-50 sec	2:26:34				
										T-48 sec	2:26:36				
										T-46 sec	2:26:38				
										T-44 sec	2:26:40				
										T-42 sec	2:26:42				
										T-40 sec	2:26:44				
										T-38 sec	2:26:46				
										T-36 sec	2:26:48				
										T-34 sec	2:26:50				
										T-32 sec	2:26:52				
										T-30 sec	2:26:54				
										T-28 sec	2:26:56				
										T-26 sec	2:26:58				
										T-24 sec	2:27:00				
										T-22 sec	2:27:02				
										T-20 sec	2:27:04				
										T-18 sec	2:27:06				
3645.303	350.000	-165.476		0.000	114.250	10.000	15.000	-103.000	7575.405	-33.600		T-16 sec	2:27:08	60.042	3645.303	350.000
3645.303	350.000	-165.476		0.000	114.250	10.000	15.000	-103.000	7575.405	-33.600		T-14 sec	2:27:10	60.042	3645.303	350.000
3645.303	350.000	-165.476		0.000	114.250	10.000	15.000	-103.000	7575.405	-33.600		T-12 sec	2:27:12	60.042	3645.303	350.000
3645.303	350.000	-165.476		0.000	114.250	10.000	15.000	-103.000	7575.405	-33.600		T-10 sec	2:27:14	60.042	3645.303	350.000
3645.303	350.000	-165.476		0.000	114.250	10.000	15.000	-103.000	7575.405	-33.600		T-08 sec	2:27:16	60.042	3645.303	350.000
3645.303	350.000	-165.476		0.000	114.250	10.000	15.000	-103.000	7575.405	-33.600		T-06 sec	2:27:18	60.042	3645.303	350.000
3645.303	350.000	-165.476		0.000	114.250	10.000	15.000	-103.000	7575.405	-33.600		T-04 sec	2:27:20	60.042	3645.303	350.000
3645.303	350.000	-165.476		0.000	114.250	10.000	15.000	-103.000	7575.405	-33.600		T-02 sec	2:27:22	60.042	3645.303	350.000
												T+0 sec	2:27:24			
												T+02 sec	2:27:26			
												T+04 sec	2:27:28			
												T+06 sec	2:27:30			
												T+08 sec	2:27:32			
												T+10 sec	2:27:34			
3770.953	335.000	-207.830		1.000	117.357	10.000	0.000	-103.000	7577.456	94.171	3720.799	T+12 sec	2:27:36			
3770.953	335.000	-207.830		1.000	117.357	10.000	0.000	-103.000	7577.456	94.171	3720.799	T+14 sec	2:27:38			
3770.953	335.000	-207.830		1.000	117.357	10.000	0.000	-103.000	7577.456	94.171	3720.799	T+16 sec	2:27:40			
3770.953	335.000	-207.830		1.000	117.357	10.000	0.000	-103.000	7577.456	94.171	3720.799	T+18 sec	2:27:42	59.883	3779.625	335.000
3770.953	335.000	-207.830		1.000	117.357	10.000	0.000	-103.000	7577.456	94.171	3720.799	T+20 sec	2:27:44	59.883	3779.625	335.000
3770.953	335.000	-207.830		1.000	117.357	10.000	0.000	-103.000	7577.456	94.171	3720.799	T+22 sec	2:27:46	59.883	3779.625	335.000
3770.953	335.000	-207.830		1.000	117.357	10.000	0.000	-103.000	7577.456	94.171	3720.799	T+24 sec	2:27:48	59.883	3779.625	335.000

T+26 sec	2:27:50	59.883	3779.625	335.000
T+28 sec	2:27:52	59.883	3779.625	335.000
T+30 sec	2:27:54	59.883	3779.625	335.000
T+32 sec	2:27:56			
T+34 sec	2:27:58			
T+36 sec	2:28:00			
T+38 sec	2:28:02			
T+40 sec	2:28:04			
T+42 sec	2:28:06			
T+44 sec	2:28:08			
T+46 sec	2:28:10			
T+48 sec	2:28:12			
T+50 sec	2:28:14			
T+52 sec	2:28:16			
T+54 sec	2:28:18			
T+56 sec	2:28:20			
T+58 sec	2:28:22			
T+60 sec	2:28:24			
T+62 sec	2:28:26			
T+64 sec	2:28:28			
T+66 sec	2:28:30			
T+68 sec	2:28:32			
T+70 sec	2:28:34			
T+72 sec	2:28:36			
T+74 sec	2:28:38			
T+76 sec	2:28:40			
T+78 sec	2:28:42			
T+80 sec	2:28:44			

Date:	Monday, October 12, 2009				
Time of T(0)	2:27:24				
erturbation Hz	2:33:08				
T(-2) to T(-16)]	60.0420	Hz			
(+18 to T(+30)]	59.8831	Hz			
equency Actual	-0.159	Hz			
T(-2) to T(-16)]	3645.30	MW			
(+18 to T(+30)]	3779.63	MW			
elta MW Actual	134.32	MW			
al Adjustments	-53.49	MW			
bation Average	-33.60	MW			
bation Average	93.49	MW			
R for FRO Delta	127.09	MW			
r FRO Adjusted	73.60	MW			
Schedules MW	350.00		Pre-Perturbation Bias Setting	-103.000	MW/0.1 Hz
ming Load MW	-165.48		Post-Perturbation Bias Setting	-103.000	MW/0.1 Hz
ped Hydro MW	0.00		EPFR for Bias Setting Pre-Perturbation Average	-43.2598	MW
ping Units MW	114.25		EPFR for Bias Setting Post-Perturbation Average	120.3630	MW
Response MW	-4.20		EPFR for Bias Setting Delta	163.6228	MW
ieneration MW	15.00		Primary Frequency Response Delivery of Bias	82.09%	
n Adjustments	309.57				
Schedules MW	335.00		Pre-Perturbation BA Load	7575.405	MW
ming Load MW	-209.89		Post-Perturbation BA Load	7577.974	MW
ped Hydro MW	1.14		Pre to Post Perturbation BA Load Change	2.569	MW
ping Units MW	118.14		Load Dampening Frequency Response	1.617	MW/0.1 Hz
Response MW	11.69		Load Dampening % of Total BA Frequency Response	-1.91%	
ieneration MW	0.00				
n Adjustments	256.09				
justments MW	-53.49				

iation

mance for FRO	1.057	P.U.
djusted for FRO	1.478	P.U.

Non-Conforming Load Load (-) MW	Pumped Hydro Load (-) Gen (+) MW	Ramping Units Gen (+) MW	Transferred Frequency Response Rec (-) Del (+) MW/0.1 Hz	Contingent BA Lost Generation Load (-) Gen (+) MW	BA Bias Setting MW/0.1 Hz	BA Load MW	EPFR MW	Expected Net Actual Interchange MW

Date:	Monday, October 12, 2009	
Time of T(0)	2:27:24	
Time of Frequency Recovery to 60 Hz or Pre-Perturbation Hz	2:33:08	
Value A Pre-Perturbation Average Frequency [T(-2) to T(-16)]	60.0420	
Value B Post-Perturbation Average Frequency [T(+20 to T(+40)]	59.8883	
Pre to Post Perturbation Delta Frequency Actual	-0.154	
Value A Pre-Perturbation Average Interchange MW [T(-2) to T(-16)]	3645.30	
Value B Post-Perturbation Average Interchange MW [T(+20 to T(+40)]	3784.13	
Pre to Post Perturbation Interchange Delta MW Actual	138.83	
Net Total Adjustments	-53.27	
EPFR for FRO Pre-Perturbation Average	-33.60	
EPFR for FRO Post-Perturbation Average	89.38	
EPFR for FRO Delta	122.98	
EPFR for FRO Adjusted	69.72	
Pre JOU Dynamic Schedules MW	350.00	
Pre Non-Conforming Load MW	-165.48	
Pre Pumped Hydro MW	0.00	
Pre Ramping Units MW	114.25	
Pre Transferred Frequency Response MW	-4.20	
Pre Contingent BA Lost Generation MW	15.00	
Sum of Pre Perturbation Adjustments	309.57	
Post JOU Dynamic Schedules MW	335.00	
Post Non-Conforming Load MW	-210.82	
Post Pumped Hydro MW	2.09	
Post Ramping Units MW	118.86	
Post Transferred Frequency Response MW	11.17	
Post Contingent BA Lost Generation MW	0.00	
Sum of Post Perturbation Adjustments	256.31	
Net Total Adjustments MW	-53.27	

20 to 40 second Average Period Evaluation

Initial P.U. Performance for FRO	1.129	
Initial P.U. Performance Adjusted for FRO	1.562	

T	Frequency Hz	Net Actual Interchange MW	JOU Dynamic Schedules Imp(-) Exp (+) MW	Non-Conforming Load Load (-) MW	Pumped Hydro Load (-) Gen (+) MW

T-72 sec	2:26:12
T-70 sec	2:26:14
T-68 sec	2:26:16

								T-66 sec	2:26:18						
								T-64 sec	2:26:20						
								T-62 sec	2:26:22						
								T-60 sec	2:26:24						
								T-58 sec	2:26:26						
								T-56 sec	2:26:28						
								T-54 sec	2:26:30						
								T-52 sec	2:26:32						
								T-50 sec	2:26:34						
								T-48 sec	2:26:36						
								T-46 sec	2:26:38						
								T-44 sec	2:26:40						
								T-42 sec	2:26:42						
								T-40 sec	2:26:44						
								T-38 sec	2:26:46						
								T-36 sec	2:26:48						
								T-34 sec	2:26:50						
								T-32 sec	2:26:52						
								T-30 sec	2:26:54						
								T-28 sec	2:26:56						
								T-26 sec	2:26:58						
								T-24 sec	2:27:00						
								T-22 sec	2:27:02						
								T-20 sec	2:27:04						
								T-18 sec	2:27:06						
-165.476	0.000	114.250	10.000	15.000	-103.000	7575.405	-33.600	T-16 sec	2:27:08	60.042	3645.303	350.000	-165.476	0.000	
-165.476	0.000	114.250	10.000	15.000	-103.000	7575.405	-33.600	T-14 sec	2:27:10	60.042	3645.303	350.000	-165.476	0.000	
-165.476	0.000	114.250	10.000	15.000	-103.000	7575.405	-33.600	T-12 sec	2:27:12	60.042	3645.303	350.000	-165.476	0.000	
-165.476	0.000	114.250	10.000	15.000	-103.000	7575.405	-33.600	T-10 sec	2:27:14	60.042	3645.303	350.000	-165.476	0.000	
-165.476	0.000	114.250	10.000	15.000	-103.000	7575.405	-33.600	T-08 sec	2:27:16	60.042	3645.303	350.000	-165.476	0.000	
-165.476	0.000	114.250	10.000	15.000	-103.000	7575.405	-33.600	T-06 sec	2:27:18	60.042	3645.303	350.000	-165.476	0.000	
-165.476	0.000	114.250	10.000	15.000	-103.000	7575.405	-33.600	T-04 sec	2:27:20	60.042	3645.303	350.000	-165.476	0.000	
-165.476	0.000	114.250	10.000	15.000	-103.000	7575.405	-33.600	T-02 sec	2:27:22	60.042	3645.303	350.000	-165.476	0.000	
								T+0 sec	2:27:24						
								T+02 sec	2:27:26						
								T+04 sec	2:27:28						
								T+06 sec	2:27:30						
								T+08 sec	2:27:32						
								T+10 sec	2:27:34						
								T+12 sec	2:27:36						
								T+14 sec	2:27:38						
								T+16 sec	2:27:40						
-209.885	1.143	118.143	10.000	0.000	-103.000	7577.974	93.486	3718.901	T+18 sec	2:27:42					
-209.885	1.143	118.143	10.000	0.000	-103.000	7577.974	93.486	3718.901	T+20 sec	2:27:44	59.888	3784.134	335.000	-210.820	2.091
-209.885	1.143	118.143	10.000	0.000	-103.000	7577.974	93.486	3718.901	T+22 sec	2:27:46	59.888	3784.134	335.000	-210.820	2.091
-209.885	1.143	118.143	10.000	0.000	-103.000	7577.974	93.486	3718.901	T+24 sec	2:27:48	59.888	3784.134	335.000	-210.820	2.091

-209.885	1.143	118.143	10.000	0.000	-103.000	7577.974	93.486	3718.901	T+26 sec	2:27:50	59.888	3784.134	335.000	-210.820	2.091
-209.885	1.143	118.143	10.000	0.000	-103.000	7577.974	93.486	3718.901	T+28 sec	2:27:52	59.888	3784.134	335.000	-210.820	2.091
-209.885	1.143	118.143	10.000	0.000	-103.000	7577.974	93.486	3718.901	T+30 sec	2:27:54	59.888	3784.134	335.000	-210.820	2.091
									T+32 sec	2:27:56	59.888	3784.134	335.000	-210.820	2.091
									T+34 sec	2:27:58	59.888	3784.134	335.000	-210.820	2.091
									T+36 sec	2:28:00	59.888	3784.134	335.000	-210.820	2.091
									T+38 sec	2:28:02	59.888	3784.134	335.000	-210.820	2.091
									T+40 sec	2:28:04	59.888	3784.134	335.000	-210.820	2.091
									T+42 sec	2:28:06					
									T+44 sec	2:28:08					
									T+46 sec	2:28:10					
									T+48 sec	2:28:12					
									T+50 sec	2:28:14					
									T+52 sec	2:28:16					
									T+54 sec	2:28:18					
									T+56 sec	2:28:20					
									T+58 sec	2:28:22					
									T+60 sec	2:28:24					
									T+62 sec	2:28:26					
									T+64 sec	2:28:28					
									T+66 sec	2:28:30					
									T+68 sec	2:28:32					
									T+70 sec	2:28:34					
									T+72 sec	2:28:36					
									T+74 sec	2:28:38					
									T+76 sec	2:28:40					
									T+78 sec	2:28:42					
									T+80 sec	2:28:44					

Date:	Monday, October 12, 2009	
Time of T(0)	2:27:24	
Time of Frequency Recovery to 60 Hz or Pre-Perturbation Hz	2:33:08	
Value A Pre-Perturbation Average Frequency [T(-2) to T(-16)]	60.0420	Hz
Value B Post-Perturbation Average Frequency [T(+18 to T(+52)]	59.8880	Hz
Pre to Post Perturbation Delta Frequency Actual	-0.154	Hz
Value A Pre-Perturbation Average Interchange MW [T(-2) to T(-16)]	3645.30	MW
Value B Post-Perturbation Average Interchange MW [T(+18 to T(+52)]	3787.80	MW
Pre to Post Perturbation Interchange Delta MW Actual	142.49	MW
Net Total Adjustments	-52.29	MW
EPFR for FRO Pre-Perturbation Average	-33.60	MW
EPFR for FRO Post-Perturbation Average	89.60	MW
EPFR for FRO Delta	123.20	MW
EPFR for FRO Adjusted	70.91	MW
Pre JOU Dynamic Schedules MW	350.00	MW
Pre Non-Conforming Load MW	-165.48	MW
Pre Pumped Hydro MW	0.00	MW
Pre Ramping Units MW	114.25	MW
Pre Transferred Frequency Response MW	-4.20	MW
Pre Contingent BA Lost Generation MW	15.00	MW
Sum of Pre Perturbation Adjustments	309.57	MW
Post JOU Dynamic Schedules MW	335.00	MW
Post Non-Conforming Load MW	-211.75	MW
Post Pumped Hydro MW	3.33	MW
Post Ramping Units MW	119.50	MW
Post Transferred Frequency Response MW	11.20	MW
Post Contingent BA Lost Generation MW	0.00	MW
Sum of Post Perturbation Adjustments	257.28	MW
Net Total Adjustments MW	-52.29	MW

Left-margin units: Hz, Hz, Hz, MW, MW, MW, MW, MW, MW, MW, MW, MW, MW, MW, MW, MW, MW, MW, MW, MW, MW, MW, MW, MW, MW, MW, P.U., P.U.

Right-edge fragments: EPFR, EPFR, Pri, Load Dam

Pre-Perturbation Bias Setting	-103.000	MW/0.1 Hz
Post-Perturbation Bias Setting	-103.000	MW/0.1 Hz
EPFR for Bias Setting Pre-Perturbation Average	-43.2598	MW
EPFR for Bias Setting Post-Perturbation Average	115.0787	MW
EPFR for Bias Setting Delta	158.3386	MW
Primary Frequency Response Delivery of Bias	87.68%	
Pre-Perturbation BA Load	7575.405	MW
Post-Perturbation BA Load	7578.450	MW
Pre to Post Perturbation BA Load Change	3.045	MW
Load Dampening Frequency Response	1.981	MW/0.1 Hz
Load Dampening % of Total BA Frequency Response	-2.19%	

18 to 52 second Average Period Evaluation

Initial P.U. Performance for FRO	1.157	P.U.
Initial P.U. Performance Adjusted for FRO	1.581	P.U.

Ramping Units Gen (+) MW	Transferred Frequency Response Rec (-) Del (+) MW/0.1 Hz	Contingent BA Lost Generation Load (-) Gen (+) MW	BA Bias Setting MW/0.1 Hz	BA Load MW	EPFR MW	Expected Net Actual Interchange MW

	T	Frequency Hz	Net Actual Interchange MW	JOU Dynamic Schedules Imp(-) Exp (+) MW	Non-Conforming Load Load (-) MW	Pumped Hydro Load (-) Gen (+) MW	Ramping Units Gen (+) MW	Transferred Frequency Response Rec (-) Del (+) MW/0.1 Hz
T-72 sec	2:26:12							
T-70 sec	2:26:14							
T-68 sec	2:26:16							

							T-66 sec	2:26:18							
							T-64 sec	2:26:20							
							T-62 sec	2:26:22							
							T-60 sec	2:26:24							
							T-58 sec	2:26:26							
							T-56 sec	2:26:28							
							T-54 sec	2:26:30							
							T-52 sec	2:26:32							
							T-50 sec	2:26:34							
							T-48 sec	2:26:36							
							T-46 sec	2:26:38							
							T-44 sec	2:26:40							
							T-42 sec	2:26:42							
							T-40 sec	2:26:44							
							T-38 sec	2:26:46							
							T-36 sec	2:26:48							
							T-34 sec	2:26:50							
							T-32 sec	2:26:52							
							T-30 sec	2:26:54							
							T-28 sec	2:26:56							
							T-26 sec	2:26:58							
							T-24 sec	2:27:00							
							T-22 sec	2:27:02							
							T-20 sec	2:27:04							
							T-18 sec	2:27:06							
114.250	10.000	15.000	-103.000	7575.405	-33.600		T-16 sec	2:27:08	60.042	3645.303	350.000	-165.476	0.000	114.250	10.000
114.250	10.000	15.000	-103.000	7575.405	-33.600		T-14 sec	2:27:10	60.042	3645.303	350.000	-165.476	0.000	114.250	10.000
114.250	10.000	15.000	-103.000	7575.405	-33.600		T-12 sec	2:27:12	60.042	3645.303	350.000	-165.476	0.000	114.250	10.000
114.250	10.000	15.000	-103.000	7575.405	-33.600		T-10 sec	2:27:14	60.042	3645.303	350.000	-165.476	0.000	114.250	10.000
114.250	10.000	15.000	-103.000	7575.405	-33.600		T-08 sec	2:27:16	60.042	3645.303	350.000	-165.476	0.000	114.250	10.000
114.250	10.000	15.000	-103.000	7575.405	-33.600		T-06 sec	2:27:18	60.042	3645.303	350.000	-165.476	0.000	114.250	10.000
114.250	10.000	15.000	-103.000	7575.405	-33.600		T-04 sec	2:27:20	60.042	3645.303	350.000	-165.476	0.000	114.250	10.000
114.250	10.000	15.000	-103.000	7575.405	-33.600		T-02 sec	2:27:22	60.042	3645.303	350.000	-165.476	0.000	114.250	10.000
							T+0 sec	2:27:24							
							T+02 sec	2:27:26							
							T+04 sec	2:27:28							
							T+06 sec	2:27:30							
							T+08 sec	2:27:32							
							T+10 sec	2:27:34							
							T+12 sec	2:27:36							
							T+14 sec	2:27:38							
							T+16 sec	2:27:40							
							T+18 sec	2:27:42	59.888	3787.795	335.000	-211.753	3.333	119.500	10.000
118.864	10.000	0.000	-103.000	7578.450	89.382	3715.018	T+20 sec	2:27:44	59.888	3787.795	335.000	-211.753	3.333	119.500	10.000
118.864	10.000	0.000	-103.000	7578.450	89.382	3715.018	T+22 sec	2:27:46	59.888	3787.795	335.000	-211.753	3.333	119.500	10.000
118.864	10.000	0.000	-103.000	7578.450	89.382	3715.018	T+24 sec	2:27:48	59.888	3787.795	335.000	-211.753	3.333	119.500	10.000

118.864	10.000	0.000	-103.000	7578.450	89.382	3715.018	T+26 sec	2:27:50	59.888	3787.795	335.000	-211.753		3.333	119.500	10.000
118.864	10.000	0.000	-103.000	7578.450	89.382	3715.018	T+28 sec	2:27:52	59.888	3787.795	335.000	-211.753		3.333	119.500	10.000
118.864	10.000	0.000	-103.000	7578.450	89.382	3715.018	T+30 sec	2:27:54	59.888	3787.795	335.000	-211.753		3.333	119.500	10.000
118.864	10.000	0.000	-103.000	7578.450	89.382	3715.018	T+32 sec	2:27:56	59.888	3787.795	335.000	-211.753		3.333	119.500	10.000
118.864	10.000	0.000	-103.000	7578.450	89.382	3715.018	T+34 sec	2:27:58	59.888	3787.795	335.000	-211.753		3.333	119.500	10.000
118.864	10.000	0.000	-103.000	7578.450	89.382	3715.018	T+36 sec	2:28:00	59.888	3787.795	335.000	-211.753		3.333	119.500	10.000
118.864	10.000	0.000	-103.000	7578.450	89.382	3715.018	T+38 sec	2:28:02	59.888	3787.795	335.000	-211.753		3.333	119.500	10.000
118.864	10.000	0.000	-103.000	7578.450	89.382	3715.018	T+40 sec	2:28:04	59.888	3787.795	335.000	-211.753		3.333	119.500	10.000
							T+42 sec	2:28:06	59.888	3787.795	335.000	-211.753		3.333	119.500	10.000
							T+44 sec	2:28:08	59.888	3787.795	335.000	-211.753		3.333	119.500	10.000
							T+46 sec	2:28:10	59.888	3787.795	335.000	-211.753		3.333	119.500	10.000
							T+48 sec	2:28:12	59.888	3787.795	335.000	-211.753		3.333	119.500	10.000
							T+50 sec	2:28:14	59.888	3787.795	335.000	-211.753		3.333	119.500	10.000
							T+52 sec	2:28:16	59.888	3787.795	335.000	-211.753		3.333	119.500	10.000
							T+54 sec	2:28:18								
							T+56 sec	2:28:20								
							T+58 sec	2:28:22								
							T+60 sec	2:28:24								
							T+62 sec	2:28:26								
							T+64 sec	2:28:28								
							T+66 sec	2:28:30								
							T+68 sec	2:28:32								
							T+70 sec	2:28:34								
							T+72 sec	2:28:36								
							T+74 sec	2:28:38								
							T+76 sec	2:28:40								
							T+78 sec	2:28:42								
							T+80 sec	2:28:44								

Pre-Perturbation Bias Setting	-103.000	MW/0.1 Hz
Post-Perturbation Bias Setting	-103.000	MW/0.1 Hz
t for Bias Setting Pre-Perturbation Average	-43.2598	MW
for Bias Setting Post-Perturbation Average	115.3599	MW
EPFR for Bias Setting Delta	158.6197	MW
mary Frequency Response Delivery of Bias	89.83%	
Pre-Perturbation BA Load	7575.405	MW
Post-Perturbation BA Load	7578.870	MW
Pre to Post Perturbation BA Load Change	3.465	MW
Load Dampening Frequency Response	2.250	MW/0.1 Hz
ıpening % of Total BA Frequency Response	-2.43%	

Date:	Monday, October 12, 2009		
Time of T(0)	2:27:24		
Time of Frequency Recovery to 60 Hz or Pre-Perturbation Hz	2:33:08		
Value A Pre-Perturbation Average Frequency [T(-2) to T(-16)]	60.0420	Hz	
Value B Post-Perturbation Average Frequency [T(+20 to T(+52)]	59.8888	Hz	
Pre to Post Perturbation Delta Frequency Actual	-0.153	Hz	
Value A Pre-Perturbation Average Interchange MW [T(-2) to T(-16)]	3645.30	MW	
Value B Post-Perturbation Average Interchange MW [T(+20 to T(+52)]	3788.85	MW	
Pre to Post Perturbation Interchange Delta MW Actual	143.54	MW	
Net Total Adjustments	-52.43	MW	
EPFR for FRO Pre-Perturbation Average	-33.60	MW	
EPFR for FRO Post-Perturbation Average	88.99	MW	
EPFR for FRO Delta	122.59	MW	
EPFR for FRO Adjusted	70.16	MW	
Pre JOU Dynamic Schedules MW	350.00	MW	Pre-P
Pre Non-Conforming Load MW	-165.48	MW	Post-P
Pre Pumped Hydro MW	0.00	MW	EPFR for Bias Setting Pr
Pre Ramping Units MW	114.25	MW	EPFR for Bias Setting Pos
Pre Transferred Frequency Response MW	-4.20	MW	EPF
Pre Contingent BA Lost Generation MW	15.00	MW	Primary Frequency Re
Sum of Pre Perturbation Adjustments	309.57	MW	
Post JOU Dynamic Schedules MW	335.00	MW	Pr
Post Non-Conforming Load MW	-212.06	MW	Pos
Post Pumped Hydro MW	3.47	MW	Pre to Post Pertur
Post Ramping Units MW	119.62	MW	Load Dampeni
Post Transferred Frequency Response MW	11.12	MW	Load Dampening % of Total E
Post Contingent BA Lost Generation MW	0.00	MW	
Sum of Post Perturbation Adjustments	257.15	MW	
Net Total Adjustments MW	-52.43	MW	

20 to 52 second Average Period Evaluation

Initial P.U. Performance for FRO	1.171	P.U.
Initial P.U. Performance Adjusted for FRO	1.599	P.U.

Contingent BA Lost Generation Load (-) Gen (+) MW	BA Bias Setting MW/0.1 Hz	BA Load MW	EPFR MW	Expected Net Actual Interchange MW	T	Frequency Hz	Net Actual Interchange MW	JOU Dynamic Schedules Imp(-) Exp (+) MW	Non-Conforming Load Load (-) MW	Pumped Hydro Load (-) Gen (+) MW	Ramping Units Gen (+) MW	Transferred Frequency Response Rec (-) Del (+) MW/0.1 Hz	Contingent BA Lost Generation Load (-) Gen (+) MW
					T-72 sec	2:26:12							
					T-70 sec	2:26:14							
					T-68 sec	2:26:16							

					T-66 sec	2:26:18								
					T-64 sec	2:26:20								
					T-62 sec	2:26:22								
					T-60 sec	2:26:24								
					T-58 sec	2:26:26								
					T-56 sec	2:26:28								
					T-54 sec	2:26:30								
					T-52 sec	2:26:32								
					T-50 sec	2:26:34								
					T-48 sec	2:26:36								
					T-46 sec	2:26:38								
					T-44 sec	2:26:40								
					T-42 sec	2:26:42								
					T-40 sec	2:26:44								
					T-38 sec	2:26:46								
					T-36 sec	2:26:48								
					T-34 sec	2:26:50								
					T-32 sec	2:26:52								
					T-30 sec	2:26:54								
					T-28 sec	2:26:56								
					T-26 sec	2:26:58								
					T-24 sec	2:27:00								
					T-22 sec	2:27:02								
					T-20 sec	2:27:04								
					T-18 sec	2:27:06								
15.000	-103.000	7575.405	-33.600		T-16 sec	2:27:08	60.042	3645.303	350.000	-165.476		0.000	114.250	10.000	15.000
15.000	-103.000	7575.405	-33.600		T-14 sec	2:27:10	60.042	3645.303	350.000	-165.476		0.000	114.250	10.000	15.000
15.000	-103.000	7575.405	-33.600		T-12 sec	2:27:12	60.042	3645.303	350.000	-165.476		0.000	114.250	10.000	15.000
15.000	-103.000	7575.405	-33.600		T-10 sec	2:27:14	60.042	3645.303	350.000	-165.476		0.000	114.250	10.000	15.000
15.000	-103.000	7575.405	-33.600		T-08 sec	2:27:16	60.042	3645.303	350.000	-165.476		0.000	114.250	10.000	15.000
15.000	-103.000	7575.405	-33.600		T-06 sec	2:27:18	60.042	3645.303	350.000	-165.476		0.000	114.250	10.000	15.000
15.000	-103.000	7575.405	-33.600		T-04 sec	2:27:20	60.042	3645.303	350.000	-165.476		0.000	114.250	10.000	15.000
15.000	-103.000	7575.405	-33.600		T-02 sec	2:27:22	60.042	3645.303	350.000	-165.476		0.000	114.250	10.000	15.000
					T+0 sec	2:27:24								
					T+02 sec	2:27:26								
					T+04 sec	2:27:28								
					T+06 sec	2:27:30								
					T+08 sec	2:27:32								
					T+10 sec	2:27:34								
					T+12 sec	2:27:36								
					T+14 sec	2:27:38								
					T+16 sec	2:27:40								
0.000	-103.000	7578.870	89.600	3716.209	T+18 sec	2:27:42								
0.000	-103.000	7578.870	89.600	3716.209	T+20 sec	2:27:44	59.889	3788.847	335.000	-212.065		3.471	119.618	10.000	0.000
0.000	-103.000	7578.870	89.600	3716.209	T+22 sec	2:27:46	59.889	3788.847	335.000	-212.065		3.471	119.618	10.000	0.000
0.000	-103.000	7578.870	89.600	3716.209	T+24 sec	2:27:48	59.889	3788.847	335.000	-212.065		3.471	119.618	10.000	0.000

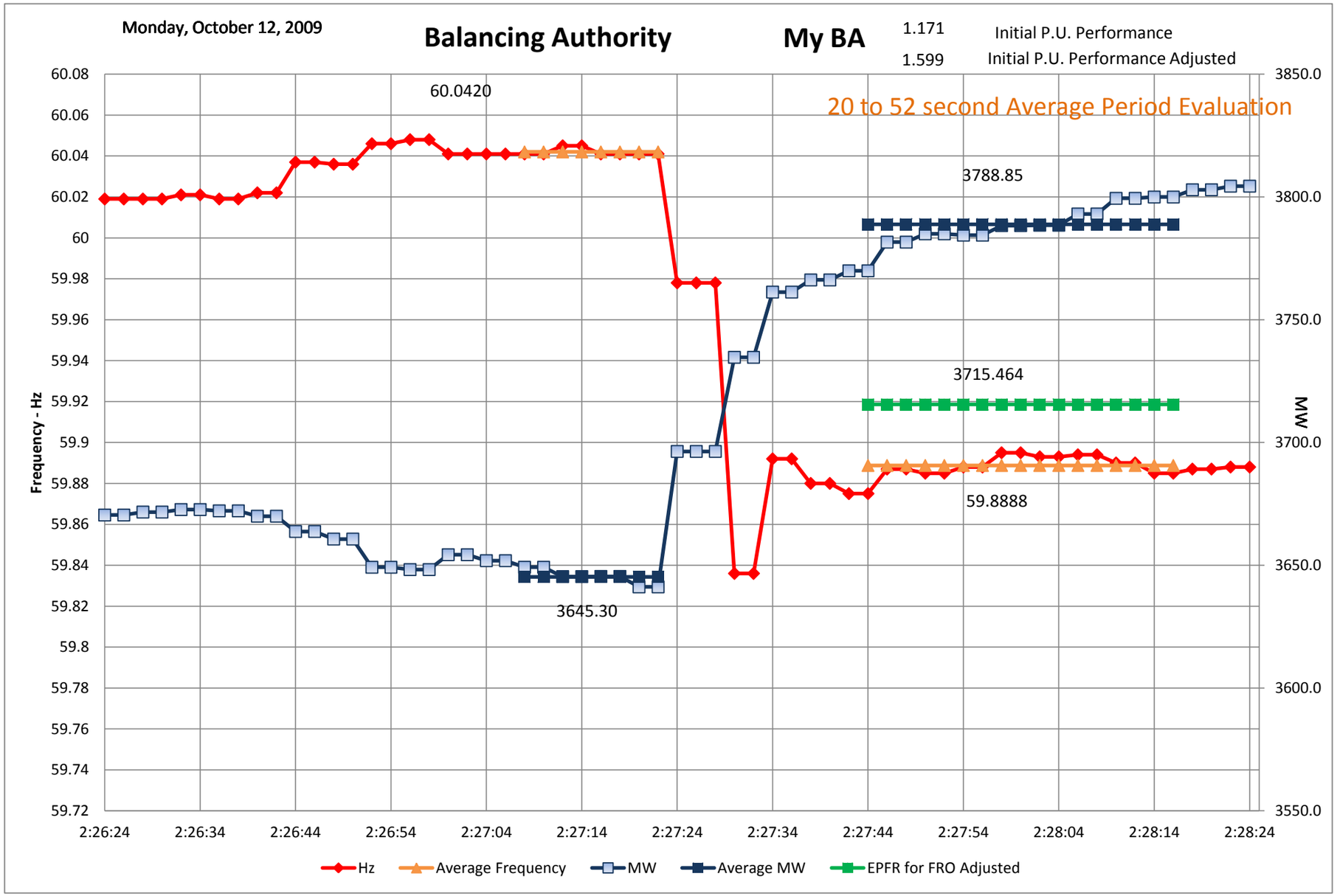
0.000	-103.000	7578.870	89.600	3716.209	T+26 sec	2:27:50	59.889	3788.847	335.000	-212.065	3.471	119.618	10.000	0.000
0.000	-103.000	7578.870	89.600	3716.209	T+28 sec	2:27:52	59.889	3788.847	335.000	-212.065	3.471	119.618	10.000	0.000
0.000	-103.000	7578.870	89.600	3716.209	T+30 sec	2:27:54	59.889	3788.847	335.000	-212.065	3.471	119.618	10.000	0.000
0.000	-103.000	7578.870	89.600	3716.209	T+32 sec	2:27:56	59.889	3788.847	335.000	-212.065	3.471	119.618	10.000	0.000
0.000	-103.000	7578.870	89.600	3716.209	T+34 sec	2:27:58	59.889	3788.847	335.000	-212.065	3.471	119.618	10.000	0.000
0.000	-103.000	7578.870	89.600	3716.209	T+36 sec	2:28:00	59.889	3788.847	335.000	-212.065	3.471	119.618	10.000	0.000
0.000	-103.000	7578.870	89.600	3716.209	T+38 sec	2:28:02	59.889	3788.847	335.000	-212.065	3.471	119.618	10.000	0.000
0.000	-103.000	7578.870	89.600	3716.209	T+40 sec	2:28:04	59.889	3788.847	335.000	-212.065	3.471	119.618	10.000	0.000
0.000	-103.000	7578.870	89.600	3716.209	T+42 sec	2:28:06	59.889	3788.847	335.000	-212.065	3.471	119.618	10.000	0.000
0.000	-103.000	7578.870	89.600	3716.209	T+44 sec	2:28:08	59.889	3788.847	335.000	-212.065	3.471	119.618	10.000	0.000
0.000	-103.000	7578.870	89.600	3716.209	T+46 sec	2:28:10	59.889	3788.847	335.000	-212.065	3.471	119.618	10.000	0.000
0.000	-103.000	7578.870	89.600	3716.209	T+48 sec	2:28:12	59.889	3788.847	335.000	-212.065	3.471	119.618	10.000	0.000
0.000	-103.000	7578.870	89.600	3716.209	T+50 sec	2:28:14	59.889	3788.847	335.000	-212.065	3.471	119.618	10.000	0.000
0.000	-103.000	7578.870	89.600	3716.209	T+52 sec	2:28:16	59.889	3788.847	335.000	-212.065	3.471	119.618	10.000	0.000
					T+54 sec	2:28:18								
					T+56 sec	2:28:20								
					T+58 sec	2:28:22								
					T+60 sec	2:28:24								
					T+62 sec	2:28:26								
					T+64 sec	2:28:28								
					T+66 sec	2:28:30								
					T+68 sec	2:28:32								
					T+70 sec	2:28:34								
					T+72 sec	2:28:36								
					T+74 sec	2:28:38								
					T+76 sec	2:28:40								
					T+78 sec	2:28:42								
					T+80 sec	2:28:44								

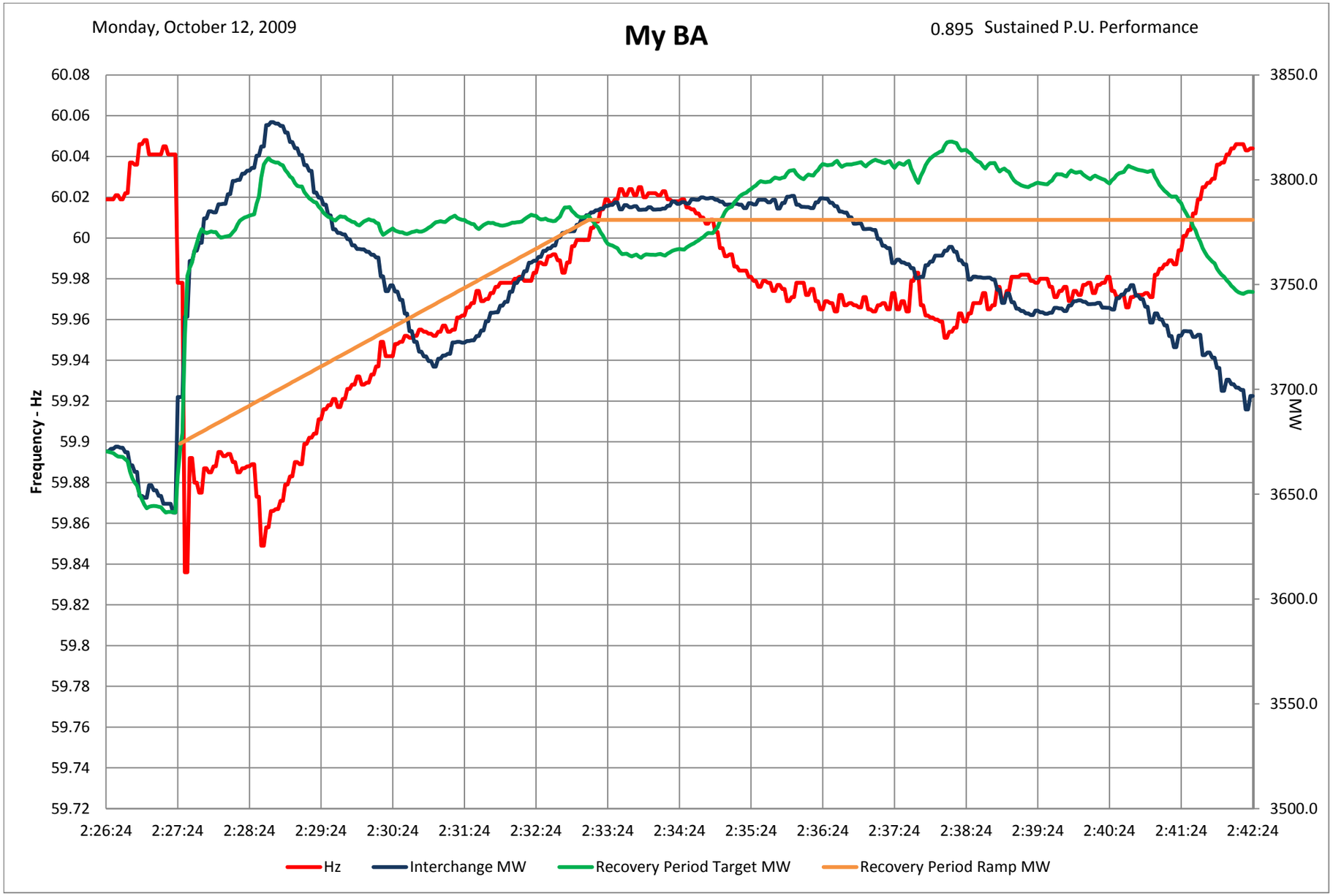
erturbation Bias Setting	-103.000	MW/0.1 Hz
erturbation Bias Setting	-103.000	MW/0.1 Hz
e-Perturbation Average	-43.2598	MW
;t-Perturbation Average	114.5723	MW
FR for Bias Setting Delta	157.8321	MW
esponse Delivery of Bias	90.95%	
e-Perturbation BA Load	7575.405	MW
;t-Perturbation BA Load	7578.948	MW
bation BA Load Change	3.543	MW
ng Frequency Response	2.312	MW/0.1 Hz
BA Frequency Response	-2.47%	

BA Bias Setting MW/0.1 Hz	BA Load MW	EPFR MW	Expected Net Actual Interchange MW

-103.000	7575.405	-33.600	
-103.000	7575.405	-33.600	
-103.000	7575.405	-33.600	
-103.000	7575.405	-33.600	
-103.000	7575.405	-33.600	
-103.000	7575.405	-33.600	
-103.000	7575.405	-33.600	
-103.000	7575.405	-33.600	
-103.000	7578.948	88.988	3715.464
-103.000	7578.948	88.988	3715.464
-103.000	7578.948	88.988	3715.464

-103.000	7578.948	88.988	3715.464
-103.000	7578.948	88.988	3715.464
-103.000	7578.948	88.988	3715.464
-103.000	7578.948	88.988	3715.464
-103.000	7578.948	88.988	3715.464
-103.000	7578.948	88.988	3715.464
-103.000	7578.948	88.988	3715.464
-103.000	7578.948	88.988	3715.464
-103.000	7578.948	88.988	3715.464
-103.000	7578.948	88.988	3715.464
-103.000	7578.948	88.988	3715.464
-103.000	7578.948	88.988	3715.464
-103.000	7578.948	88.988	3715.464
-103.000	7578.948	88.988	3715.464
-103.000	7578.948	88.988	3715.464


Monday, October 12, 2009
Balancing Authority
My BA
1.171
Initial P.U. Performance
1.599
Initial P.U. Performance Adjusted
20 to 52 second Average Period Evaluation
60.0420
3788.85
3715.464
59.8888
3645.30
Frequency - Hz
MW
60.08
60.06
60.04
60.02
60
59.98
59.96
59.94
59.92
59.9
59.88
59.86
59.84
59.82
59.8
59.78
59.76
59.74
59.72
3850.0
3800.0
3750.0
3700.0
3650.0
3600.0
3550.0
2:26:24
2:26:34
2:26:44
2:26:54
2:27:04
2:27:14
2:27:24
2:27:34
2:27:44
2:27:54
2:28:04
2:28:14
2:28:24
Hz
Average Frequency
MW
Average MW
EPFR for FRO Adjusted


Monday, October 12, 2009
My BA
0.895 Sustained P.U. Performance
Frequency - Hz
MW
60.08
60.06
60.04
60.02
60
59.98
59.96
59.94
59.92
59.9
59.88
59.86
59.84
59.82
59.8
59.78
59.76
59.74
59.72
3850.0
3800.0
3750.0
3700.0
3650.0
3600.0
3550.0
3500.0
2:26:24
2:27:24
2:28:24
2:29:24
2:30:24
2:31:24
2:32:24
2:33:24
2:34:24
2:35:24
2:36:24
2:37:24
2:38:24
2:39:24
2:40:24
2:41:24
2:42:24
Hz
Interchange MW
Recovery Period Target MW
Recovery Period Ramp MW

Interconnection Performance

Date	A Point Time	FPointA Hz	A Value Hz	t(0) Time	C Value Hz
Monday, October 12, 2009	2:27:22	60.0410	60.0420	2:27:24	59.8360

Value B 12 to 24 sec Average Frequency	FR B 12 to 24 sec Average MW	Value B 18 to 30 sec Average Frequency	FR B 18 to 30 sec Average MW	Value B 20 to 40 sec Average Frequency	FR B 20 to 40 sec Average MW	Value B 18 to 52 sec Average Frequency	FR B 18 to 52 sec Average MW	Value B 20 to 52 sec Average Frequency	FR B 20 to 52 sec Average MW
59.8822861	-396.90693	59.8831427	-398.8954	59.8887648	-412.28807	59.8880001	-411.60431	59.8887648	-413.51972

Value A Data — BA Performance

Frequency Hz	Net Actual Interchange MW	JOU Dynamic Schedules Imp(-) Exp (+) MW	Non-Conforming Load Load (-) MW	Pumped Hydro Load (-) Gen (+) MW	Ramping Units Gen (+) MW	Transferred Frequency Response Rec (-) Del (+) MW	Contingent BA Lost Generation Load (-) Gen (+) MW	BA Bias Setting MW/0.1 Hz	BA Load MW	Bias Setting EPFR MW
60.042	3645.30	350.00	-165.48	0.00	114.25	-4.20	15.00	-103	7575.405	-43.2598

Value B — 12 to 24 second Average Period Evaluation

Frequency Hz	Net Actual Interchange MW	JOU Dynamic Schedules Imp(-) Exp (+) MW	Non-Conforming Load Load (-) MW	Pumped Hydro Load (-) Gen (+) MW	Ramping Units Gen (+) MW	Transferred Frequency Response Rec (-) Del (+) MW
59.882286	3770.95	335.00	-207.83	1.00	117.36	11.77

Value B 18 to 30 second Average Period Evaluation

Contingent BA Lost Generation Load (-) Gen (+) MW	Initial Performance Adjusted P.U.	Initial Performance Unadjusted P.U.	Sustained Performance P.U.	BA Bias Setting MW/0.1 Hz	BA Load MW	Bias Setting EPFR MW	Frequency Hz	Net Actual Interchange MW	JOU Dynamic Schedules Imp(-) Exp (+) MW	Non-Conforming Load Load (-) MW	Pumped Hydro Load (-) Gen (+) MW	Ramping Units Gen (+) MW	Transferred Frequency Response Rec (-) Del (+) MW/0.1 Hz	Contingent BA Lost Generation Load (-) Gen (+) MW	Initial Performance Adjusted P.U.
0.00	1.393	0.983	0.895	-103	7577.456	121.2453	59.883143	3779.63	335.00	-209.89	1.14	118.14	11.69	0.00	1.478

Value B 20 to 40 second Average Period Evaluation

Initial Performance Unadjusted P.U.	Sustained Performance P.U.	BA Bias Setting MW	BA Load MW	Bias Setting EPFR MW	Frequency Hz	Net Actual Interchange MW	JOU Dynamic Schedules Imp(-) Exp (+) MW	Non-Conforming Load Load (-) MW	Pumped Hydro Load (-) Gen (+) MW	Ramping Units Gen (+) MW	Transferred Frequency Response Rec (-) Del (+) MW/0.1 Hz	Contingent BA Lost Generation Load (-) Gen (+) MW	Initial Performance Adjusted P.U.	Initial Performance Unadjusted P.U.	Sustained Performance P.U.
1.057	0.895	-103	7577.974	120.363	59.888273	3784.13	335.00	-210.82	2.09	118.86	11.17	0.00	1.562	1.129	0.895

Value B 18 to 52 second Average Period Evaluation Value B

BA Bias Setting MW	BA Load MW	Bias Setting EPFR MW	Frequency Hz	Net Actual Interchange MW	JOU Dynamic Schedules Imp(-) Exp (+) MW	Non-Conforming Load Load (-) MW	Pumped Hydro Load (-) Gen (+) MW	Ramping Units Gen (+) MW	Transferred Frequency Response Rec (-) Del (+) MW	Contingent BA Lost Generation Load (-) Gen (+) MW	Initial Performance Adjusted P.U.	Initial Performance Unadjusted P.U.	Sustained Performance P.U.	BA Bias Setting MW/0.1 Hz	BA Load MW	Bias Setting EPFR MW	Frequency Hz
-103	7578.45	115.0787	59.888	3787.80	335.00	-211.75	3.33	119.50	11.20	0.00	1.581	1.157	0.895	-103	7578.87	115.3599	59.888765

20 to 52 second Average Period Evaluation

Net Actual Interchange MW	JOU Dynamic Schedules Imp(-) Exp (+) MW	Non-Conforming Load Load (-) MW	Pumped Hydro Load (-) Gen (+) MW	Ramping Units Gen (+) MW	Transferred Frequency Response Rec (-) Del (+) MW	Contingent BA Lost Generation Load (-) Gen (+) MW	Initial Performance Adjusted P.U.	Initial Performance Unadjusted P.U.	Sustained Performance P.U.	BA Bias Setting MW/0.1 Hz	BA Load MW	Bias Setting EPFR MW
3788.85	335.00	-165.48	3.47	119.62	11.12	0.00	1.599	1.171	0.895	-103	7578.948	114.5723

Steps **To be completed for each event evaluated.**

1 Set-up Data collection in exact same order as the "Data" sheet of this work book. Data should be in this order:
Column A: Date and Time in this format, mm/dd/yy HH:MM:SS
Column B: Frequency Hz
Column C: Net Actual Interchange
Column D: Joint Owned Unit dynamic schedule
Column E: Non Conforming Load
Column F: Pumped Hydro
Column G: Ramping units
Column H: Transferred Frequency Response
Column I: Contingent BA Lost load or generation
Column J: BA Bias Setting
Column K: BA Load

2 Note: Columns D, E, F, G and H are optional data. If you choose not to use these, leave the columns blank. Do not delete the columns. Use the sign (+/-) convention defined in FRS Form 1.

3 Data compression must be turned off for each data point. Quality data will give you quality results in the evaluation.

4 Data must be at 5 second sample rate for the full 25 minute minimum collection period that starts a minimum of two (2) minutes before the event begins and includes a minimum of 15 minutes after the beginning of the event.
The spreadsheet will work with up to 60 minutes of data. Be sure "Data" worksheet is clear of any old data.
If using PI historian as your data source, use "PasteSpecial/Values" to enter data into the spreadsheet. Do not include historian data collection formulas in the data. The data must be numbers not text.

5 Once data is in place in the "Data" worksheet, determine when the beginning of the event occurred. This is accomplished by knowing the UTC event time from the master event list.
Convert the UTC event time to your PI data time and then scroll through the Data worksheet column B data of frequency and observe when frequency moves from the normal, pre-event frequency.
This will usually be a single change in frequency of 0.008 to 0.010 Hz more or less. Note the row number in the worksheet that this change occurs. In this sample data spreadsheet this occurs in row 190 of the data.

6 Edit cell "C8" of the "Entry Data" worksheet, change the formula in the cell "C8" to reference the row number identified in step 5 above. In the sample data of this workbook this formula is: "=Data!A190"
If the correct row is selected, the "Graph 20 to 52s" worksheet will indicate the first change in frequency of the event on the center vertical grid line of the graph (Red Trend).

7 Determine the end of the event to be evaluated. Use the same rules that are used for DCS only look at frequency instead of ACE. Scroll down the frequency data in column B of the "Data" worksheet until frequency reaches 60 Hz or the pre-disturbance value. Note the row number in the worksheet that this occurs. In this sample data spreadsheet this occurs in row 258.

8 Edit cell "C11" of the "Entry Data" worksheet, change the formula in the cell "C11" to reference the row number identified in step 7 above. In the sample data of this workbook this formula is: "=Data!A258"

9 In cell "R41" of the "Evaluation" spreadsheet, enter the MW value of the unit(s) that tripped (from the Master Event List). This is only necessary for the "Interconnection" evaluation if you're interested.
It is not necessary to do this for the BA evaluation but it will provide a comparison of the BA frequency response as compared to the Interconnection frequency response.

10 Use the "copy" button provided to copy the evaluation and event specific data for the "FRS Form 1" of this field trial. This data is summarized in the correct order on worksheet "Form 1 Summary Data" of this workbook.
Use PasteSpecial/Values when pasting the data into FRS Form 1 on the appropriate event row.

Steps **To be completed once at the initial setup of the evaluation spreadsheet for your BA.**

A Enter the Balancing Authority name as you want it to appear on the graphs in cell "B1" of the "Entry Data" worksheet. For example: "NYISO".

B Enter your Balancing Authorities Frequency Response Obligation in cell "B2" of the "Entry Data" worksheet. For example: -80 MW/0.1 Hz (This value could change annually)

C For informational and educational purposes, a "Sustained" performance evaluation is provided in the "Evaluation" worksheet and in the "Sustained" Graph. This evaluation uses a Time Constant (TC) to model the frequency response of your BA.
The time constant is located in cell "L13" of the "Evaluation" spreadsheet and should be edited for the types of generators in your BA. Presently this time constant is set at 0.35.
The higher the value of the time constant, the faster the delivery of frequency response is expected. Setting the TC to 1.0 effectively turns off the delay and instantaneous frequency response will be modeled. Do not set higher than 1.0.
This time constant is only used in the "Sustained" evaluation and is not used for the Field Trial evaluation of performance to the FRO.
A typical setting for this time constant is 0.08 to 0.15 for hydro units, 0.10 to 0.20 for large steam turbines and 0.20 to 0.40 for combustion turbines.
By observing the slope of your "Interchange Actual" on the "Sustained" Graph, adjust the time constant until the initial slope of the "Target" is similar.
When set appropriately, the "Target" trend on the "Sustained" graph will model what Interchange Actual should have done during the event recovery period based on your minimum FRO.

Note: For ease of use, only the necessary worksheets are displayed. If you are interested in viewing graphs and other hidden worksheets, select the "tab" at the bottom, right click, select unhide and select the worksheet you wish to unhide.

Time (T)	Hz	Net Actual Interchange MW	JOU Dynamic Schedules Imp(-) Exp (+) MW	Non-Conforming Load Load (-) MW	Pumped Hydro Load (-) Gen (+) MW	Ramping Units Gen (+) MW	Transferred Frequency Response Rec (-) Del (+) MW/0.1 Hz	Contingent BA Lost Generation Load (-) Gen (+) MW	BA Bias Setting MW/0.1 Hz	BA Load MW
10/12/09 02:12:00	59.98	3669.878	350	351.361511	0	0	10	15	-103	7500
10/12/09 02:12:05	59.982	3670.949	350	351.361511	0	0.5	10	15	-103	7500.33
10/12/09 02:12:10	59.981	3671.548	350	351.361511	0	1	10	15	-103	7500.66
10/12/09 02:12:15	59.979	3672.174	350	357.94751	0	1.5	10	15	-103	7500.99
10/12/09 02:12:20	59.98	3674.263	350	357.94751	0	2	10	15	-103	7501.32
10/12/09 02:12:25	59.986	3675.092	350	357.94751	0	2.5	10	15	-103	7501.65
10/12/09 02:12:30	59.976	3669.33	350	357.94751	0	3	10	15	-103	7501.98
10/12/09 02:12:35	59.979	3673.56	350	357.94751	0	3.5	10	15	-103	7502.31
10/12/09 02:12:40	59.987	3673.834	350	360.234741	0	4	10	15	-103	7502.64
10/12/09 02:12:45	59.993	3671.22	350	360.234741	0	4.5	10	15	-103	7502.97
10/12/09 02:12:50	59.995	3671.283	350	360.234741	0	5	10	15	-103	7503.3
10/12/09 02:12:55	59.995	3668.129	350	360.234741	0	5.5	10	15	-103	7503.63
10/12/09 02:13:00	59.994	3669.291	350	360.234741	0	6	10	15	-103	7503.96
10/12/09 02:13:05	59.997	3670.683	350	346.525879	0	6.5	10	15	-103	7504.29
10/12/09 02:13:10	60.001	3670.212	350	346.525879	0	7	10	15	-103	7504.62
10/12/09 02:13:15	60.003	3671.184	350	346.525879	0	7.5	10	15	-103	7504.95
10/12/09 02:13:20	60	3670.267	350	346.525879	0	8	10	15	-103	7505.28
10/12/09 02:13:25	60.003	3670.249	350	346.525879	0	8.5	10	15	-103	7505.61
10/12/09 02:13:30	60.001	3669.899	350	296.443359	0	9	10	15	-103	7505.94
10/12/09 02:13:35	60.001	3671.628	350	296.443359	0	9.5	10	15	-103	7506.27
10/12/09 02:13:40	60.004	3671.968	350	296.443359	0	10	10	15	-103	7506.6
10/12/09 02:13:45	60.005	3671.875	350	296.443359	0	10.5	10	15	-103	7506.93
10/12/09 02:13:50	60.003	3672.873	350	296.443359	0	11	10	15	-103	7507.26
10/12/09 02:13:55	59.999	3673.531	350	341.061157	0	11.5	10	15	-103	7507.59
10/12/09 02:14:00	59.998	3673.186	350	341.061157	0	12	10	15	-103	7507.92
10/12/09 02:14:05	59.995	3673.365	350	341.061157	0	12.5	10	15	-103	7508.25
10/12/09 02:14:10	59.996	3672.093	350	341.061157	0	13	10	15	-103	7508.58
10/12/09 02:14:15	60.001	3671.073	350	341.061157	0	13.5	10	15	-103	7508.91
10/12/09 02:14:20	60.007	3671.441	350	322.826294	0	14	10	15	-103	7509.24

10/12/09 02:14:25	60.002	3670.513	350	322.826294	0	14.5	10	15	-103	7509.57
10/12/09 02:14:30	59.999	3672.713	350	322.826294	0	15	10	15	-103	7509.9
10/12/09 02:14:35	60.007	3670.826	350	322.826294	0	15.5	10	15	-103	7510.23
10/12/09 02:14:40	60.009	3671.809	350	322.826294	0	16	10	15	-103	7510.56
10/12/09 02:14:45	59.997	3673.255	350	321.544403	0	16.5	10	15	-103	7510.89
10/12/09 02:14:50	59.994	3675.426	350	321.544403	0	17	10	15	-103	7511.22
10/12/09 02:14:55	60.001	3675.311	350	321.544403	0	17.5	10	15	-103	7511.55
10/12/09 02:15:00	59.995	3675.166	350	321.544403	0	18	10	15	-103	7511.88
10/12/09 02:15:05	59.986	3674.906	350	321.544403	0	18.5	10	15	-103	7512.21
10/12/09 02:15:10	59.988	3676.714	350	362.136261	0	19	10	15	-103	7512.54
10/12/09 02:15:15	59.988	3675.543	350	362.136261	0	19.5	10	15	-103	7512.87
10/12/09 02:15:20	59.984	3676.931	350	362.136261	0	20	10	15	-103	7513.2
10/12/09 02:15:25	59.982	3677.361	350	362.136261	0	20.5	10	15	-103	7513.53
10/12/09 02:15:30	59.985	3679.228	350	362.136261	0	21	10	15	-103	7513.86
10/12/09 02:15:35	59.987	3677.627	350	336.311798	0	21.5	10	15	-103	7514.19
10/12/09 02:15:40	59.987	3676.409	350	336.311798	0	22	10	15	-103	7514.52
10/12/09 02:15:45	59.98	3676.915	350	336.311798	0	22.5	10	15	-103	7514.85
10/12/09 02:15:50	59.987	3679.233	350	336.311798	0	23	10	15	-103	7515.18
10/12/09 02:15:55	59.988	3678.344	350	336.311798	0	23.5	10	15	-103	7515.51
10/12/09 02:16:00	59.978	3677.678	350	316.443054	0	24	10	15	-103	7515.84
10/12/09 02:16:05	59.979	3678.729	350	316.443054	0	24.5	10	15	-103	7516.17
10/12/09 02:16:10	59.988	3680.287	350	316.443054	0	25	10	15	-103	7516.5
10/12/09 02:16:15	59.989	3678.489	350	316.443054	0	25.5	10	15	-103	7516.83
10/12/09 02:16:20	59.992	3678.74	350	316.443054	0	26	10	15	-103	7517.16
10/12/09 02:16:25	59.995	3677.063	350	325.464294	0	26.5	10	15	-103	7517.49
10/12/09 02:16:30	59.998	3678.49	350	325.464294	0	27	10	15	-103	7517.82
10/12/09 02:16:35	59.999	3678.951	350	325.464294	0	27.5	10	15	-103	7518.15
10/12/09 02:16:40	59.992	3679.148	350	325.464294	0	28	10	15	-103	7518.48
10/12/09 02:16:45	59.998	3678.997	350	325.464294	0	28.5	10	15	-103	7518.81
10/12/09 02:16:50	60.006	3678.493	350	336.614166	0	29	10	15	-103	7519.14
10/12/09 02:16:55	60.009	3677.899	350	336.614166	0	29.5	10	15	-103	7519.47
10/12/09 02:17:00	60.011	3679.209	350	336.614166	0	30	10	15	-103	7519.8
10/12/09 02:17:05	60.008	3679.057	350	336.614166	0	30.5	10	15	-103	7520.13
10/12/09 02:17:10	60.012	3680.604	350	336.614166	0	31	10	15	-103	7520.46

10/12/09 02:17:15	60.01	3680.263	350	316.726166	0	31.5	10	15	-103	7520.79
10/12/09 02:17:20	60.009	3679.561	350	316.726166	0	32	10	15	-103	7521.12
10/12/09 02:17:25	60.006	3679.912	350	316.726166	0	32.5	10	15	-103	7521.45
10/12/09 02:17:30	60.009	3679.888	350	316.726166	0	33	10	15	-103	7521.78
10/12/09 02:17:35	60.009	3679.261	350	316.726166	0	33.5	10	15	-103	7522.11
10/12/09 02:17:40	60.004	3679.025	350	320.195526	0	34	10	15	-103	7522.44
10/12/09 02:17:45	59.999	3678.295	350	320.195526	0	34.5	10	15	-103	7522.77
10/12/09 02:17:50	59.994	3678.236	350	320.195526	0	35	10	15	-103	7523.1
10/12/09 02:17:55	59.994	3677.772	350	320.195526	0	35.5	10	15	-103	7523.43
10/12/09 02:18:00	59.995	3677.093	350	320.195526	0	36	10	15	-103	7523.76
10/12/09 02:18:05	59.99	3678.516	350	341.86615	0	36.5	10	15	-103	7524.09
10/12/09 02:18:10	59.983	3680.197	350	341.86615	0	37	10	15	-103	7524.42
10/12/09 02:18:15	59.977	3677.921	350	341.86615	0	37.5	10	15	-103	7524.75
10/12/09 02:18:20	59.999	3682.07	350	341.86615	0	38	10	15	-103	7525.08
10/12/09 02:18:25	59.989	3678.077	350	341.86615	0	38.5	10	15	-103	7525.41
10/12/09 02:18:30	59.984	3678.427	350	348.597839	0	39	10	15	-103	7525.74
10/12/09 02:18:35	59.985	3677.822	350	348.597839	0	39.5	10	15	-103	7526.07
10/12/09 02:18:40	59.986	3677.397	350	348.597839	0	40	10	15	-103	7526.4
10/12/09 02:18:45	59.981	3678.617	350	348.597839	0	40.5	10	15	-103	7526.73
10/12/09 02:18:50	59.998	3681.252	350	348.597839	0	41	10	15	-103	7527.06
10/12/09 02:18:55	60.007	3678.161	350	329.085022	0	41.5	10	15	-103	7527.39
10/12/09 02:19:00	59.981	3676.222	350	329.085022	0	42	10	15	-103	7527.72
10/12/09 02:19:05	59.974	3677.49	350	329.085022	0	42.5	10	15	-103	7528.05
10/12/09 02:19:10	59.974	3675.437	350	329.085022	0	43	10	15	-103	7528.38
10/12/09 02:19:15	59.979	3683.829	350	329.085022	0	43.5	10	15	-103	7528.71
10/12/09 02:19:20	59.984	3681.108	350	342.418243	0	44	10	15	-103	7529.04
10/12/09 02:19:25	59.988	3676.752	350	342.418243	0	44.5	10	15	-103	7529.37
10/12/09 02:19:30	59.987	3671.942	350	342.418243	0	45	10	15	-103	7529.7
10/12/09 02:19:35	59.985	3670.129	350	342.418243	0	45.5	10	15	-103	7530.03
10/12/09 02:19:40	59.983	3672.048	350	342.418243	0	46	10	15	-103	7530.36
10/12/09 02:19:45	59.989	3672.414	350	338.794647	0	46.5	10	15	-103	7530.69
10/12/09 02:19:50	59.982	3671.837	350	338.794647	0	47	10	15	-103	7531.02
10/12/09 02:19:55	59.981	3670.372	350	338.794647	0	47.5	10	15	-103	7531.35
10/12/09 02:20:00	59.986	3671.401	350	338.794647	0	48	10	15	-103	7531.68

10/12/09 02:20:05	59.987	3670.296	350	338.794647	0	48.5	10	15	-103	7532.01
10/12/09 02:20:10	59.98	3668.59	350	335.931	0	49	10	15	-103	7532.34
10/12/09 02:20:15	59.98	3670.263	350	335.931	0	49.5	10	15	-103	7532.67
10/12/09 02:20:20	59.981	3670.102	350	335.931	0	50	10	15	-103	7533
10/12/09 02:20:25	59.98	3672.442	350	335.931	0	50.5	10	15	-103	7533.33
10/12/09 02:20:30	59.98	3671.947	350	335.931	0	51	10	15	-103	7533.66
10/12/09 02:20:35	59.977	3670.137	350	339.712402	0	51.5	10	15	-103	7533.99
10/12/09 02:20:40	59.979	3672.391	350	339.712402	0	52	10	15	-103	7534.32
10/12/09 02:20:45	59.977	3672.626	350	339.712402	0	52.5	10	15	-103	7534.65
10/12/09 02:20:50	59.973	3673.183	350	339.712402	0	53	10	15	-103	7534.98
10/12/09 02:20:55	59.973	3676.623	350	339.712402	0	53.5	10	15	-103	7535.31
10/12/09 02:21:00	59.975	3676.543	350	332.024658	0	54	10	15	-103	7535.64
10/12/09 02:21:05	59.977	3675.256	350	332.024658	0	54.5	10	15	-103	7535.97
10/12/09 02:21:10	59.98	3671.277	350	332.024658	0	55	10	15	-103	7536.3
10/12/09 02:21:15	59.981	3669.963	350	332.024658	0	55.5	10	15	-103	7536.63
10/12/09 02:21:20	59.982	3669.497	350	332.024658	0	56	10	15	-103	7536.96
10/12/09 02:21:25	59.981	3666.482	350	330.759033	0	56.5	10	15	-103	7537.29
10/12/09 02:21:30	59.985	3666.911	350	330.759033	0	57	10	15	-103	7537.62
10/12/09 02:21:35	59.989	3667.456	350	330.759033	0	57.5	10	15	-103	7537.95
10/12/09 02:21:40	59.998	3665.262	350	330.759033	0	58	10	15	-103	7538.28
10/12/09 02:21:45	60.004	3663.229	350	330.759033	0	58.5	10	15	-103	7538.61
10/12/09 02:21:50	60.013	3661.695	350	323.419952	0	59	10	15	-103	7538.94
10/12/09 02:21:55	60.013	3662.959	350	323.419952	0	59.5	10	15	-103	7539.27
10/12/09 02:22:00	60.01	3664.139	350	323.419952	0	60	10	15	-103	7539.6
10/12/09 02:22:05	60.019	3663.265	350	323.419952	0	60.5	10	15	-103	7539.93
10/12/09 02:22:10	60.02	3661.929	350	323.419952	0	61	10	15	-103	7540.26
10/12/09 02:22:15	60.021	3658.661	350	342.350922	0	61.5	10	15	-103	7540.59
10/12/09 02:22:20	60.019	3657.571	350	342.350922	0	62	10	15	-103	7540.92
10/12/09 02:22:25	60.025	3658.015	350	342.350922	0	62.5	10	15	-103	7541.25
10/12/09 02:22:30	60.02	3659.224	350	342.350922	0	63	10	15	-103	7541.58
10/12/09 02:22:35	60.018	3658.155	350	342.350922	0	63.5	10	15	-103	7541.91
10/12/09 02:22:40	60.019	3659.778	350	345.081818	0	64	10	15	-103	7542.24
10/12/09 02:22:45	60.023	3662.387	350	345.081818	0	64.5	10	15	-103	7542.57
10/12/09 02:22:50	60.025	3662.39	350	345.081818	0	65	10	15	-103	7542.9

10/12/09 02:22:55	60.02	3663.539	350	345.081818	0	65.5	10	15	-103	7543.23
10/12/09 02:23:00	60.02	3662.552	350	345.081818	0	66	10	15	-103	7543.56
10/12/09 02:23:05	60.021	3663.91	350	346.537384	0	66.5	10	15	-103	7543.89
10/12/09 02:23:10	60.014	3662.791	350	346.537384	0	67	10	15	-103	7544.22
10/12/09 02:23:15	60.013	3664.315	350	346.537384	0	67.5	10	15	-103	7544.55
10/12/09 02:23:20	60.008	3665.798	350	346.537384	0	68	10	15	-103	7544.88
10/12/09 02:23:25	60.011	3667.677	350	346.537384	0	68.5	10	15	-103	7545.21
10/12/09 02:23:30	60.009	3666.688	350	342.905762	0	69	10	15	-103	7545.54
10/12/09 02:23:35	60.009	3667.696	350	342.905762	0	69.5	10	15	-103	7545.87
10/12/09 02:23:40	60.002	3667.043	350	342.905762	0	70	10	15	-103	7546.2
10/12/09 02:23:45	59.996	3665.88	350	342.905762	0	70.5	10	15	-103	7546.53
10/12/09 02:23:50	59.998	3665.802	350	342.905762	0	71	10	15	-103	7546.86
10/12/09 02:23:55	59.998	3664.948	350	340.094391	0	71.5	10	15	-103	7547.19
10/12/09 02:24:00	59.995	3666.133	350	340.094391	0	72	10	15	-103	7547.52
10/12/09 02:24:05	59.993	3667.084	350	340.094391	0	72.5	10	15	-103	7547.85
10/12/09 02:24:10	59.982	3667.337	350	340.094391	0	73	10	15	-103	7548.18
10/12/09 02:24:15	59.982	3668.691	350	340.094391	0	73.5	10	15	-103	7548.51
10/12/09 02:24:20	59.982	3669.606	350	342.771179	0	74	10	15	-103	7548.84
10/12/09 02:24:25	59.978	3670.265	350	342.771179	0	74.5	10	15	-103	7549.17
10/12/09 02:24:30	59.974	3673.243	350	342.771179	0	75	10	15	-103	7549.5
10/12/09 02:24:35	59.979	3676.418	350	342.771179	0	75.5	10	15	-103	7549.83
10/12/09 02:24:40	59.98	3674.637	350	342.771179	0	76	10	15	-103	7550.16
10/12/09 02:24:45	59.987	3674.768	350	342.909912	0	76.5	10	15	-103	7550.49
10/12/09 02:24:50	59.99	3673.514	350	342.909912	0	77	10	15	-103	7550.82
10/12/09 02:24:55	59.991	3673.056	350	342.909912	0	77.5	10	15	-103	7551.15
10/12/09 02:25:00	59.993	3671.493	350	342.909912	0	78	10	15	-103	7551.48
10/12/09 02:25:05	59.996	3670.028	350	342.909912	0	78.5	10	15	-103	7551.81
10/12/09 02:25:10	60.003	3671.578	350	343.286011	0	79	10	15	-103	7552.14
10/12/09 02:25:15	60.005	3673.819	350	343.286011	0	79.5	10	15	-103	7552.47
10/12/09 02:25:20	60.004	3673.182	350	343.286011	0	80	10	15	-103	7552.8
10/12/09 02:25:25	60.01	3672.363	350	343.286011	0	80.5	10	15	-103	7553.13
10/12/09 02:25:30	60.011	3672.261	350	343.286011	0	81	10	15	-103	7553.46
10/12/09 02:25:35	60.014	3673.553	350	331.852966	0	81.5	10	15	-103	7553.79
10/12/09 02:25:40	60.011	3674.537	350	331.852966	0	82	10	15	-103	7554.12

10/12/09 02:25:45	60.017	3672.563	350	331.852966	0	82.5	10	15	-103	7554.45
10/12/09 02:25:50	60.014	3672.388	350	331.852966	0	83	10	15	-103	7554.78
10/12/09 02:25:55	60.014	3671.288	350	331.852966	0	83.5	10	15	-103	7555.11
10/12/09 02:26:00	60.019	3672.982	350	329.98822	0	84	10	15	-103	7555.44
10/12/09 02:26:05	60.019	3671.193	350	329.98822	0	84.5	10	15	-103	7555.77
10/12/09 02:26:10	60.026	3671.189	350	329.98822	0	85	10	15	-103	7556.1
10/12/09 02:26:15	60.019	3664.495	350	329.98822	0	85.5	10	15	-103	7556.43
10/12/09 02:26:20	60.02	3666.821	350	329.98822	0	86	10	15	-103	7556.76
10/12/09 02:26:25	60.021	3670.267	350	255.444168	0	86.5	10	15	-103	7557.09
10/12/09 02:26:30	60.019	3672.493	350	165.101685	0	87	10	15	-103	7557.42
10/12/09 02:26:35	60.022	3672.164	350	165.101685	0	87.5	10	15	-103	7557.75
10/12/09 02:26:40	60.037	3669.983	350	165.101685	0	88	10	15	-103	7558.08
10/12/09 02:26:45	60.037	3661.599	350	165.101685	0	88.5	10	15	-103	7558.41
10/12/09 02:26:50	60.048	3651.492	350	165.101685	0	89	10	15	-103	7558.74
10/12/09 02:26:55	60.041	3648.246	350	165.476395	0	89.5	10	15	-103	7559.07
10/12/09 02:27:00	60.039	3654.294	350	165.476395	0	90	10	15	-103	7559.4
10/12/09 02:27:05	60.043	3651.059	350	165.476395	0	90.5	10	15	-103	7559.73
10/12/09 02:27:10	60.041	3648.236	350	165.476395	0	91	10	15	-103	7560.06
10/12/09 02:27:15	60.041	3645.446	350	165.476395	0	91.5	10	15	-103	7560.39
10/12/09 02:27:20	59.852	3641.191	335	206.459106	1	92	10	0	-103	7560.72
10/12/09 02:27:25	59.869	3734.904	335	206.459106	1	92.5	10	0	-103	7561.05
10/12/09 02:27:30	59.88	3737.157	335	206.459106	1	93	10	0	-103	7561.38
10/12/09 02:27:35	59.875	3766.194	335	206.459106	1	93.5	10	0	-103	7561.71
10/12/09 02:27:40	59.886	3769.925	335	206.459106	1	94	10	0	-103	7562.04
10/12/09 02:27:45	59.887	3782.5	335	211.256042	1	94.5	10	0	-103	7562.37
10/12/09 02:27:50	59.895	3784.73	335	211.256042	1	95	10	0	-103	7562.7
10/12/09 02:27:55	59.893	3788.328	335	211.256042	2	95.5	10	0	-103	7563.03
10/12/09 02:28:00	59.891	3788.472	335	211.256042	3	96	10	0	-103	7563.36
10/12/09 02:28:05	59.885	3794.374	335	211.256042	4	96.5	10	0	-103	7563.69
10/12/09 02:28:10	59.887	3800.427	335	214.346695	5	97	10	0	-103	7564.02
10/12/09 02:28:15	59.888	3802.925	335	214.346695	6	97.5	10	0	-103	7564.35
10/12/09 02:28:20	59.882	3804.388	335	214.346695	7	98	10	0	-103	7564.68
10/12/09 02:28:25	59.857	3809.237	335	214.346695	8	98.5	10	0	-103	7565.01
10/12/09 02:28:30	59.858	3814.862	335	214.346695	9	99	10	0	-103	7565.34

10/12/09 02:28:35	59.866	3826.053	335	212.172699	10	99.5	10	0	-103	7565.67
10/12/09 02:28:40	59.866	3827.524	335	212.172699	11	100	10	0	-103	7566
10/12/09 02:28:45	59.874	3826.454	335	212.172699	12	100.5	10	0	-103	7566.33
10/12/09 02:28:50	59.883	3823.826	335	212.172699	13	101	10	0	-103	7566.66
10/12/09 02:28:55	59.89	3818.055	335	212.172699	14	101.5	10	0	-103	7566.99
10/12/09 02:29:00	59.893	3815.01	335	215.598175	15	102	10	0	-103	7567.32
10/12/09 02:29:05	59.903	3809.652	335	215.598175	16	102.5	10	0	-103	7567.65
10/12/09 02:29:10	59.904	3805.593	335	215.598175	16	103	10	0	-103	7567.98
10/12/09 02:29:15	59.911	3793.975	335	215.598175	16	103.5	10	0	-103	7568.31
10/12/09 02:29:20	59.917	3791.502	335	215.598175	16	104	10	0	-103	7568.64
10/12/09 02:29:25	59.92	3784.563	335	218.327255	16	104.5	10	0	-103	7568.97
10/12/09 02:29:30	59.917	3781.701	335	218.327255	16	105	10	0	-103	7569.3
10/12/09 02:29:35	59.921	3774.604	335	218.327255	16	105.5	10	0	-103	7569.63
10/12/09 02:29:40	59.925	3773.958	335	218.327255	16	106	10	0	-103	7569.96
10/12/09 02:29:45	59.927	3769.63	335	218.327255	16	106.5	10	0	-103	7570.29
10/12/09 02:29:50	59.928	3767.643	335	217.379425	0	107	10	0	-103	7570.62
10/12/09 02:29:55	59.929	3766.788	335	217.379425	0	107.5	10	0	-103	7570.95
10/12/09 02:30:00	59.937	3765.672	335	217.379425	0	108	10	0	-103	7571.28
10/12/09 02:30:05	59.945	3765.105	335	217.379425	0	108.5	10	0	-103	7571.61
10/12/09 02:30:10	59.942	3758.387	335	217.379425	0	109	10	0	-103	7571.94
10/12/09 02:30:15	59.942	3746.889	335	214.830353	0	109.5	10	0	-103	7572.27
10/12/09 02:30:20	59.947	3749.593	335	214.830353	0	110	10	0	-103	7572.6
10/12/09 02:30:25	59.951	3749.077	335	214.830353	0	110.5	10	0	-103	7572.93
10/12/09 02:30:30	59.951	3740.259	335	214.830353	0	111	10	0	-103	7573.26
10/12/09 02:30:35	59.952	3727.838	335	214.830353	0	111.5	10	0	-103	7573.59
10/12/09 02:30:40	59.952	3722.649	335	227.655914	0	112	10	0	-103	7573.92
10/12/09 02:30:45	59.952	3718.142	335	227.655914	0	112.5	10	0	-103	7574.25
10/12/09 02:30:50	59.952	3713.694	335	227.655914	0	113	10	0	-103	7574.58
10/12/09 02:30:55	59.954	3710.81	335	227.655914	0	113.5	10	0	-103	7574.91
10/12/09 02:31:00	59.956	3714.623	335	227.655914	0	114	10	0	-103	7575.24
10/12/09 02:31:05	59.956	3716.461	335	225.018082	0	114.5	10	0	-103	7575.57
10/12/09 02:31:10	59.961	3717.759	335	225.018082	0	115	10	0	-103	7575.9
10/12/09 02:31:15	59.962	3722.658	335	225.018082	0	115.5	10	0	-103	7576.23
10/12/09 02:31:20	59.966	3722.278	335	225.018082	0	116	10	0	-103	7576.56

10/12/09 02:31:25	59.97	3723.984	335	225.018082	0	116.5	10	0	-103	7576.89
10/12/09 02:31:30	59.969	3723.893	335	228.365158	0	117	10	0	-103	7577.22
10/12/09 02:31:35	59.97	3728.053	335	228.365158	0	117.5	10	0	-103	7577.55
10/12/09 02:31:40	59.973	3732.53	335	228.365158	0	118	10	0	-103	7577.88
10/12/09 02:31:45	59.978	3736.907	335	228.365158	0	118.5	10	0	-103	7578.21
10/12/09 02:31:50	59.978	3738.699	335	228.365158	0	119	10	0	-103	7578.54
10/12/09 02:31:55	59.978	3741.794	335	234.075333	0	119.5	10	0	-103	7578.87
10/12/09 02:32:00	59.982	3746.608	335	234.075333	0	120	10	0	-103	7579.2
10/12/09 02:32:05	59.98	3751.558	335	234.075333	0	120.5	10	0	-103	7579.53
10/12/09 02:32:10	59.979	3755.599	335	234.075333	0	121	10	0	-103	7579.86
10/12/09 02:32:15	59.983	3760.405	335	234.075333	0	121.5	10	0	-103	7580.19
10/12/09 02:32:20	59.989	3761.407	335	228.798157	0	122	10	0	-103	7580.52
10/12/09 02:32:25	59.987	3764.958	335	228.798157	0	122.5	10	0	-103	7580.85
10/12/09 02:32:30	59.992	3766.433	335	354.89566	0	123	10	0	-103	7581.18
10/12/09 02:32:35	59.989	3768.634	335	354.89566	0	123.5	10	0	-103	7581.51
10/12/09 02:32:40	59.983	3772.445	335	340.46936	0	124	10	0	-103	7581.84
10/12/09 02:32:45	59.993	3775.841	335	340.46936	0	124.5	10	0	-103	7582.17
10/12/09 02:32:50	59.999	3774.866	335	340.46936	0	125	10	0	-103	7582.5
10/12/09 02:32:55	59.999	3778.554	335	340.46936	0	125.5	10	0	-103	7582.83
10/12/09 02:33:00	60.002	3781.256	335	340.46936	0	126	10	0	-103	7583.16
10/12/09 02:33:05	60.007	3783.896	335	337.642914	0	126.5	10	0	-103	7583.49
10/12/09 02:33:10	60.014	3785.768	335	337.642914	0	127	10	0	-103	7583.82
10/12/09 02:33:15	60.019	3786.304	335	337.642914	0	127.5	10	0	-103	7584.15
10/12/09 02:33:20	60.017	3787.516	335	337.642914	0	128	10	0	-103	7584.48
10/12/09 02:33:25	60.023	3788.607	335	337.642914	0	128.5	10	0	-103	7584.81
10/12/09 02:33:30	60.021	3787.537	335	284.36084	0	129	10	0	-103	7585.14
10/12/09 02:33:35	60.024	3787.93	335	284.36084	0	129.5	10	0	-103	7585.47
10/12/09 02:33:40	60.02	3786.875	350	284.36084	0	130	10	0	-103	7585.8
10/12/09 02:33:45	60.024	3785.018	350	284.36084	0	130.5	10	0	-103	7586.13
10/12/09 02:33:50	60.022	3785.949	350	284.36084	0	131	10	0	-103	7586.46
10/12/09 02:33:55	60.022	3786.877	350	260.467987	0	131.5	10	0	-103	7586.79
10/12/09 02:34:00	60.023	3785.726	350	260.467987	0	132	10	0	-103	7587.12
10/12/09 02:34:05	60.022	3785.798	350	260.467987	0	132.5	10	0	-103	7587.45
10/12/09 02:34:10	60.018	3786.939	350	260.467987	0	133	10	0	-103	7587.78

10/12/09 02:34:15	60.018	3789.673	350	260.467987	0	133.5	10	0	-103	7588.11
10/12/09 02:34:20	60.016	3788.479	350	253.141541	0	134	10	0	-103	7588.44
10/12/09 02:34:25	60.016	3789.005	350	253.141541	0	134.5	10	0	-103	7588.77
10/12/09 02:34:30	60.012	3788.933	350	253.141541	0	135	10	0	-103	7589.1
10/12/09 02:34:35	60.01	3790.411	350	253.141541	0	135.5	10	0	-103	7589.43
10/12/09 02:34:40	60.009	3791.54	350	253.141541	0	136	10	0	-103	7589.76
10/12/09 02:34:45	60.01	3791.443	350	251.929871	0	136.5	10	0	-103	7590.09
10/12/09 02:34:50	59.995	3790.603	350	251.929871	0	137	10	0	-103	7590.42
10/12/09 02:34:55	59.991	3789.585	350	251.929871	0	137.5	10	0	-103	7590.75
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10/12/09 02:35:10	59.984	3788.571	350	250.674194	0	139	10	0	-103	7591.74
10/12/09 02:35:15	59.981	3786.453	350	250.674194	0	139.5	10	0	-103	7592.07
10/12/09 02:35:20	59.977	3788.813	350	250.674194	0	140	10	0	-103	7592.4
10/12/09 02:35:25	59.976	3788.41	350	250.674194	0	140.5	10	0	-103	7592.73
10/12/09 02:35:30	59.978	3790.665	350	250.674194	0	141	10	0	-103	7593.06
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10/12/09 02:35:40	59.977	3790.43	350	253.631866	0	142	10	0	-103	7593.72
10/12/09 02:35:45	59.973	3787.442	350	253.631866	0	142.5	10	0	-103	7594.05
10/12/09 02:35:50	59.971	3790.602	350	253.631866	0	143	10	0	-103	7594.38
10/12/09 02:35:55	59.978	3792.311	350	253.631866	0	143.5	10	0	-103	7594.71
10/12/09 02:36:00	59.975	3788.08	350	246.957306	0	144	10	15	-103	7595.04
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10/12/09 02:36:10	59.969	3787.405	350	246.957306	0	145	10	15	-103	7595.7
10/12/09 02:36:15	59.965	3789.214	350	246.957306	0	145.5	10	15	-103	7596.03
10/12/09 02:36:20	59.97	3791.221	350	246.957306	0	146	10	15	-103	7596.36
10/12/09 02:36:25	59.965	3788.824	350	254.541779	0	146.5	10	15	-103	7596.69
10/12/09 02:36:30	59.972	3789.167	350	254.541779	0	147	10	15	-103	7597.02
10/12/09 02:36:35	59.967	3784.831	350	254.541779	0	147.5	10	15	-103	7597.35
10/12/09 02:36:40	59.969	3784.32	350	254.541779	0	148	10	15	-103	7597.68
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10/12/09 02:36:55	59.965	3776.429	350	256.571594	0	149.5	10	15	-103	7598.67
10/12/09 02:37:00	59.97	3776.597	350	256.571594	0	150	10	15	-103	7599

10/12/09 02:37:05	59.969	3773.17	350	256.571594	0	150.5	10	15	-103	7599.33
10/12/09 02:37:10	59.965	3768.793	350	256.571594	0	151	10	15	-103	7599.66
10/12/09 02:37:15	59.973	3767.366	350	258.37262	0	151.5	10	15	-103	7599.99
10/12/09 02:37:20	59.968	3760.295	350	258.37262	0	152	10	15	-103	7600.32
10/12/09 02:37:25	59.967	3761.777	350	258.37262	0	152.5	10	15	-103	7600.65
10/12/09 02:37:30	59.979	3760.157	350	258.37262	0	153	10	15	-103	7600.98
10/12/09 02:37:35	59.983	3757.773	350	258.37262	0	153.5	10	15	-103	7601.31
10/12/09 02:37:40	59.965	3753.087	350	263.047363	0	154	10	15	-103	7601.64
10/12/09 02:37:45	59.962	3758.225	350	263.047363	0	154.5	10	15	-103	7601.97
10/12/09 02:37:50	59.96	3758.041	350	263.047363	0	155	10	15	-103	7602.3
10/12/09 02:37:55	59.959	3763.822	350	263.047363	0	155.5	10	15	-103	7602.63
10/12/09 02:38:00	59.953	3763.858	350	263.047363	0	156	10	15	-103	7602.96
10/12/09 02:38:05	59.957	3768.339	350	260.984375	0	156.5	10	15	-103	7603.29
10/12/09 02:38:10	59.963	3767.438	350	260.984375	0	157	10	15	-103	7603.62
10/12/09 02:38:15	59.959	3761.57	350	260.984375	0	157.5	10	15	-103	7603.95
10/12/09 02:38:20	59.965	3759.627	350	260.984375	0	158	10	15	-103	7604.28
10/12/09 02:38:25	59.968	3750.102	350	260.984375	0	158.5	10	15	-103	7604.61
10/12/09 02:38:30	59.973	3753.51	350	261.318329	0	159	10	15	-103	7604.94
10/12/09 02:38:35	59.965	3753.178	350	261.318329	0	159.5	10	15	-103	7605.27
10/12/09 02:38:40	59.972	3753.291	350	261.318329	0	160	10	15	-103	7605.6
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10/12/09 02:38:50	59.974	3740.37	350	261.318329	0	161	10	15	-103	7606.26
10/12/09 02:38:55	59.981	3745.738	350	262.1026	0	161.5	10	15	-103	7606.59
10/12/09 02:39:00	59.982	3741.618	350	262.1026	0	162	10	15	-103	7606.92
10/12/09 02:39:05	59.984	3738.901	350	262.1026	0	162.5	10	15	-103	7607.25
10/12/09 02:39:10	59.979	3737.273	350	262.1026	0	163	10	15	-103	7607.58
10/12/09 02:39:15	59.978	3735.448	350	262.1026	0	163.5	10	15	-103	7607.91
10/12/09 02:39:20	59.981	3737.541	350	262.71701	0	164	10	15	-103	7608.24
10/12/09 02:39:25	59.978	3736.693	350	262.71701	0	164.5	10	15	-103	7608.57
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10/12/09 02:39:35	59.974	3738.875	350	262.71701	0	165.5	10	15	-103	7609.23
10/12/09 02:39:40	59.972	3738.647	350	262.71701	0	166	10	15	-103	7609.56
10/12/09 02:39:45	59.971	3737.892	350	260.016479	0	166.5	10	15	-103	7609.89
10/12/09 02:39:50	59.972	3740.329	350	260.016479	0	167	10	15	-103	7610.22

10/12/09 02:39:55	59.977	3742.524	350	260.016479	0	167.5	10	15	-103	7610.55
10/12/09 02:40:00	59.976	3741.723	350	260.016479	0	168	10	15	-103	7610.88
10/12/09 02:40:05	59.974	3739.964	350	260.016479	0	168.5	10	15	-103	7611.21
10/12/09 02:40:10	59.978	3742.833	350	263.87323	0	169	10	15	-103	7611.54
10/12/09 02:40:15	59.981	3738.966	350	263.87323	0	169.5	10	15	-103	7611.87
10/12/09 02:40:20	59.971	3738.879	350	263.87323	0	170	10	15	-103	7612.2
10/12/09 02:40:25	59.971	3738.558	350	263.87323	0	170.5	10	15	-103	7612.53
10/12/09 02:40:30	59.966	3743.419	350	263.87323	0	171	10	15	-103	7612.86
10/12/09 02:40:35	59.971	3747.34	350	264.5979	0	171.5	10	15	-103	7613.19
10/12/09 02:40:40	59.969	3749.75	350	264.5979	0	172	10	15	-103	7613.52
10/12/09 02:40:45	59.974	3743.745	350	264.5979	0	172.5	10	15	-103	7613.85
10/12/09 02:40:50	59.971	3740.299	350	264.5979	0	173	10	15	-103	7614.18
10/12/09 02:40:55	59.982	3731.83	350	264.5979	0	173.5	10	15	-103	7614.51
10/12/09 02:41:00	59.985	3736.229	350	262.415924	0	174	10	15	-103	7614.84
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10/12/09 02:41:10	59.987	3729.18	350	262.415924	0	175	10	15	-103	7615.5
10/12/09 02:41:15	59.994	3720.108	350	262.415924	0	175.5	10	15	-103	7615.83
10/12/09 02:41:20	60.003	3725.661	350	262.415924	0	176	10	15	-103	7616.16
10/12/09 02:41:25	60.006	3727.825	350	259.685242	0	176.5	10	15	-103	7616.49
10/12/09 02:41:30	60.019	3727.231	350	259.685242	0	177	10	15	-103	7616.82
10/12/09 02:41:35	60.025	3726.016	350	259.685242	0	177.5	10	15	-103	7617.15
10/12/09 02:41:40	60.029	3716.375	350	259.685242	0	178	10	15	-103	7617.48
10/12/09 02:41:45	60.037	3717.142	350	259.685242	0	178.5	10	15	-103	7617.81
10/12/09 02:41:50	60.037	3713.632	350	255.911011	0	179	10	15	-103	7618.14
10/12/09 02:41:55	60.041	3699.356	350	255.911011	0	179.5	10	15	-103	7618.47
10/12/09 02:42:00	60.043	3704.591	350	255.911011	0	180	10	15	-103	7618.8
10/12/09 02:42:05	60.048	3701.316	350	255.911011	0	180.5	10	15	-103	7619.13
10/12/09 02:42:10	60.043	3699.529	350	255.911011	0	181	10	15	-103	7619.46
10/12/09 02:42:15	60.044	3690.477	350	258.148193	0	181.5	10	15	-103	7619.79
10/12/09 02:42:20	60.045	3696.877	350	258.148193	0	182	10	15	-103	7620.12
10/12/09 02:42:25	60.041	3696.968	350	258.148193	0	182.5	10	15	-103	7620.45
10/12/09 02:42:30	60.036	3699.631	350	258.148193	0	183	10	15	-103	7620.78
10/12/09 02:42:35	60.033	3700.106	350	258.148193	0	183.5	10	15	-103	7621.11
10/12/09 02:42:40	60.037	3701.122	350	258.873596	0	184	10	15	-103	7621.44

10/12/09 02:42:45	60.03	3701.998	350	258.873596	0	184.5	10	15	-103	7621.77
10/12/09 02:42:50	60.033	3703.909	350	258.873596	0	185	10	15	-103	7622.1
10/12/09 02:42:55	60.032	3704.087	350	258.873596	0	185.5	10	15	-103	7622.43
10/12/09 02:43:00	60.033	3703.706	350	258.873596	0	186	10	15	-103	7622.76
10/12/09 02:43:05	60.035	3704.36	350	249.33757	0	186.5	10	15	-103	7623.09
10/12/09 02:43:10	60.039	3702.204	350	249.33757	0	187	10	15	-103	7623.42
10/12/09 02:43:15	60.039	3703.318	350	249.33757	0	187.5	10	15	-103	7623.75
10/12/09 02:43:20	60.038	3702.525	350	249.33757	0	188	10	15	-103	7624.08
10/12/09 02:43:25	60.037	3702.865	350	249.33757	0	188.5	10	15	-103	7624.41
10/12/09 02:43:30	60.04	3702.28	350	258.278168	0	189	10	15	-103	7624.74
10/12/09 02:43:35	60.045	3700.276	350	258.278168	0	189.5	10	15	-103	7625.07
10/12/09 02:43:40	60.043	3697.729	350	258.278168	0	190	10	15	-103	7625.4
10/12/09 02:43:45	60.044	3697.346	350	258.278168	0	190.5	10	15	-103	7625.73
10/12/09 02:43:50	60.034	3694.763	350	258.278168	0	191	10	15	-103	7626.06
10/12/09 02:43:55	60.039	3696.798	350	258.406372	0	191.5	10	15	-103	7626.39
10/12/09 02:44:00	60.034	3701.791	350	258.406372	0	192	10	15	-103	7626.72
10/12/09 02:44:05	60.032	3702.148	350	258.406372	0	192.5	10	15	-103	7627.05
10/12/09 02:44:10	60.027	3707.521	350	258.406372	0	193	10	15	-103	7627.38
10/12/09 02:44:15	60.032	3707.34	350	258.406372	0	193.5	10	15	-103	7627.71
10/12/09 02:44:20	60.033	3707.384	350	260.538879	0	194	10	15	-103	7628.04
10/12/09 02:44:25	60.039	3706.823	350	260.538879	0	194.5	10	15	-103	7628.37
10/12/09 02:44:30	60.035	3701.582	350	260.538879	0	195	10	15	-103	7628.7
10/12/09 02:44:35	60.04	3702.212	350	260.538879	0	195.5	10	15	-103	7629.03
10/12/09 02:44:40	60.036	3700.397	350	260.538879	0	196	10	15	-103	7629.36
10/12/09 02:44:45	60.045	3700.827	350	257.88208	0	196.5	10	15	-103	7629.69
10/12/09 02:44:50	60.042	3696.935	350	257.88208	0	197	10	15	-103	7630.02
10/12/09 02:44:55	60.044	3693.824	350	257.88208	0	197.5	10	15	-103	7630.35
10/12/09 02:45:00	60.041	3696.897	350	257.88208	0	198	10	15	-103	7630.68
10/12/09 02:45:05	60.045	3697.502	350	257.88208	0	198.5	10	15	-103	7631.01
10/12/09 02:45:10	60.039	3700.177	350	258.588654	0	199	10	15	-103	7631.34
10/12/09 02:45:15	60.042	3697.681	350	258.588654	0	199.5	10	15	-103	7631.67
10/12/09 02:45:20	60.036	3698.359	350	258.588654	0	200	10	15	-103	7632
10/12/09 02:45:25	60.039	3700.262	350	258.588654	0	200.5	10	15	-103	7632.33
10/12/09 02:45:30	60.039	3700.902	350	258.588654	0	201	10	15	-103	7632.66

10/12/09 02:45:35	60.038	3701.139	350	261.906158	0	201.5	10	15	-103	7632.99
10/12/09 02:45:40	60.037	3700.264	350	261.906158	0	202	10	15	-103	7633.32
10/12/09 02:45:45	60.037	3700.458	350	261.906158	0	202.5	10	15	-103	7633.65
10/12/09 02:45:50	60.036	3698.794	350	261.906158	0	203	10	15	-103	7633.98
10/12/09 02:45:55	60.033	3700.661	350	261.906158	0	203.5	10	15	-103	7634.31
10/12/09 02:46:00	60.032	3702.968	350	256.747803	0	204	10	15	-103	7634.64
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10/12/09 02:46:10	60.036	3703.744	350	256.747803	0	205	10	15	-103	7635.3
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10/12/09 02:46:20	60.034	3705.059	350	256.747803	0	206	10	15	-103	7635.96
10/12/09 02:46:25	60.038	3703.831	350	167.431976	0	206.5	10	15	-103	7636.29
10/12/09 02:46:30	60.042	3702.795	350	167.431976	0	207	10	15	-103	7636.62
10/12/09 02:46:35	60.04	3696.25	350	167.431976	0	207.5	10	15	-103	7636.95
10/12/09 02:46:40	60.043	3693.518	350	167.431976	0	208	10	15	-103	7637.28
10/12/09 02:46:45	60.04	3695.186	350	167.431976	0	208.5	10	15	-103	7637.61
10/12/09 02:46:50	60.044	3694.753	350	164.973404	0	209	10	15	-103	7637.94
10/12/09 02:46:55	60.036	3694.159	350	164.973404	0	209.5	10	15	-103	7638.27
10/12/09 02:47:00	60.042	3692.686	350	164.973404	0	210	10	15	-103	7638.6
10/12/09 02:47:05	60.043	3692.357	350	164.973404	0	210.5	10	15	-103	7638.93
10/12/09 02:47:10	60.039	3690.836	350	164.973404	0	211	10	15	-103	7639.26
10/12/09 02:47:15	60.034	3694.117	350	157.628082	0	211.5	10	15	-103	7639.59
10/12/09 02:47:20	60.035	3695.581	350	157.628082	0	212	10	15	-103	7639.92
10/12/09 02:47:25	60.03	3696.305	350	157.628082	0	212.5	10	15	-103	7640.25
10/12/09 02:47:30	60.031	3697.336	350	157.628082	0	213	10	15	-103	7640.58
10/12/09 02:47:35	60.032	3699.251	350	157.628082	0	213.5	10	15	-103	7640.91
10/12/09 02:47:40	60.032	3699.105	350	155.531708	0	214	10	15	-103	7641.24
10/12/09 02:47:45	60.033	3698.136	350	155.531708	0	214.5	10	15	-103	7641.57
10/12/09 02:47:50	60.039	3697.412	350	155.531708	0	215	10	15	-103	7641.9
10/12/09 02:47:55	60.036	3693.224	350	155.531708	0	215.5	10	15	-103	7642.23
10/12/09 02:48:00	60.04	3691.919	350	155.531708	0	216	10	15	-103	7642.56
10/12/09 02:48:05	60.036	3692.374	350	160.447235	0	216.5	10	15	-103	7642.89
10/12/09 02:48:10	60.041	3694.71	350	160.447235	0	217	10	15	-103	7643.22
10/12/09 02:48:15	60.036	3693.617	350	160.447235	0	217.5	10	15	-103	7643.55
10/12/09 02:48:20	60.038	3694.27	350	160.447235	0	218	10	15	-103	7643.88

10/12/09 02:48:25	60.041	3692.532	350	160.447235	0	218.5	10	15	-103	7644.21
10/12/09 02:48:30	60.036	3691.012	350	163.958603	0	219	10	15	-103	7644.54
10/12/09 02:48:35	60.038	3693.727	350	163.958603	0	219.5	10	15	-103	7644.87
10/12/09 02:48:40	60.034	3692.641	350	163.958603	0	220	10	15	-103	7645.2
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10/12/09 02:48:50	60.029	3693.172	350	163.958603	0	221	10	15	-103	7645.86
10/12/09 02:48:55	60.03	3695.225	350	166.072449	0	221.5	10	15	-103	7646.19
10/12/09 02:49:00	60.022	3693.412	350	166.072449	0	222	10	15	-103	7646.52
10/12/09 02:49:05	60.024	3698.012	350	166.072449	0	222.5	10	15	-103	7646.85
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10/12/09 02:49:15	60.025	3700.544	350	166.072449	0	223.5	10	15	-103	7647.51
10/12/09 02:49:20	60.025	3698.596	350	163.766586	0	224	10	15	-103	7647.84
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10/12/09 02:49:30	60.023	3701.45	350	163.766586	0	225	10	15	-103	7648.5
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10/12/09 02:49:40	60.024	3701.965	350	163.766586	0	226	10	15	-103	7649.16
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10/12/09 02:49:50	60.023	3701.205	350	165.101685	0	227	10	15	-103	7649.82
10/12/09 02:49:55	60.024	3700.177	350	165.101685	0	227.5	10	15	-103	7650.15
10/12/09 02:50:00	60.026	3700.277	350	165.101685	0	228	10	15	-103	7650.48
10/12/09 02:50:05	60.02	3700.26	350	165.101685	0	228.5	10	15	-103	7650.81
10/12/09 02:50:10	60.015	3699.926	350	165.476395	0	229	10	15	-103	7651.14
10/12/09 02:50:15	60.017	3703.516	350	165.476395	0	229.5	10	15	-103	7651.47
10/12/09 02:50:20	60.017	3703.672	350	165.476395	0	230	10	15	-103	7651.8
10/12/09 02:50:25	60.012	3702.921	350	165.476395	0	230.5	10	15	-103	7652.13
10/12/09 02:50:30	60.002	3703.167	350	165.476395	0	231	10	15	-103	7652.46
10/12/09 02:50:35	59.999	3703.775	350	206.459106	0	231.5	10	15	-103	7652.79
10/12/09 02:50:40	60.004	3701.534	350	206.459106	0	232	10	0	-103	7616
10/12/09 02:50:45	59.996	3700.625	335	206.459106	0	232.5	10	0	-103	7626
10/12/09 02:50:50	59.989	3701.737	335	206.459106	0	233	10	0	-103	7632
10/12/09 02:50:55	59.985	3700.977	335	206.459106	0	233.5	10	0	-103	7632
10/12/09 02:51:00	59.984	3699.854	335	211.256042	0	234	10	0	-103	7632
10/12/09 02:51:05	59.98	3700.77	335	211.256042	1	234.5	10	0	-103	7632
10/12/09 02:51:10	59.976	3701.625	335	211.256042	1	235	10	0	-103	7632

10/12/09 02:51:15	59.974	3704.785	335	211.256042	1	235.5	10	0	-103	7632
10/12/09 02:51:20	59.973	3706.958	335	211.256042	1	236	10	0	-103	7632
10/12/09 02:51:25	59.971	3706.257	335	214.346695	1	236.5	10	0	-103	7632
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10/12/09 02:51:45	59.978	3706.119	335	214.346695	3	238.5	10	0	-103	7632
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10/12/09 02:52:15	59.998	3705.639	335	215.598175	9	241.5	10	0	-103	7632
10/12/09 02:52:20	60.005	3703.191	335	215.598175	10	242	10	0	-103	7632
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10/12/09 02:52:35	60.025	3697.868	335	215.598175	13	243.5	10	0	-103	7632
10/12/09 02:52:40	60.023	3693.912	335	218.327255	14	244	10	0	-103	7632
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10/12/09 02:53:00	60.031	3685.576	335	218.327255	16	246	10	0	-103	7632
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10/12/09 02:53:15	60.016	3692.715	335	217.379425	16	247.5	10	0	-103	7631
10/12/09 02:53:20	60.012	3692.462	335	217.379425	16	248	10	0	-103	7625
10/12/09 02:53:25	60.008	3693.743	335	217.379425	16	248.5	10	0	-103	7623
10/12/09 02:53:30	60.005	3694.681	335	214.830353	16	249	10	0	-103	7621
10/12/09 02:53:35	59.999	3693.75	335	214.830353	16	249.5	10	0	-103	7623
10/12/09 02:53:40	60	3692.806	335	214.830353	16	250	10	0	-103	7625
10/12/09 02:53:45	59.995	3691.077	335	214.830353	16	250.5	10	0	-103	7627
10/12/09 02:53:50	59.993	3689.797	335	214.830353	16	251	10	0	-103	7628
10/12/09 02:53:55	59.985	3689.553	335	227.655914	16	251.5	10	0	-103	7628
10/12/09 02:54:00	59.988	3689.736	335	227.655914	16	252	10	0	-103	7629

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10/12/09 02:54:10	59.986	3686.707	335	227.655914	16	253	10	0	-103	7631
10/12/09 02:54:15	59.99	3684.333	335	227.655914	16	253.5	10	0	-103	7635
10/12/09 02:54:20	59.984	3683.735	335	225.018082	16	254	10	0	-103	7638
10/12/09 02:54:25	59.982	3683.473	335	225.018082	16	254.5	10	0	-103	7639
10/12/09 02:54:30	59.978	3684.884	335	225.018082	16	255	10	0	-103	7642
10/12/09 02:54:35	59.975	3685.087	335	225.018082	16	255.5	10	0	-103	7644
10/12/09 02:54:40	59.976	3685.196	335	225.018082	16	256	10	0	-103	7645
10/12/09 02:54:45	59.979	3688.599	335	228.365158	16	256.5	10	0	-103	7647
10/12/09 02:54:50	59.979	3686.678	335	228.365158	16	257	10	0	-103	7648
10/12/09 02:54:55	59.977	3685.143	335	228.365158	16	257.5	10	0	-103	7649
10/12/09 02:55:00	59.978	3684.093	335	228.365158	16	258	10	0	-103	7650
10/12/09 02:55:05	59.983	3682.318	335	228.365158	16	258.5	10	0	-103	7651
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10/12/09 02:55:40	59.993	3670.159	335	228.798157	16	262	10	0	-103	7656
10/12/09 02:55:45	59.994	3681.799	335	228.798157	16	262.5	10	0	-103	7657
10/12/09 02:55:50	59.984	3684.116	335	228.798157	16	263	10	0	-103	7657
10/12/09 02:55:55	59.985	3684.165	335	228.798157	16	263.5	10	0	-103	7658
10/12/09 02:56:00	59.986	3685.584	335	229.466965	16	264	10	0	-103	7658
10/12/09 02:56:05	59.985	3684.976	335	229.466965	16	264.5	10	0	-103	7659
10/12/09 02:56:10	59.982	3684.872	335	229.466965	16	265	10	0	-103	7659
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10/12/09 02:56:20	60.003	3682.579	335	229.466965	16	266	10	0	-103	7660
10/12/09 02:56:25	60.003	3682.224	335	228.980164	16	266.5	10	0	-103	7660
10/12/09 02:56:30	60.002	3681.458	335	228.980164	16	267	10	0	-103	7661
10/12/09 02:56:35	60.004	3680.167	335	228.980164	16	267.5	10	0	-103	7661
10/12/09 02:56:40	60.009	3679.429	335	228.980164	16	268	10	0	-103	7662
10/12/09 02:56:45	60.017	3678.267	335	228.980164	16	268.5	10	0	-103	7662
10/12/09 02:56:50	60.021	3676.81	335	219.975555	16	269	10	0	-103	7663

10/12/09 02:56:55	60.018	3671.145	335	219.975555	16	269.5	10	0	-103	7663
10/12/09 02:57:00	60.02	3673.648	335	219.975555	16	270	10	0	-103	7664
10/12/09 02:57:05	60.018	3676.676	335	219.975555	16	270.5	10	0	-103	7664
10/12/09 02:57:10	60.018	3676.437	335	219.975555	16	271	10	0	-103	7665
10/12/09 02:57:15	60.016	3678.828	335	229.089249	16	271.5	10	0	-103	7666
10/12/09 02:57:20	60.015	3678.915	335	229.089249	16	272	10	0	-103	7666
10/12/09 02:57:25	60.014	3678.367	335	229.089249	16	272.5	10	0	-103	7667
10/12/09 02:57:30	60.015	3678.589	335	229.089249	16	273	10	0	-103	7668
10/12/09 02:57:35	60.016	3674.669	335	229.089249	16	273.5	10	0	-103	7668
10/12/09 02:57:40	60.021	3674.402	335	229.663269	16	274	10	0	-103	7669
10/12/09 02:57:45	60.022	3671.914	335	229.663269	16	274.5	10	0	-103	7669
10/12/09 02:57:50	60.025	3670.946	335	229.663269	16	275	10	0	-103	7670
10/12/09 02:57:55	60.022	3671.539	335	229.663269	16	275.5	10	0	-103	7670
10/12/09 02:58:00	60.024	3674.01	335	229.663269	16	276	10	0	-103	7671
10/12/09 02:58:05	60.029	3676.051	335	229.233856	16	276.5	10	0	-103	7671
10/12/09 02:58:10	60.032	3672.583	335	229.233856	16	277	10	0	-103	7672
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10/12/09 02:58:20	60.021	3666.312	335	229.233856	16	278	10	0	-103	7673
10/12/09 02:58:25	60.025	3657.714	350	229.233856	16	278.5	10	0	-103	7673
10/12/09 02:58:30	60.023	3669.309	350	231.409882	16	279	10	0	-103	7673
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10/12/09 02:58:40	60.02	3672.683	350	231.409882	16	280	10	0	-103	7673
10/12/09 02:58:45	60.014	3675.641	350	231.409882	16	280.5	10	0	-103	7673
10/12/09 02:58:50	60.011	3677.009	350	231.409882	16	281	10	0	-103	7673
10/12/09 02:58:55	60.01	3680.02	350	218.622284	16	281.5	10	0	-103	7673
10/12/09 02:59:00	60.012	3679.597	350	218.622284	16	282	10	0	-103	7673
10/12/09 02:59:05	60.014	3679.062	350	218.622284	16	282.5	10	0	-103	7673
10/12/09 02:59:10	60.011	3679.587	350	218.622284	16	283	10	0	-103	7673
10/12/09 02:59:15	60.008	3678.418	350	218.622284	16	283.5	10	0	-103	7673
10/12/09 02:59:20	60.013	3679.681	350	213.535858	16	284	10	0	-103	7673
10/12/09 02:59:25	60.018	3678.469	350	213.535858	16	284.5	10	0	-103	7673
10/12/09 02:59:30	60.019	3678.456	350	213.535858	16	285	10	0	-103	7673
10/12/09 02:59:35	60.02	3677.431	350	213.535858	16	285.5	10	0	-103	7674
10/12/09 02:59:40	60.016	3677.315	350	213.535858	16	286	10	0	-103	7675

10/12/09 02:59:45	60.019	3678.874	350	225.651855	16	286.5	10	0	-103	7676
10/12/09 02:59:50	60.018	3681.058	350	225.651855	16	287	10	0	-103	7677
10/12/09 02:59:55	60.016	3679.553	350	225.651855	16	287.5	10	0	-103	7678
10/12/09 03:00:00	60.015	3682.73	350	225.651855	16	288	10	0	-103	7679
10/12/09 03:00:05	59.999	3681.915	350	225.651855	16	288.5	10	0	-103	7680
10/12/09 03:00:10	59.982	3683.813	350	212.573639	16	289	10	0	-103	7681
10/12/09 03:00:15	59.97	3684.643	350	212.573639	16	289.5	10	0	-103	7682
10/12/09 03:00:20	59.968	3689.404	350	212.573639	16	290	10	0	-103	7684
10/12/09 03:00:25	59.972	3693.793	350	212.573639	16	290.5	10	0	-103	7685
10/12/09 03:00:30	59.964	3694.974	350	212.573639	16	291	10	0	-103	7687
10/12/09 03:00:35	59.966	3698.617	350	219.897293	16	291.5	10	0	-103	7689
10/12/09 03:00:40	59.965	3699.85	350	219.897293	16	292	10	0	-103	7690
10/12/09 03:00:45	59.97	3702.218	350	219.897293	16	292.5	10	0	-103	7692
10/12/09 03:00:50	59.973	3703.365	350	219.897293	16	293	10	0	-103	7692
10/12/09 03:00:55	59.976	3704.899	350	219.897293	16	293.5	10	0	-103	7693
10/12/09 03:01:00	59.977	3704.293	350	231.1754	16	294	10	0	-103	7693
10/12/09 03:01:05	59.976	3703.142	350	231.1754	16	294.5	10	0	-103	7694
10/12/09 03:01:10	59.974	3705.376	350	231.1754	16	295	10	0	-103	7694
10/12/09 03:01:15	59.976	3706.776	350	231.1754	16	295.5	10	0	-103	7695
10/12/09 03:01:20	59.981	3706.928	350	231.1754	16	296	10	0	-103	7695
10/12/09 03:01:25	59.985	3706.771	350	226.634125	16	296.5	10	0	-103	7695
10/12/09 03:01:30	59.979	3704.127	350	226.634125	16	297	10	0	-103	7696
10/12/09 03:01:35	59.987	3705.968	350	226.634125	16	297.5	10	0	-103	7696
10/12/09 03:01:40	59.98	3704.683	350	226.634125	16	298	10	0	-103	7697
10/12/09 03:01:45	59.984	3704.988	350	226.634125	16	298.5	10	0	-103	7697
10/12/09 03:01:50	59.989	3704.893	350	227.255066	16	299	10	0	-103	7697
10/12/09 03:01:55	59.996	3701.795	350	227.255066	16	299.5	10	0	-103	7698
10/12/09 03:02:00	59.997	3701.308	350	227.255066	16	300	10	0	-103	7698
10/12/09 03:02:05	59.997	3700.541	350	227.255066	16	300.5	10	0	-103	7698.33
10/12/09 03:02:10	59.996	3700.858	350	227.255066	16	301	10	0	-103	7698.66
10/12/09 03:02:15	60.003	3700.224	350	229.290222	16	301.5	10	0	-103	7698.99
10/12/09 03:02:20	60.008	3698.032	350	229.290222	16	302	10	0	-103	7699.32
10/12/09 03:02:25	60.004	3699.241	350	229.290222	16	302.5	10	0	-103	7699.65
10/12/09 03:02:30	60.001	3701.11	350	229.290222	16	303	10	0	-103	7699.98

10/12/09 03:02:35	60.004	3700.22	350	229.290222	16	303.5	10	0	-103	7700.31
10/12/09 03:02:40	60.008	3702.554	350	221.461365	16	304	10	0	-103	7700.64
10/12/09 03:02:45	60.006	3701.923	350	221.461365	16	304.5	10	0	-103	7700.97
10/12/09 03:02:50	60.005	3704.093	350	221.461365	16	305	10	0	-103	7701.3
10/12/09 03:02:55	59.999	3704.455	350	221.461365	16	305.5	10	0	-103	7701.63
10/12/09 03:03:00	60.004	3705.329	350	221.461365	16	306	10	0	-103	7701.96
10/12/09 03:03:05	60.013	3703.675	350	241.274368	16	306.5	10	0	-103	7702.29
10/12/09 03:03:10	60.012	3702.669	350	241.274368	16	307	10	0	-103	7702.62
10/12/09 03:03:15	60.005	3703.297	350	241.274368	16	307.5	10	0	-103	7702.95
10/12/09 03:03:20	60.011	3705.279	350	241.274368	16	308	10	0	-103	7703.28
10/12/09 03:03:25	60.016	3703.438	350	241.274368	16	308.5	10	0	-103	7703.61
10/12/09 03:03:30	60.019	3703.708	350	243.071854	16	309	10	0	-103	7703.94
10/12/09 03:03:35	60.013	3704.139	350	243.071854	16	309.5	10	0	-103	7704.27
10/12/09 03:03:40	60.009	3705.429	350	243.071854	16	310	10	0	-103	7704.6
10/12/09 03:03:45	60.009	3705.634	350	243.071854	16	310.5	10	0	-103	7704.93
10/12/09 03:03:50	60.02	3707.267	350	243.071854	16	311	10	0	-103	7705.26
10/12/09 03:03:55	60.018	3705.655	350	241.670212	16	311.5	10	0	-103	7705.59
10/12/09 03:04:00	60.019	3704.224	350	241.670212	16	312	10	0	-103	7705.92
10/12/09 03:04:05	60.022	3704.795	350	241.670212	16	312.5	10	0	-103	7706.25
10/12/09 03:04:10	60.03	3702.764	350	241.670212	16	313	10	0	-103	7706.58
10/12/09 03:04:15	60.023	3701.063	350	241.670212	16	313.5	10	0	-103	7706.91
10/12/09 03:04:20	60.023	3699.369	350	228.149307	16	314	10	0	-103	7707.24
10/12/09 03:04:25	60.024	3704.25	350	228.149307	16	314.5	10	0	-103	7707.57
10/12/09 03:04:30	60.022	3703.374	350	228.149307	16	315	10	0	-103	7707.9
10/12/09 03:04:35	60.025	3704.947	350	228.149307	16	315.5	10	0	-103	7708.23
10/12/09 03:04:40	60.02	3703.541	350	228.149307	16	316	10	0	-103	7708.56
10/12/09 03:04:45	60.013	3704.376	350	235.128983	16	316.5	10	0	-103	7708.89
10/12/09 03:04:50	60.017	3706.995	350	235.128983	16	317	10	0	-103	7709.22
10/12/09 03:04:55	60.019	3707.767	350	235.128983	16	317.5	10	0	-103	7709.55
10/12/09 03:05:00	60.015	3708.831	350	235.128983	16	318	10	0	-103	7709.88
10/12/09 03:05:05	60.014	3709.817	350	235.128983	16	318.5	10	0	-103	7710.21
10/12/09 03:05:10	60.019	3709.094	350	246.433136	16	319	10	0	-103	7710.54
10/12/09 03:05:15	60.014	3709.933	350	246.433136	16	319.5	10	0	-103	7710.87
10/12/09 03:05:20	60.022	3710.591	350	246.433136	16	320	10	0	-103	7711.2

10/12/09 03:05:25	60.024	3707.38	350	246.433136	16	320.5	10	0	-103	7711.53
10/12/09 03:05:30	60.024	3706.99	350	246.433136	16	321	10	0	-103	7711.86
10/12/09 03:05:35	60.02	3704.406	350	236.553543	16	321.5	10	0	-103	7712.19
10/12/09 03:05:40	60.025	3706.567	350	236.553543	16	322	10	0	-103	7712.52
10/12/09 03:05:45	60.03	3704.428	350	236.553543	16	322.5	10	0	-103	7712.85
10/12/09 03:05:50	60.026	3703.532	350	236.553543	16	323	10	0	-103	7713.18
10/12/09 03:05:55	60.029	3703.169	350	236.553543	16	323.5	10	0	-103	7713.51
10/12/09 03:06:00	60.03	3701.52	350	230.297562	16	324	10	0	-103	7713.84
10/12/09 03:06:05	60.016	3698.009	350	230.297562	16	324.5	10	0	-103	7714.17
10/12/09 03:06:10	60.028	3703.192	350	230.297562	16	325	10	0	-103	7714.5
10/12/09 03:06:15	60.015	3699.956	350	230.297562	16	325.5	10	0	-103	7714.83
10/12/09 03:06:20	60.011	3703.802	350	230.297562	16	326	10	0	-103	7715.16
10/12/09 03:06:25	60.013	3707.49	350	231.175537	16	326.5	10	0	-103	7715.49
10/12/09 03:06:30	60.016	3706.991	350	231.175537	16	327	10	0	-103	7715.82
10/12/09 03:06:35	60.013	3705.398	350	231.175537	16	327.5	10	0	-103	7716.15
10/12/09 03:06:40	59.994	3709.144	350	231.175537	16	328	10	0	-103	7716.48
10/12/09 03:06:45	59.99	3706.193	350	231.175537	16	328.5	10	0	-103	7716.81
10/12/09 03:06:50	59.993	3707.903	350	225.61763	16	329	10	0	-103	7717.14
10/12/09 03:06:55	59.993	3706.683	350	225.61763	16	329.5	10	0	-103	7717.47
10/12/09 03:07:00	59.985	3704.934	350	225.61763	16	330	10	0	-103	7717.8
10/12/09 03:07:05	59.982	3707.071	350	225.61763	16	330.5	10	0	-103	7718.13
10/12/09 03:07:10	59.981	3707.479	350	225.61763	16	331	10	0	-103	7718.46
10/12/09 03:07:15	59.978	3710.419	350	230.734421	16	331.5	10	0	-103	7718.79
10/12/09 03:07:20	59.977	3708.708	350	230.734421	16	332	10	0	-103	7719.12
10/12/09 03:07:25	59.983	3708.335	350	230.734421	16	332.5	10	0	-103	7719.45
10/12/09 03:07:30	59.981	3707.911	350	230.734421	16	333	10	0	-103	7719.78
10/12/09 03:07:35	59.981	3709.689	350	230.734421	16	333.5	10	0	-103	7720.11
10/12/09 03:07:40	59.98	3706.541	350	234.847107	16	334	10	0	-103	7720.44
10/12/09 03:07:45	59.978	3712.303	350	234.847107	16	334.5	10	0	-103	7720.77
10/12/09 03:07:50	59.976	3711.703	350	234.847107	16	335	10	0	-103	7721.1
10/12/09 03:07:55	59.975	3714.612	350	234.847107	16	335.5	10	0	-103	7721.43
10/12/09 03:08:00	59.975	3715.323	350	234.847107	16	336	10	0	-103	7721.76
10/12/09 03:08:05	59.975	3714.717	350	228.960922	16	336.5	10	0	-103	7722.09
10/12/09 03:08:10	59.977	3713.996	350	228.960922	16	337	10	0	-103	7722.42

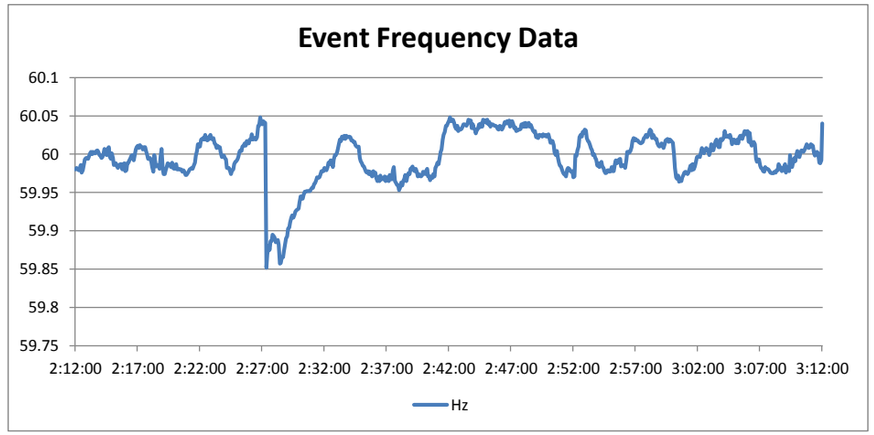
10/12/09 03:08:15	59.976	3715.631	350	228.960922	16	337.5	10	0	-103	7722.75
10/12/09 03:08:20	59.979	3715.567	350	228.960922	16	338	10	0	-103	7723.08
10/12/09 03:08:25	59.979	3713.142	350	228.960922	16	338.5	10	0	-103	7723.41
10/12/09 03:08:30	59.987	3712.275	350	231.177917	16	339	10	0	-103	7723.74
10/12/09 03:08:35	59.984	3710.05	350	231.177917	16	339.5	10	0	-103	7724.07
10/12/09 03:08:40	59.98	3710.472	350	231.177917	16	340	10	0	-103	7724.4
10/12/09 03:08:45	59.978	3710.2	350	231.177917	16	340.5	10	0	-103	7724.73
10/12/09 03:08:50	59.982	3709.462	350	231.177917	16	341	10	0	-103	7725.06
10/12/09 03:08:55	59.983	3710.573	350	236.489288	16	341.5	10	0	-103	7725.39
10/12/09 03:09:00	59.987	3708.371	350	236.489288	16	342	10	0	-103	7725.72
10/12/09 03:09:05	59.976	3707.49	350	236.489288	16	342.5	10	0	-103	7726.05
10/12/09 03:09:10	59.983	3709.894	350	236.489288	16	343	10	0	-103	7726.38
10/12/09 03:09:15	59.981	3711.627	350	236.489288	16	343.5	10	0	-103	7726.71
10/12/09 03:09:20	59.978	3712.393	350	245.038925	16	344	10	0	-103	7727.04
10/12/09 03:09:25	59.999	3716.626	350	245.038925	16	344.5	10	0	-103	7727.37
10/12/09 03:09:30	59.986	3712.092	350	245.038925	16	345	10	0	-103	7727.7
10/12/09 03:09:35	59.983	3714.953	350	245.038925	16	345.5	10	0	-103	7728.03
10/12/09 03:09:40	59.99	3716.308	350	245.038925	16	346	10	0	-103	7728.36
10/12/09 03:09:45	59.995	3714.714	350	223.605682	16	346.5	10	0	-103	7728.69
10/12/09 03:09:50	59.991	3715.927	350	223.605682	16	347	10	0	-103	7729.02
10/12/09 03:09:55	60	3715.324	350	223.605682	16	347.5	10	0	-103	7729.35
10/12/09 03:10:00	60.004	3711.708	350	223.605682	16	348	10	0	-103	7729.68
10/12/09 03:10:05	59.999	3713.362	350	223.605682	16	348.5	10	0	-103	7730.01
10/12/09 03:10:10	59.996	3718.292	350	231.119354	16	349	10	0	-103	7730.34
10/12/09 03:10:15	60.002	3717.815	350	231.119354	16	349.5	10	0	-103	7730.67
10/12/09 03:10:20	60.005	3718.56	350	231.119354	16	350	10	0	-103	7731
10/12/09 03:10:25	60.004	3718.821	350	231.119354	16	350.5	10	0	-103	7731.33
10/12/09 03:10:30	60.003	3719.299	350	231.119354	16	351	10	0	-103	7731.66
10/12/09 03:10:35	60.006	3719.731	350	237.20665	16	351.5	10	0	-103	7731.99
10/12/09 03:10:40	60.01	3718.58	350	237.20665	16	352	10	0	-103	7732.32
10/12/09 03:10:45	60.013	3720.034	350	237.20665	16	352.5	10	0	-103	7732.65
10/12/09 03:10:50	60.009	3720.811	350	237.20665	16	353	10	0	-103	7732.98
10/12/09 03:10:55	60.008	3719.447	350	237.20665	16	353.5	10	0	-103	7733.31
10/12/09 03:11:00	60.009	3721.272	350	240.516373	16	354	10	0	-103	7733.64

10/12/09 03:11:05	60.013	3721.594	350	240.516373	16	354.5	10	0	-103	7733.97
10/12/09 03:11:10	60.012	3721.999	350	240.516373	16	355	10	0	-103	7734.3
10/12/09 03:11:15	60.011	3720.86	350	240.516373	16	355.5	10	0	-103	7734.63
10/12/09 03:11:20	60.001	3723.816	350	240.516373	16	356	10	0	-103	7734.96
10/12/09 03:11:25	59.998	3724.869	350	237.566055	16	356.5	10	0	-103	7735.29
10/12/09 03:11:30	60.002	3723.696	350	237.566055	16	357	10	0	-103	7735.62
10/12/09 03:11:35	60.003	3721.879	350	237.566055	16	357.5	10	0	-103	7735.95
10/12/09 03:11:40	60.001	3722.906	350	237.566055	16	358	10	0	-103	7736.28
10/12/09 03:11:45	59.989	3723.201	350	237.566055	16	358.5	10	0	-103	7736.61
10/12/09 03:11:50	59.988	3723.881	350	231.581421	16	359	10	0	-103	7736.94
10/12/09 03:11:55	59.992	3724.944	350	231.581421	16	359.5	10	0	-103	7737.27
10/12/09 03:12:00	60.04	3723.693	350	231.581421	16	360	10	0	-103	7737.6

Balancing Authority Name:	My BA
Balancing Authority Frequency Response Obligation (FRO from FRS Form 1)	-80

Note: See "Instruction" tab for more detailed instructions.

Step 1.	Copy and Paste Event Data into the appropriate cells of the "Data" worksheet. Maintain date and time format of mm/dd/yy hh:mm:ss.	
Step 2.	Determine Time of T(0) and edit formula in cell "C8" to reference the correct row of the "Data" worksheet. T(0) is the first change in frequency of about 0.010 Hz (10 mHz) which should be the first scan of frequency data of the event.	2:27:20
Step 3.	Time of Frequency Recovery to 60 Hz or Pre-Perturbation Hz	2:33:00
Step 4.	Enter MW output of generator or load that caused event (+ for gen loss, - for load loss) (Value from NERC Event List. If multiple units, enter total MW loss.) If MW loss value is not known, enter a default 1000 MW.	633 MW
Step 5.	Hit the big blue button to copy your data for pasting into FRS Form 1 "BA Event Data" worksheet.	Copy Form 2 Data for Pasting into Form 1
Step 6.	Paste data into "FRS Form 1" in the appropriate row on the "BA Event Data" worksheet.	



Step 7. Save this workbook using the following file name format:MyBA_yymmdd_hhmm_FRS_Form2.xlsm

09/10/12 Date yymmdd

2:27 Time hh:ss of T(0)

Where "MyBA" = your BA mnemonic

scan rate	2 seconds	Date:	Monday, October 12, 2009		Balancing Authority	My BA	
		Time of T(0)	2:27:20		Grid Nominal Frequency	60.000	Hz
		Time of Frequency Recovery to 60 Hz or Pre-Perturbation Hz	2:33:00		Capacity @ Droop for Minimum Performance	2400.0	MW
		Value A Pre-Perturbation Average Frequency [T(-2) to T(-16)]	60.0413	Hz	Droop Setting	5.00% 3.00000	Hz
		Value B Post-Perturbation Average Frequency [T(+20 to T(+52)]	59.8883	Hz	Deadband Setting	0.000	Hz
		Pre to Post Perturbation Delta Frequency Actual	-0.153	Hz	Hz Span	3.00000	Hz
		Value A Pre-Perturbation Average Interchange MW [T(-2) to T(-16)]	3649.00	MW	Frequency Response Obligation (FRO)	-80	MW/0.1 Hz
		Value B Post-Perturbation Average Interchange MW [T(+20 to T(+52)]	3785.20	MW			
		Pre to Post Perturbation Interchange Delta MW Actual	136.20	MW			
		Initial Performance Ramp Magnitude Adjustment	-12.61	MW			
		EPFR Pre-Perturbation Average	-33.00	MW			
		EPFR Post-Perturbation Average	89.36	MW			
		EPFR Delta	122.36	MW	TC (frequency response filter constant)	0.350	Time Constant for delayed delivery of PFR during Sustained Measure
						Low Hz	Delta Hz Event
						3763.51	Actual Interchange MW Average during frequency recovery period
						3781.52	Target Interchange MW Average during frequency recovery period
EPFR = Expected Primary Frequency Response		EPFR(Final)	109.75	MW		3727.24	Interchange Average Ramp MW during frequency recovery period
		MW Response in right direction for frequency delta	Yes			3645.45	Actual MW @ T(-4)
						98.66	Starting and Ending Difference in Interchange MW during frequency recovery pe
						0:05:40	Event Duration (h:mm:ss)
						No	Target MW Average minus MW @ T(-4) less than zero
						136.07	Interchange Target Relative Average Change - MW (Low Frequency Event)
						118.06	Interchange Actual Relative Average Change - MW (Low Frequency Event)
						No	Interchange Actual Average minus MW @ T(-4) less than zero
						Yes	Interchange Average MW minus MW @ T(-4) greater than zero
						Yes	Interchange Target MW Average minus MW @ T(-4) greater than zero
						37.41	Interchange Target Relative Average Change - MW (High Frequency Event)
						19.40	Interchange Actual Relative Average Change - MW (High Frequency Event)
						Up	Ramp Direction during frequency recovery period
		Initial Response P.U. Performance	1.241	P.U.		0.868	P.U. Sustianed Response P.U. Performance

	T	Frequency Hz	Interchange MW	Value B 20 to 52 sec Average Frequency	Average MW	FRO (EPFR) Expected Primary Frequency Response	(TC) Delayed Delivery Frequency Response	Initial Measure Final Expected Primary Frequency Response	Average Ramp MW/scan	Recovery Period Target MW	Average Output During Recovery Period MW	Average Target During Recovery Period MW	Recovery Period Ramp MW	Average Ramp During Recovery Period MW	Generator Trip MW
T-72 sec	2:26:08	60.019	3671.193			-15.201	-5.320								633
T-70 sec	2:26:10	60.026	3671.189			-20.801	-10.738								
T-68 sec	2:26:12	60.026	3671.189			-20.801	-14.260								

T-66 sec	2:26:14	60.026	3671.189			-20.801	-16.549										
T-64 sec	2:26:16	60.019	3664.495			-15.201	-16.077										
T-62 sec	2:26:18	60.019	3664.495			-15.201	-15.771										
T-60 sec	2:26:20	60.02	3666.821			-16.000	-15.851		-0.150	3666.821							
T-58 sec	2:26:22	60.02	3666.821			-16.000	-15.903		-0.150	3666.618							
T-56 sec	2:26:24	60.02	3666.821			-16.000	-15.937		-0.150	3666.434							
T-54 sec	2:26:26	60.021	3670.267			-16.800	-16.239		-0.150	3665.982							
T-52 sec	2:26:28	60.021	3670.267			-16.800	-16.435		-0.150	3665.635							
T-50 sec	2:26:30	60.019	3672.493			-15.201	-16.003		-0.150	3665.917							
T-48 sec	2:26:32	60.019	3672.493			-15.201	-15.722		-0.150	3666.047							
T-46 sec	2:26:34	60.019	3672.493			-15.201	-15.540		-0.150	3666.080							
T-44 sec	2:26:36	60.022	3672.164			-17.599	-16.261		-0.150	3665.208							
T-42 sec	2:26:38	60.022	3672.164			-17.599	-16.729		-0.150	3664.590							
T-40 sec	2:26:40	60.037	3669.983			-29.599	-21.234		-0.150	3659.935							
T-38 sec	2:26:42	60.037	3669.983			-29.599	-24.162		-0.150	3656.857							
T-36 sec	2:26:44	60.037	3669.983			-29.599	-26.065		-0.150	3654.803							
T-34 sec	2:26:46	60.037	3661.599			-29.599	-27.302		-0.150	3653.416							
T-32 sec	2:26:48	60.037	3661.599			-29.599	-28.106		-0.150	3652.461							
T-30 sec	2:26:50	60.048	3651.492			-38.400	-31.709		-0.150	3648.708							
T-28 sec	2:26:52	60.048	3651.492			-38.400	-34.051		-0.150	3646.216							
T-26 sec	2:26:54	60.048	3651.492			-38.400	-35.573		-0.150	3644.543							
T-24 sec	2:26:56	60.041	3648.246			-32.800	-34.603		-0.150	3645.363							
T-22 sec	2:26:58	60.041	3648.246			-32.800	-33.972		-0.150	3645.844							
T-20 sec	2:27:00	60.039	3654.294			-31.201	-33.002		-0.150	3646.663							
T-18 sec	2:27:02	60.039	3654.294			-31.201	-32.372		-0.150	3647.143							
T-16 sec	2:27:04	60.039	3654.294	60.041	3649.002	-31.201	-31.962		-0.150	3647.402							
T-14 sec	2:27:06	60.043	3651.059	60.041	3649.002	-34.399	-32.815		-0.150	3646.399							
T-12 sec	2:27:08	60.043	3651.059	60.041	3649.002	-34.399	-33.370		-0.150	3645.694							
T-10 sec	2:27:10	60.041	3648.236	60.041	3649.002	-32.800	-33.170		-0.150	3645.743							
T-08 sec	2:27:12	60.041	3648.236	60.041	3649.002	-32.800	-33.041		-0.150	3645.722							
T-06 sec	2:27:14	60.041	3648.236	60.041	3649.002	-32.800	-32.957		-0.150	3645.656							
T-04 sec	2:27:16	60.041	3645.446	60.041	3649.002	-32.800	-32.902		-0.150	3645.561							
T-02 sec	2:27:18	60.041	3645.446	60.041	3649.002	-32.800	-32.866		-0.150	3645.446							
T+0 sec	2:27:20	59.852	3641.191			118.399	20.077		0.000	3698.389							633
T+02 sec	2:27:22	59.852	3641.191			118.399	54.489		0.580	3733.382	3641.191	3715.885	3678.197	3678.197			633
T+04 sec	2:27:24	59.852	3641.191			118.399	76.858		0.580	3756.331	3641.191	3729.367	3678.778	3678.488			633
T+06 sec	2:27:26	59.869	3734.904			104.800	86.638		0.580	3766.691	3664.619	3738.698	3679.358	3678.778			633
T+08 sec	2:27:28	59.869	3734.904			104.800	92.995		0.580	3773.628	3678.676	3745.684	3679.938	3679.068			633
T+10 sec	2:27:30	59.869	3734.904			104.800	97.127		0.580	3778.341	3688.048	3751.127	3680.519	3679.358			633
T+12 sec	2:27:32	59.88	3737.157			95.999	96.732		0.580	3778.526	3695.063	3755.041	3681.099	3679.648			633
T+14 sec	2:27:34	59.88	3737.157			95.999	96.476		0.580	3778.850	3700.325	3758.017	3681.680	3679.938			633
T+16 sec	2:27:36	59.875	3766.194			100.000	97.709		0.580	3780.664	3707.644	3760.534	3682.260	3680.229			633
T+18 sec	2:27:38	59.875	3766.194			100.000	98.511		0.580	3782.046	3713.499	3762.685	3682.840	3680.519			633
T+20 sec	2:27:40	59.875	3766.194	59.888	3785.205	100.000	99.032	3758.755	0.580	3783.148	3718.289	3764.545	3683.421	3680.809			633
T+22 sec	2:27:42	59.886	3769.925	59.888	3785.205	91.199	96.290	3758.755	0.580	3780.987	3722.592	3765.915	3684.001	3681.099			633
T+24 sec	2:27:44	59.886	3769.925	59.888	3785.205	91.199	94.508	3758.755	0.580	3779.785	3726.233	3766.982	3684.581	3681.389			633

T+26 sec	2:27:46	59.887	3782.500	59.888	3785.205	90.399	93.070	3758.755	0.580	3778.927	3730.252	3767.835	3685.162	3681.680	633
T+28 sec	2:27:48	59.887	3782.500	59.888	3785.205	90.399	92.135	3758.755	0.580	3778.572	3733.735	3768.551	3685.742	3681.970	633
T+30 sec	2:27:50	59.887	3782.500	59.888	3785.205	90.399	91.528	3758.755	0.580	3778.545	3736.783	3769.176	3686.322	3682.260	633
T+32 sec	2:27:52	59.895	3784.730	59.888	3785.205	84.000	88.893	3758.755	0.580	3776.491	3739.604	3769.606	3686.903	3682.550	633
T+34 sec	2:27:54	59.895	3784.730	59.888	3785.205	84.000	87.180	3758.755	0.580	3775.358	3742.111	3769.926	3687.483	3682.840	633
T+36 sec	2:27:56	59.893	3788.328	59.888	3785.205	85.599	86.627	3758.755	0.580	3775.385	3744.543	3770.213	3688.063	3683.130	633
T+38 sec	2:27:58	59.893	3788.328	59.888	3785.205	85.599	86.267	3758.755	0.580	3775.606	3746.732	3770.483	3688.644	3683.421	633
T+40 sec	2:28:00	59.893	3788.328	59.888	3785.205	85.599	86.033	3758.755	0.580	3775.952	3748.713	3770.743	3689.224	3683.711	633
T+42 sec	2:28:02	59.891	3788.472	59.888	3785.205	87.201	86.442	3758.755	0.580	3776.941	3750.520	3771.025	3689.805	3684.001	633
T+44 sec	2:28:04	59.891	3788.472	59.888	3785.205	87.201	86.708	3758.755	0.580	3777.788	3752.170	3771.319	3690.385	3684.291	633
T+46 sec	2:28:06	59.885	3794.374	59.888	3785.205	92.001	88.560	3758.755	0.580	3780.221	3753.929	3771.690	3690.965	3684.581	633
T+48 sec	2:28:08	59.885	3794.374	59.888	3785.205	92.001	89.765	3758.755	0.580	3782.005	3755.547	3772.102	3691.546	3684.872	633
T+50 sec	2:28:10	59.885	3794.374	59.888	3785.205	92.001	90.548	3758.755	0.580	3783.369	3757.040	3772.536	3692.126	3685.162	633
T+52 sec	2:28:12	59.887	3800.427	59.888	3785.205	90.399	90.496	3758.755	0.580	3783.897	3758.647	3772.956	3692.706	3685.452	633
T+54 sec	2:28:14	59.887	3800.427			90.399	90.462		0.580	3784.444	3760.139	3773.367	3693.287	3685.742	633
T+56 sec	2:28:16	59.888	3802.925			89.600	90.160		0.580	3784.722	3761.614	3773.758	3693.867	3686.032	633
T+58 sec	2:28:18	59.888	3802.925			89.600	89.964		0.580	3785.106	3762.991	3774.137	3694.447	3686.322	633
T+60 sec	2:28:20	59.888	3802.925			89.600	89.836		0.580	3785.559	3764.280	3774.505	3695.028	3686.613	633
T+62 sec	2:28:22	59.882	3804.388			94.400	91.434		0.580	3787.737	3765.533	3774.919	3695.608	3686.903	633
T+64 sec	2:28:24	59.882	3804.388			94.400	92.472		0.580	3789.355	3766.710	3775.356	3696.188	3687.193	633
T+66 sec	2:28:26	59.857	3809.237			114.401	100.147		0.580	3797.611	3767.961	3776.011	3696.769	3687.483	633
T+68 sec	2:28:28	59.857	3809.237			114.401	105.136		0.580	3803.180	3769.141	3776.787	3697.349	3687.773	633
T+70 sec	2:28:30	59.857	3809.237			114.401	108.379		0.580	3807.004	3770.254	3777.626	3697.930	3688.063	633
T+72 sec	2:28:32	59.858	3814.862			113.599	110.206		0.580	3809.411	3771.460	3778.485	3698.510	3688.354	633
T+74 sec	2:28:34	59.858	3814.862			113.599	111.393		0.580	3811.179	3772.602	3779.346	3699.090	3688.644	633
T+76 sec	2:28:36	59.866	3826.053			107.199	109.925		0.580	3810.291	3773.973	3780.139	3699.671	3688.934	633
T+78 sec	2:28:38	59.866	3826.053			107.199	108.971		0.580	3809.917	3775.275	3780.884	3700.251	3689.224	633
T+80 sec	2:28:40	59.866	3826.053			107.199	108.351		0.580	3809.877	3776.513	3781.591	3700.831	3689.514	633
	2:28:42	59.866	3827.524			107.199	107.948		0.580	3810.055	3777.728	3782.268	3701.412	3689.805	633
	2:28:44	59.866	3827.524			107.199	107.686		0.580	3810.373	3778.886	3782.922	3701.992	3690.095	633
	2:28:46	59.874	3826.454			100.800	105.276		0.580	3808.543	3779.967	3783.504	3702.572	3690.385	633
	2:28:48	59.874	3826.454			100.800	103.709		0.580	3807.557	3781.000	3784.039	3703.153	3690.675	633
	2:28:50	59.874	3826.454			100.800	102.691		0.580	3807.119	3781.988	3784.541	3703.733	3690.965	633
	2:28:52	59.883	3823.826			93.600	99.509		0.580	3804.518	3782.878	3784.966	3704.313	3691.255	633
	2:28:54	59.883	3823.826			93.600	97.441		0.580	3803.030	3783.731	3785.342	3704.894	3691.546	633
	2:28:56	59.89	3818.055			88.000	94.137		0.580	3800.306	3784.432	3785.647	3705.474	3691.836	633
	2:28:58	59.89	3818.055			88.000	91.989		0.580	3798.739	3785.104	3785.909	3706.055	3692.126	633
	2:29:00	59.89	3818.055			88.000	90.593		0.580	3797.923	3785.750	3786.145	3706.635	3692.416	633
	2:29:02	59.893	3815.010			85.599	88.845		0.580	3796.755	3786.313	3786.349	3707.215	3692.706	633
	2:29:04	59.893	3815.010			85.599	87.709		0.580	3796.200	3786.854	3786.535	3707.796	3692.997	633
	2:29:06	59.903	3809.652			77.600	84.171		0.580	3793.242	3787.277	3786.659	3708.376	3693.287	633
	2:29:08	59.903	3809.652			77.600	81.871		0.580	3791.523	3787.683	3786.747	3708.956	3693.577	633
	2:29:10	59.903	3809.652			77.600	80.376		0.580	3790.608	3788.076	3786.816	3709.537	3693.867	633
	2:29:12	59.904	3805.593			76.801	79.125		0.580	3789.937	3788.383	3786.871	3710.117	3694.157	633
	2:29:14	59.904	3805.593			76.801	78.311		0.580	3789.704	3788.680	3786.920	3710.697	3694.447	633

2:29:16	59.911	3793.975	71.201	75.823	0.580	3787.795	3788.770	3786.935	3711.278	3694.738	633
2:29:18	59.911	3793.975	71.201	74.205	0.580	3786.758	3788.856	3786.932	3711.858	3695.028	633
2:29:20	59.911	3793.975	71.201	73.153	0.580	3786.287	3788.940	3786.921	3712.439	3695.318	633
2:29:22	59.917	3791.502	66.400	70.790	0.580	3784.504	3788.982	3786.882	3713.019	3695.608	633
2:29:24	59.917	3791.502	66.400	69.253	0.580	3783.548	3789.022	3786.829	3713.599	3695.898	633
2:29:26	59.92	3784.563	64.001	67.415	0.580	3782.290	3788.952	3786.758	3714.180	3696.188	633
2:29:28	59.92	3784.563	64.001	66.220	0.580	3781.675	3788.884	3786.680	3714.760	3696.479	633
2:29:30	59.92	3784.563	64.001	65.444	0.580	3781.479	3788.819	3786.601	3715.340	3696.769	633
2:29:32	59.917	3781.701	66.400	65.779	0.580	3782.394	3788.713	3786.539	3715.921	3697.059	633
2:29:34	59.917	3781.701	66.400	65.996	0.580	3783.192	3788.610	3786.489	3716.501	3697.349	633
2:29:36	59.921	3774.604	63.199	65.017	0.580	3782.794	3788.407	3786.436	3717.081	3697.639	633
2:29:38	59.921	3774.604	63.199	64.381	0.580	3782.738	3788.209	3786.383	3717.662	3697.930	633
2:29:40	59.921	3774.604	63.199	63.967	0.580	3782.904	3788.018	3786.334	3718.242	3698.220	633
2:29:42	59.925	3773.958	60.001	62.579	0.580	3782.096	3787.823	3786.275	3718.822	3698.510	633
2:29:44	59.925	3773.958	60.001	61.676	0.580	3781.774	3787.633	3786.213	3719.403	3698.800	633
2:29:46	59.927	3769.630	58.401	60.530	0.580	3781.208	3787.389	3786.146	3719.983	3699.090	633
2:29:48	59.927	3769.630	58.401	59.785	0.580	3781.044	3787.153	3786.078	3720.564	3699.380	633
2:29:50	59.927	3769.630	58.401	59.301	0.580	3781.140	3786.922	3786.013	3721.144	3699.671	633
2:29:52	59.928	3767.643	57.599	58.705	0.580	3781.125	3786.672	3785.949	3721.724	3699.961	633
2:29:54	59.928	3767.643	57.599	58.318	0.580	3781.318	3786.428	3785.890	3722.305	3700.251	633
2:29:56	59.929	3766.788	56.799	57.786	0.580	3781.367	3786.179	3785.833	3722.885	3700.541	633
2:29:58	59.929	3766.788	56.799	57.441	0.580	3781.601	3785.937	3785.780	3723.465	3700.831	633
2:30:00	59.929	3766.788	56.799	57.216	0.580	3781.957	3785.700	3785.733	3724.046	3701.122	633
2:30:02	59.937	3765.672	50.400	54.831	0.580	3780.152	3785.456	3785.665	3724.626	3701.412	633
2:30:04	59.937	3765.672	50.400	53.280	0.580	3779.181	3785.218	3785.586	3725.206	3701.702	633
2:30:06	59.945	3765.105	44.000	50.032	0.580	3776.514	3784.978	3785.478	3725.787	3701.992	633
2:30:08	59.945	3765.105	44.000	47.921	0.580	3774.983	3784.744	3785.355	3726.367	3702.282	633
2:30:10	59.945	3765.105	44.000	46.549	0.580	3774.191	3784.516	3785.225	3726.947	3702.572	633
2:30:12	59.942	3758.387	46.399	46.496	0.580	3774.719	3784.216	3785.104	3727.528	3702.863	633
2:30:14	59.942	3758.387	46.399	46.462	0.580	3775.265	3783.922	3784.993	3728.108	3703.153	633
2:30:16	59.942	3746.889	46.399	46.440	0.580	3775.824	3783.506	3784.890	3728.689	3703.443	633
2:30:18	59.942	3746.889	46.399	46.426	0.580	3776.390	3783.099	3784.795	3729.269	3703.733	633
2:30:20	59.942	3746.889	46.399	46.416	0.580	3776.961	3782.701	3784.709	3729.849	3704.023	633
2:30:22	59.947	3749.593	42.401	45.011	0.580	3776.136	3782.341	3784.616	3730.430	3704.313	633
2:30:24	59.947	3749.593	42.401	44.098	0.580	3775.803	3781.989	3784.521	3731.010	3704.604	633
2:30:26	59.951	3749.077	39.200	42.383	0.580	3774.669	3781.639	3784.416	3731.590	3704.894	633
2:30:28	59.951	3749.077	39.200	41.269	0.580	3774.135	3781.296	3784.308	3732.171	3705.184	633
2:30:30	59.951	3749.077	39.200	40.545	0.580	3773.991	3780.961	3784.201	3732.751	3705.474	633
2:30:32	59.951	3740.259	39.200	40.074	0.580	3774.101	3780.541	3784.096	3733.331	3705.764	633
2:30:34	59.951	3740.259	39.200	39.768	0.580	3774.375	3780.130	3783.997	3733.912	3706.055	633
2:30:36	59.952	3727.838	38.400	39.289	0.580	3774.477	3779.602	3783.901	3734.492	3706.345	633
2:30:38	59.952	3727.838	38.400	38.978	0.580	3774.746	3779.084	3783.809	3735.072	3706.635	633
2:30:40	59.952	3727.838	38.400	38.776	0.580	3775.124	3778.577	3783.723	3735.653	3706.925	633
2:30:42	59.952	3722.649	38.400	38.644	0.580	3775.573	3778.029	3783.644	3736.233	3707.215	633
2:30:44	59.952	3722.649	38.400	38.559	0.580	3776.068	3777.491	3783.570	3736.814	3707.505	633
2:30:46	59.952	3718.142	38.400	38.503	0.580	3776.592	3776.920	3783.503	3737.394	3707.796	633

2:30:48	59.952	3718.142	38.400	38.467	0.580	3777.137	3776.360	3783.442	3737.974	3708.086	633
2:30:50	59.952	3718.142	38.400	38.444	0.580	3777.694	3775.811	3783.388	3738.555	3708.376	633
2:30:52	59.952	3713.694	38.400	38.429	0.580	3778.259	3775.231	3783.340	3739.135	3708.666	633
2:30:54	59.952	3713.694	38.400	38.419	0.580	3778.829	3774.661	3783.298	3739.715	3708.956	633
2:30:56	59.954	3710.810	36.801	37.853	0.580	3778.843	3774.075	3783.257	3740.296	3709.247	633
2:30:58	59.954	3710.810	36.801	37.485	0.580	3779.056	3773.500	3783.219	3740.876	3709.537	633
2:31:00	59.954	3710.810	36.801	37.245	0.580	3779.397	3772.935	3783.185	3741.456	3709.827	633
2:31:02	59.956	3714.623	35.199	36.529	0.580	3779.261	3772.415	3783.150	3742.037	3710.117	633
2:31:04	59.956	3714.623	35.199	36.064	0.580	3779.376	3771.903	3783.116	3742.617	3710.407	633
2:31:06	59.956	3716.461	35.199	35.761	0.580	3779.654	3771.417	3783.086	3743.197	3710.697	633
2:31:08	59.956	3716.461	35.199	35.564	0.580	3780.037	3770.939	3783.060	3743.778	3710.988	633
2:31:10	59.956	3716.461	35.199	35.436	0.580	3780.490	3770.469	3783.037	3744.358	3711.278	633
2:31:12	59.961	3717.759	31.201	33.954	0.580	3779.588	3770.019	3783.008	3744.939	3711.568	633
2:31:14	59.961	3717.759	31.201	32.991	0.580	3779.205	3769.576	3782.976	3745.519	3711.858	633
2:31:16	59.962	3722.658	30.399	32.083	0.580	3778.878	3769.182	3782.941	3746.099	3712.148	633
2:31:18	59.962	3722.658	30.399	31.494	0.580	3778.868	3768.794	3782.907	3746.680	3712.439	633
2:31:20	59.962	3722.658	30.399	31.110	0.580	3779.065	3768.413	3782.876	3747.260	3712.729	633
2:31:22	59.966	3722.278	27.200	29.742	0.580	3778.277	3768.034	3782.838	3747.840	3713.019	633
2:31:24	59.966	3722.278	27.200	28.852	0.580	3777.968	3767.662	3782.798	3748.421	3713.309	633
2:31:26	59.97	3723.984	23.999	27.154	0.580	3776.850	3767.310	3782.750	3749.001	3713.599	633
2:31:28	59.97	3723.984	23.999	26.050	0.580	3776.326	3766.964	3782.699	3749.581	3713.889	633
2:31:30	59.97	3723.984	23.999	25.332	0.580	3776.189	3766.623	3782.647	3750.162	3714.180	633
2:31:32	59.969	3723.893	24.799	25.145	0.580	3776.582	3766.286	3782.599	3750.742	3714.470	633
2:31:34	59.969	3723.893	24.799	25.024	0.580	3777.041	3765.955	3782.556	3751.322	3714.760	633
2:31:36	59.97	3728.053	23.999	24.665	0.580	3777.263	3765.661	3782.515	3751.903	3715.050	633
2:31:38	59.97	3728.053	23.999	24.432	0.580	3777.610	3765.372	3782.477	3752.483	3715.340	633
2:31:40	59.97	3728.053	23.999	24.280	0.580	3778.039	3765.087	3782.443	3753.064	3715.630	633
2:31:42	59.973	3732.530	21.600	23.342	0.580	3777.681	3764.840	3782.407	3753.644	3715.921	633
2:31:44	59.973	3732.530	21.600	22.733	0.580	3777.652	3764.597	3782.372	3754.224	3716.211	633
2:31:46	59.978	3736.907	17.599	20.936	0.580	3776.436	3764.391	3782.327	3754.805	3716.501	633
2:31:48	59.978	3736.907	17.599	19.768	0.580	3775.848	3764.187	3782.279	3755.385	3716.791	633
2:31:50	59.978	3736.907	17.599	19.009	0.580	3775.670	3763.986	3782.231	3755.965	3717.081	633
2:31:52	59.978	3738.699	17.599	18.516	0.580	3775.757	3763.802	3782.183	3756.546	3717.372	633
2:31:54	59.978	3738.699	17.599	18.195	0.580	3776.016	3763.620	3782.139	3757.126	3717.662	633
2:31:56	59.978	3741.794	17.599	17.987	0.580	3776.388	3763.463	3782.097	3757.706	3717.952	633
2:31:58	59.978	3741.794	17.599	17.851	0.580	3776.833	3763.308	3782.060	3758.287	3718.242	633
2:32:00	59.978	3741.794	17.599	17.763	0.580	3777.325	3763.156	3782.026	3758.867	3718.532	633
2:32:02	59.982	3746.608	14.401	16.586	0.580	3776.729	3763.039	3781.989	3759.447	3718.822	633
2:32:04	59.982	3746.608	14.401	15.822	0.580	3776.545	3762.924	3781.951	3760.028	3719.113	633
2:32:06	59.98	3751.558	16.000	15.884	0.580	3777.187	3762.845	3781.918	3760.608	3719.403	633
2:32:08	59.98	3751.558	16.000	15.925	0.580	3777.809	3762.767	3781.889	3761.189	3719.693	633
2:32:10	59.98	3751.558	16.000	15.951	0.580	3778.415	3762.691	3781.866	3761.769	3719.983	633
2:32:12	59.979	3755.599	16.800	16.248	0.580	3779.293	3762.642	3781.848	3762.349	3720.273	633
2:32:14	59.979	3755.599	16.800	16.441	0.580	3780.066	3762.595	3781.836	3762.930	3720.564	633
2:32:16	59.983	3760.405	13.599	15.446	0.580	3779.652	3762.580	3781.821	3763.510	3720.854	633
2:32:18	59.983	3760.405	13.599	14.800	0.580	3779.585	3762.566	3781.806	3764.090	3721.144	633

2:32:20	59.983	3760.405	13.599	14.379	0.580	3779.745	3762.551	3781.793	3764.671	3721.434	633
2:32:22	59.989	3761.407	8.801	12.427	0.580	3778.373	3762.544	3781.770	3765.251	3721.724	633
2:32:24	59.989	3761.407	8.801	11.158	0.580	3777.685	3762.536	3781.744	3765.831	3722.014	633
2:32:26	59.987	3764.958	10.400	10.893	0.580	3778.000	3762.552	3781.719	3766.412	3722.305	633
2:32:28	59.987	3764.958	10.400	10.720	0.580	3778.408	3762.568	3781.698	3766.992	3722.595	633
2:32:30	59.987	3764.958	10.400	10.608	0.580	3778.876	3762.583	3781.680	3767.572	3722.885	633
2:32:32	59.992	3766.433	6.400	9.135	0.580	3777.983	3762.607	3781.656	3768.153	3723.175	633
2:32:34	59.992	3766.433	6.400	8.178	0.580	3777.606	3762.632	3781.631	3768.733	3723.465	633
2:32:36	59.989	3768.634	8.801	8.396	0.580	3778.405	3762.669	3781.610	3769.314	3723.755	633
2:32:38	59.989	3768.634	8.801	8.538	0.580	3779.127	3762.707	3781.595	3769.894	3724.046	633
2:32:40	59.989	3768.634	8.801	8.630	0.580	3779.799	3762.743	3781.584	3770.474	3724.336	633
2:32:42	59.983	3772.445	13.599	10.369	0.580	3782.119	3762.803	3781.587	3771.055	3724.626	633
2:32:44	59.983	3772.445	13.599	11.499	0.580	3783.830	3762.862	3781.601	3771.635	3724.916	633
2:32:46	59.993	3775.841	5.600	9.435	0.580	3782.345	3762.942	3781.605	3772.215	3725.206	633
2:32:48	59.993	3775.841	5.600	8.092	0.580	3781.583	3763.020	3781.605	3772.796	3725.497	633
2:32:50	59.993	3775.841	5.600	7.220	0.580	3781.291	3763.097	3781.603	3773.376	3725.787	633
2:32:52	59.999	3774.866	0.800	4.973	0.580	3779.624	3763.168	3781.591	3773.956	3726.077	633
2:32:54	59.999	3774.866	0.800	3.512	0.580	3778.744	3763.237	3781.575	3774.537	3726.367	633
2:32:56	59.999	3778.554	0.800	2.563	0.580	3778.375	3763.328	3781.556	3775.117	3726.657	633
2:32:58	59.999	3778.554	0.800	1.946	0.580	3778.338	3763.417	3781.537	3775.698	3726.947	633
2:33:00	59.999	3778.554	0.800	1.545	0.580	3778.518	3763.506	3781.519	3776.278	3727.238	633
2:33:02	60.002	3781.256	-1.599	0.444	0.000	3777.417	3763.609	3781.495	3776.278	3727.524	633
2:33:04	60.002	3781.256	-1.599	-0.271	0.000	3776.702	3763.711	3781.467	3776.278	3727.808	633
2:33:06	60.007	3783.896	-5.600	-2.136	0.000	3774.837	3763.827	3781.429	3776.278	3728.088	633
2:33:08	60.007	3783.896	-5.600	-3.348	0.000	3773.625	3763.942	3781.385	3776.278	3728.365	633
2:33:10	60.007	3783.896	-5.600	-4.136	0.000	3772.836	3764.055	3781.336	3776.278	3728.639	633
2:33:12	60.014	3785.768	-11.200	-6.609	0.000	3770.364	3764.178	3781.274	3776.278	3728.909	633
2:33:14	60.014	3785.768	-11.200	-8.216	0.000	3768.757	3764.299	3781.204	3776.278	3729.177	633
2:33:16	60.019	3786.304	-15.201	-10.660	0.000	3766.313	3764.422	3781.121	3776.278	3729.442	633
2:33:18	60.019	3786.304	-15.201	-12.250	0.000	3764.723	3764.544	3781.030	3776.278	3729.703	633
2:33:20	60.019	3786.304	-15.201	-13.283	0.000	3763.690	3764.664	3780.934	3776.278	3729.962	633
2:33:22	60.017	3787.516	-13.599	-13.393	0.000	3763.580	3764.789	3780.838	3776.278	3730.218	633
2:33:24	60.017	3787.516	-13.599	-13.465	0.000	3763.508	3764.914	3780.744	3776.278	3730.471	633
2:33:26	60.023	3788.607	-18.399	-15.192	0.000	3761.781	3765.042	3780.641	3776.278	3730.721	633
2:33:28	60.023	3788.607	-18.399	-16.314	0.000	3760.659	3765.170	3780.533	3776.278	3730.969	633
2:33:30	60.023	3788.607	-18.399	-17.044	0.000	3759.929	3765.296	3780.422	3776.278	3731.214	633
2:33:32	60.021	3787.537	-16.800	-16.959	0.000	3760.014	3765.415	3780.313	3776.278	3731.456	633
2:33:34	60.021	3787.537	-16.800	-16.903	0.000	3760.070	3765.532	3780.205	3776.278	3731.696	633
2:33:36	60.024	3787.930	-19.199	-17.707	0.000	3759.266	3765.651	3780.094	3776.278	3731.933	633
2:33:38	60.024	3787.930	-19.199	-18.229	0.000	3758.744	3765.768	3779.982	3776.278	3732.168	633
2:33:40	60.024	3787.930	-19.199	-18.568	0.000	3758.405	3765.884	3779.869	3776.278	3732.400	633
2:33:42	60.02	3786.875	-16.000	-17.669	0.000	3759.304	3765.993	3779.762	3776.278	3732.629	633
2:33:44	60.02	3786.875	-16.000	-17.085	0.000	3759.888	3766.102	3779.659	3776.278	3732.857	633
2:33:46	60.024	3785.018	-19.199	-17.825	0.000	3759.148	3766.199	3779.553	3776.278	3733.082	633
2:33:48	60.024	3785.018	-19.199	-18.306	0.000	3758.667	3766.296	3779.446	3776.278	3733.304	633
2:33:50	60.024	3785.018	-19.199	-18.618	0.000	3758.355	3766.391	3779.338	3776.278	3733.525	633

2:33:52	60.022	3785.949	-17.599	-18.262	0.000	3758.711	3766.490	3779.234	3776.278	3733.743	633
2:33:54	60.022	3785.949	-17.599	-18.030	0.000	3758.943	3766.589	3779.131	3776.278	3733.959	633
2:33:56	60.022	3786.877	-17.599	-17.879	0.000	3759.094	3766.691	3779.031	3776.278	3734.173	633
2:33:58	60.022	3786.877	-17.599	-17.781	0.000	3759.192	3766.792	3778.931	3776.278	3734.384	633
2:34:00	60.022	3786.877	-17.599	-17.718	0.000	3759.255	3766.892	3778.833	3776.278	3734.594	633
2:34:02	60.023	3785.726	-18.399	-17.956	0.000	3759.017	3766.985	3778.735	3776.278	3734.801	633
2:34:04	60.023	3785.726	-18.399	-18.111	0.000	3758.862	3767.077	3778.637	3776.278	3735.006	633
2:34:06	60.022	3785.798	-17.599	-17.932	0.000	3759.041	3767.169	3778.541	3776.278	3735.210	633
2:34:08	60.022	3785.798	-17.599	-17.816	0.000	3759.157	3767.260	3778.447	3776.278	3735.411	633
2:34:10	60.022	3785.798	-17.599	-17.740	0.000	3759.233	3767.350	3778.354	3776.278	3735.610	633
2:34:12	60.018	3786.939	-14.401	-16.571	0.000	3760.402	3767.444	3778.267	3776.278	3735.808	633
2:34:14	60.018	3786.939	-14.401	-15.812	0.000	3761.161	3767.538	3778.185	3776.278	3736.003	633
2:34:16	60.018	3789.673	-14.401	-15.318	0.000	3761.655	3767.644	3778.106	3776.278	3736.197	633
2:34:18	60.018	3789.673	-14.401	-14.997	0.000	3761.976	3767.749	3778.029	3776.278	3736.389	633
2:34:20	60.018	3789.673	-14.401	-14.789	0.000	3762.184	3767.853	3777.954	3776.278	3736.579	633
2:34:22	60.016	3788.479	-12.799	-14.092	0.000	3762.881	3767.950	3777.883	3776.278	3736.767	633
2:34:24	60.016	3788.479	-12.799	-13.640	0.000	3763.333	3768.046	3777.814	3776.278	3736.953	633
2:34:26	60.016	3789.005	-12.799	-13.345	0.000	3763.628	3768.144	3777.748	3776.278	3737.138	633
2:34:28	60.016	3789.005	-12.799	-13.154	0.000	3763.819	3768.241	3777.683	3776.278	3737.321	633
2:34:30	60.016	3789.005	-12.799	-13.030	0.000	3763.943	3768.338	3777.620	3776.278	3737.502	633
2:34:32	60.012	3788.933	-9.601	-11.830	0.000	3765.143	3768.432	3777.562	3776.278	3737.681	633
2:34:34	60.012	3788.933	-9.601	-11.050	0.000	3765.923	3768.527	3777.509	3776.278	3737.859	633
2:34:36	60.01	3790.411	-7.999	-9.982	0.000	3766.991	3768.626	3777.461	3776.278	3738.035	633
2:34:38	60.01	3790.411	-7.999	-9.288	0.000	3767.685	3768.725	3777.416	3776.278	3738.210	633
2:34:40	60.01	3790.411	-7.999	-8.837	0.000	3768.136	3768.824	3777.374	3776.278	3738.383	633
2:34:42	60.009	3791.540	-7.199	-8.263	0.000	3768.710	3768.926	3777.335	3776.278	3738.555	633
2:34:44	60.009	3791.540	-7.199	-7.891	0.000	3769.082	3769.027	3777.298	3776.278	3738.725	633
2:34:46	60.01	3791.443	-7.999	-7.929	0.000	3769.044	3769.127	3777.261	3776.278	3738.893	633
2:34:48	60.01	3791.443	-7.999	-7.953	0.000	3769.020	3769.227	3777.225	3776.278	3739.060	633
2:34:50	60.01	3791.443	-7.999	-7.969	0.000	3769.004	3769.325	3777.188	3776.278	3739.225	633
2:34:52	59.995	3790.603	4.001	-3.780	0.000	3773.193	3769.419	3777.171	3776.278	3739.389	633
2:34:54	59.995	3790.603	4.001	-1.056	0.000	3775.917	3769.512	3777.165	3776.278	3739.552	633
2:34:56	59.991	3789.585	7.199	1.833	0.000	3778.806	3769.599	3777.172	3776.278	3739.713	633
2:34:58	59.991	3789.585	7.199	3.711	0.000	3780.684	3769.686	3777.188	3776.278	3739.872	633
2:35:00	59.991	3789.585	7.199	4.932	0.000	3781.905	3769.772	3777.208	3776.278	3740.031	633
2:35:02	59.988	3788.105	9.601	6.566	0.000	3783.539	3769.851	3777.235	3776.278	3740.188	633
2:35:04	59.988	3788.105	9.601	7.628	0.000	3784.601	3769.930	3777.267	3776.278	3740.343	633
2:35:06	59.985	3788.497	12.000	9.158	0.000	3786.131	3770.009	3777.305	3776.278	3740.497	633
2:35:08	59.985	3788.497	12.000	10.153	0.000	3787.126	3770.088	3777.347	3776.278	3740.650	633
2:35:10	59.985	3788.497	12.000	10.799	0.000	3787.772	3770.166	3777.391	3776.278	3740.802	633
2:35:12	59.984	3788.571	12.799	11.499	0.000	3788.472	3770.243	3777.438	3776.278	3740.952	633
2:35:14	59.984	3788.571	12.799	11.954	0.000	3788.927	3770.320	3777.486	3776.278	3741.101	633
2:35:16	59.981	3786.453	15.201	13.090	0.000	3790.063	3770.388	3777.538	3776.278	3741.249	633
2:35:18	59.981	3786.453	15.201	13.829	0.000	3790.802	3770.455	3777.594	3776.278	3741.396	633
2:35:20	59.981	3786.453	15.201	14.309	0.000	3791.282	3770.521	3777.651	3776.278	3741.541	633
2:35:22	59.977	3788.813	18.399	15.741	0.000	3792.714	3770.597	3777.713	3776.278	3741.685	633

2:35:24	59.977	3788.813	18.399	16.671	0.000	3793.644	3770.672	3777.778	3776.278	3741.828	633
2:35:26	59.976	3788.410	19.199	17.556	0.000	3794.529	3770.744	3777.847	3776.278	3741.970	633
2:35:28	59.976	3788.410	19.199	18.131	0.000	3795.104	3770.816	3777.917	3776.278	3742.110	633
2:35:30	59.976	3788.410	19.199	18.504	0.000	3795.477	3770.888	3777.989	3776.278	3742.250	633
2:35:32	59.978	3790.665	17.599	18.188	0.000	3795.161	3770.968	3778.058	3776.278	3742.388	633
2:35:34	59.978	3790.665	17.599	17.982	0.000	3794.955	3771.047	3778.126	3776.278	3742.525	633
2:35:36	59.974	3789.267	20.801	18.968	0.000	3795.941	3771.121	3778.198	3776.278	3742.662	633
2:35:38	59.974	3789.267	20.801	19.610	0.000	3796.583	3771.193	3778.272	3776.278	3742.797	633
2:35:40	59.974	3789.267	20.801	20.027	0.000	3797.000	3771.265	3778.346	3776.278	3742.930	633
2:35:42	59.977	3790.430	18.399	19.457	0.000	3796.430	3771.341	3778.418	3776.278	3743.063	633
2:35:44	59.977	3790.430	18.399	19.087	0.000	3796.060	3771.417	3778.488	3776.278	3743.195	633
2:35:46	59.973	3787.442	21.600	19.966	0.000	3796.939	3771.480	3778.560	3776.278	3743.326	633
2:35:48	59.973	3787.442	21.600	20.538	0.000	3797.511	3771.542	3778.635	3776.278	3743.456	633
2:35:50	59.973	3787.442	21.600	20.910	0.000	3797.883	3771.605	3778.710	3776.278	3743.584	633
2:35:52	59.971	3790.602	23.199	21.711	0.000	3798.684	3771.678	3778.788	3776.278	3743.712	633
2:35:54	59.971	3790.602	23.199	22.232	0.000	3799.205	3771.752	3778.867	3776.278	3743.839	633
2:35:56	59.978	3792.311	17.599	20.611	0.000	3797.584	3771.831	3778.939	3776.278	3743.965	633
2:35:58	59.978	3792.311	17.599	19.557	0.000	3796.530	3771.910	3779.007	3776.278	3744.089	633
2:36:00	59.978	3792.311	17.599	18.872	0.000	3795.845	3771.988	3779.071	3776.278	3744.213	633
2:36:02	59.975	3788.080	20.001	19.267	0.000	3796.240	3772.050	3779.137	3776.278	3744.336	633
2:36:04	59.975	3788.080	20.001	19.524	0.000	3796.497	3772.110	3779.203	3776.278	3744.458	633
2:36:06	59.976	3787.164	19.199	19.410	0.000	3796.383	3772.168	3779.268	3776.278	3744.579	633
2:36:08	59.976	3787.164	19.199	19.336	0.000	3796.309	3772.224	3779.332	3776.278	3744.699	633
2:36:10	59.976	3787.164	19.199	19.288	0.000	3796.261	3772.280	3779.396	3776.278	3744.818	633
2:36:12	59.969	3787.405	24.799	21.217	0.000	3798.190	3772.337	3779.466	3776.278	3744.936	633
2:36:14	59.969	3787.405	24.799	22.470	0.000	3799.443	3772.393	3779.541	3776.278	3745.054	633
2:36:16	59.965	3789.214	28.000	24.406	0.000	3801.379	3772.456	3779.622	3776.278	3745.170	633
2:36:18	59.965	3789.214	28.000	25.664	0.000	3802.637	3772.518	3779.707	3776.278	3745.286	633
2:36:20	59.965	3789.214	28.000	26.481	0.000	3803.454	3772.579	3779.795	3776.278	3745.401	633
2:36:22	59.97	3791.221	23.999	25.613	0.000	3802.586	3772.648	3779.878	3776.278	3745.515	633
2:36:24	59.97	3791.221	23.999	25.048	0.000	3802.021	3772.716	3779.960	3776.278	3745.628	633
2:36:26	59.965	3788.824	28.000	26.081	0.000	3803.054	3772.775	3780.044	3776.278	3745.740	633
2:36:28	59.965	3788.824	28.000	26.753	0.000	3803.726	3772.833	3780.130	3776.278	3745.851	633
2:36:30	59.965	3788.824	28.000	27.189	0.000	3804.162	3772.891	3780.217	3776.278	3745.962	633
2:36:32	59.972	3789.167	22.400	25.513	0.000	3802.486	3772.950	3780.297	3776.278	3746.072	633
2:36:34	59.972	3789.167	22.400	24.423	0.000	3801.396	3773.008	3780.373	3776.278	3746.181	633
2:36:36	59.967	3784.831	26.401	25.115	0.000	3802.088	3773.050	3780.451	3776.278	3746.289	633
2:36:38	59.967	3784.831	26.401	25.565	0.000	3802.538	3773.093	3780.530	3776.278	3746.397	633
2:36:40	59.967	3784.831	26.401	25.858	0.000	3802.831	3773.134	3780.609	3776.278	3746.503	633
2:36:42	59.969	3784.320	24.799	25.487	0.000	3802.460	3773.174	3780.687	3776.278	3746.609	633
2:36:44	59.969	3784.320	24.799	25.246	0.000	3802.219	3773.213	3780.763	3776.278	3746.715	633
2:36:46	59.967	3779.352	26.401	25.650	0.000	3802.623	3773.235	3780.840	3776.278	3746.819	633
2:36:48	59.967	3779.352	26.401	25.913	0.000	3802.886	3773.256	3780.917	3776.278	3746.923	633
2:36:50	59.967	3779.352	26.401	26.084	0.000	3803.057	3773.278	3780.995	3776.278	3747.026	633
2:36:52	59.971	3778.633	23.199	25.074	0.000	3802.047	3773.296	3781.068	3776.278	3747.128	633
2:36:54	59.971	3778.633	23.199	24.418	0.000	3801.391	3773.315	3781.139	3776.278	3747.230	633

2:36:56	59.965	3776.429	28.000	25.672	0.000	3802.645	3773.326	3781.213	3776.278	3747.330	633
2:36:58	59.965	3776.429	28.000	26.487	0.000	3803.460	3773.336	3781.290	3776.278	3747.431	633
2:37:00	59.965	3776.429	28.000	27.016	0.000	3803.989	3773.347	3781.368	3776.278	3747.530	633
2:37:02	59.97	3776.597	23.999	25.960	0.000	3802.933	3773.358	3781.442	3776.278	3747.629	633
2:37:04	59.97	3776.597	23.999	25.274	0.000	3802.247	3773.369	3781.513	3776.278	3747.727	633
2:37:06	59.969	3773.170	24.799	25.107	0.000	3802.080	3773.369	3781.583	3776.278	3747.824	633
2:37:08	59.969	3773.170	24.799	24.999	0.000	3801.972	3773.368	3781.652	3776.278	3747.921	633
2:37:10	59.969	3773.170	24.799	24.929	0.000	3801.902	3773.367	3781.720	3776.278	3748.017	633
2:37:12	59.965	3768.793	28.000	26.004	0.000	3802.977	3773.352	3781.792	3776.278	3748.113	633
2:37:14	59.965	3768.793	28.000	26.702	0.000	3803.675	3773.337	3781.865	3776.278	3748.208	633
2:37:16	59.973	3767.366	21.600	24.917	0.000	3801.890	3773.317	3781.932	3776.278	3748.302	633
2:37:18	59.973	3767.366	21.600	23.756	0.000	3800.729	3773.297	3781.995	3776.278	3748.395	633
2:37:20	59.973	3767.366	21.600	23.002	0.000	3799.974	3773.277	3782.054	3776.278	3748.488	633
2:37:22	59.968	3760.295	25.601	23.911	0.000	3800.884	3773.234	3782.117	3776.278	3748.581	633
2:37:24	59.968	3760.295	25.601	24.503	0.000	3801.476	3773.191	3782.181	3776.278	3748.672	633
2:37:26	59.967	3761.777	26.401	25.167	0.000	3802.140	3773.154	3782.246	3776.278	3748.764	633
2:37:28	59.967	3761.777	26.401	25.599	0.000	3802.572	3773.116	3782.313	3776.278	3748.854	633
2:37:30	59.967	3761.777	26.401	25.880	0.000	3802.853	3773.079	3782.380	3776.278	3748.944	633
2:37:32	59.979	3760.157	16.800	22.702	0.000	3799.675	3773.037	3782.436	3776.278	3749.033	633
2:37:34	59.979	3760.157	16.800	20.636	0.000	3797.609	3772.996	3782.486	3776.278	3749.122	633
2:37:36	59.983	3757.773	13.599	18.173	0.000	3795.146	3772.946	3782.527	3776.278	3749.210	633
2:37:38	59.983	3757.773	13.599	16.572	0.000	3793.545	3772.897	3782.562	3776.278	3749.298	633
2:37:40	59.983	3757.773	13.599	15.531	0.000	3792.504	3772.849	3782.594	3776.278	3749.385	633
2:37:42	59.965	3753.087	28.000	19.895	0.000	3796.868	3772.785	3782.640	3776.278	3749.471	633
2:37:44	59.965	3753.087	28.000	22.732	0.000	3799.705	3772.722	3782.694	3776.278	3749.557	633
2:37:46	59.962	3758.225	30.399	25.415	0.000	3802.388	3772.676	3782.757	3776.278	3749.643	633
2:37:48	59.962	3758.225	30.399	27.159	0.000	3804.132	3772.630	3782.825	3776.278	3749.727	633
2:37:50	59.962	3758.225	30.399	28.293	0.000	3805.266	3772.585	3782.896	3776.278	3749.812	633
2:37:52	59.96	3758.041	32.001	29.591	0.000	3806.564	3772.539	3782.971	3776.278	3749.895	633
2:37:54	59.96	3758.041	32.001	30.434	0.000	3807.407	3772.493	3783.048	3776.278	3749.979	633
2:37:56	59.959	3763.822	32.800	31.262	0.000	3808.235	3772.466	3783.127	3776.278	3750.061	633
2:37:58	59.959	3763.822	32.800	31.801	0.000	3808.774	3772.439	3783.207	3776.278	3750.144	633
2:38:00	59.959	3763.822	32.800	32.151	0.000	3809.123	3772.412	3783.287	3776.278	3750.225	633
2:38:02	59.953	3763.858	37.601	34.058	0.000	3811.031	3772.386	3783.374	3776.278	3750.306	633
2:38:04	59.953	3763.858	37.601	35.298	0.000	3812.271	3772.359	3783.463	3776.278	3750.387	633
2:38:06	59.957	3768.339	34.399	34.983	0.000	3811.956	3772.347	3783.551	3776.278	3750.467	633
2:38:08	59.957	3768.339	34.399	34.779	0.000	3811.752	3772.335	3783.638	3776.278	3750.547	633
2:38:10	59.957	3768.339	34.399	34.646	0.000	3811.619	3772.322	3783.724	3776.278	3750.626	633
2:38:12	59.963	3767.438	29.599	32.880	0.000	3809.853	3772.307	3783.803	3776.278	3750.705	633
2:38:14	59.963	3767.438	29.599	31.731	0.000	3808.704	3772.293	3783.879	3776.278	3750.783	633
2:38:16	59.959	3761.570	32.800	32.106	0.000	3809.079	3772.260	3783.956	3776.278	3750.861	633
2:38:18	59.959	3761.570	32.800	32.349	0.000	3809.322	3772.228	3784.033	3776.278	3750.938	633
2:38:20	59.959	3761.570	32.800	32.507	0.000	3809.480	3772.195	3784.110	3776.278	3751.015	633
2:38:22	59.965	3759.627	28.000	30.929	0.000	3807.902	3772.157	3784.181	3776.278	3751.091	633
2:38:24	59.965	3759.627	28.000	29.904	0.000	3806.877	3772.120	3784.250	3776.278	3751.167	633
2:38:26	59.968	3750.102	25.601	28.398	0.000	3805.371	3772.054	3784.313	3776.278	3751.242	633

2:38:28	59.968	3750.102	25.601	27.419	0.000	3804.392	3771.988	3784.373	3776.278	3751.317	633
2:38:30	59.968	3750.102	25.601	26.783	0.000	3803.756	3771.923	3784.430	3776.278	3751.392	633
2:38:32	59.973	3753.510	21.600	24.969	0.000	3801.942	3771.869	3784.482	3776.278	3751.466	633
2:38:34	59.973	3753.510	21.600	23.790	0.000	3800.763	3771.814	3784.531	3776.278	3751.539	633
2:38:36	59.965	3753.178	28.000	25.263	0.000	3802.236	3771.759	3784.583	3776.278	3751.613	633
2:38:38	59.965	3753.178	28.000	26.221	0.000	3803.194	3771.705	3784.638	3776.278	3751.685	633
2:38:40	59.965	3753.178	28.000	26.844	0.000	3803.817	3771.650	3784.694	3776.278	3751.758	633
2:38:42	59.972	3753.291	22.400	25.288	0.000	3802.261	3771.597	3784.745	3776.278	3751.830	633
2:38:44	59.972	3753.291	22.400	24.277	0.000	3801.250	3771.543	3784.793	3776.278	3751.901	633
2:38:46	59.975	3749.398	20.001	22.781	0.000	3799.754	3771.479	3784.837	3776.278	3751.972	633
2:38:48	59.975	3749.398	20.001	21.808	0.000	3798.781	3771.415	3784.877	3776.278	3752.043	633
2:38:50	59.975	3749.398	20.001	21.176	0.000	3798.149	3771.351	3784.916	3776.278	3752.113	633
2:38:52	59.974	3740.370	20.801	21.044	0.000	3798.017	3771.262	3784.953	3776.278	3752.183	633
2:38:54	59.974	3740.370	20.801	20.959	0.000	3797.932	3771.173	3784.991	3776.278	3752.252	633
2:38:56	59.981	3745.738	15.201	18.944	0.000	3795.917	3771.100	3785.022	3776.278	3752.321	633
2:38:58	59.981	3745.738	15.201	17.634	0.000	3794.607	3771.028	3785.049	3776.278	3752.390	633
2:39:00	59.981	3745.738	15.201	16.782	0.000	3793.755	3770.956	3785.074	3776.278	3752.458	633
2:39:02	59.982	3741.618	14.401	15.949	0.000	3792.922	3770.872	3785.096	3776.278	3752.526	633
2:39:04	59.982	3741.618	14.401	15.407	0.000	3792.380	3770.790	3785.117	3776.278	3752.594	633
2:39:06	59.984	3738.901	12.799	14.494	0.000	3791.467	3770.700	3785.135	3776.278	3752.661	633
2:39:08	59.984	3738.901	12.799	13.901	0.000	3790.874	3770.610	3785.151	3776.278	3752.727	633
2:39:10	59.984	3738.901	12.799	13.515	0.000	3790.488	3770.521	3785.166	3776.278	3752.794	633
2:39:12	59.979	3737.273	16.800	14.665	0.000	3791.638	3770.428	3785.184	3776.278	3752.860	633
2:39:14	59.979	3737.273	16.800	15.412	0.000	3792.385	3770.335	3785.204	3776.278	3752.925	633
2:39:16	59.978	3735.448	17.599	16.178	0.000	3793.151	3770.238	3785.226	3776.278	3752.991	633
2:39:18	59.978	3735.448	17.599	16.675	0.000	3793.648	3770.141	3785.250	3776.278	3753.055	633
2:39:20	59.978	3735.448	17.599	16.999	0.000	3793.972	3770.045	3785.274	3776.278	3753.120	633
2:39:22	59.981	3737.541	15.201	16.370	0.000	3793.342	3769.955	3785.296	3776.278	3753.184	633
2:39:24	59.981	3737.541	15.201	15.960	0.000	3792.933	3769.866	3785.317	3776.278	3753.248	633
2:39:26	59.978	3736.693	17.599	16.534	0.000	3793.507	3769.775	3785.340	3776.278	3753.311	633
2:39:28	59.978	3736.693	17.599	16.907	0.000	3793.880	3769.684	3785.363	3776.278	3753.374	633
2:39:30	59.978	3736.693	17.599	17.149	0.000	3794.122	3769.594	3785.387	3776.278	3753.437	633
2:39:32	59.971	3736.094	23.199	19.267	0.000	3796.240	3769.503	3785.417	3776.278	3753.500	633
2:39:34	59.971	3736.094	23.199	20.643	0.000	3797.616	3769.412	3785.450	3776.278	3753.562	633
2:39:36	59.974	3738.875	20.801	20.698	0.000	3797.671	3769.329	3785.483	3776.278	3753.623	633
2:39:38	59.974	3738.875	20.801	20.734	0.000	3797.707	3769.247	3785.516	3776.278	3753.685	633
2:39:40	59.974	3738.875	20.801	20.758	0.000	3797.731	3769.165	3785.549	3776.278	3753.746	633
2:39:42	59.972	3738.647	22.400	21.332	0.000	3798.305	3769.083	3785.583	3776.278	3753.807	633
2:39:44	59.972	3738.647	22.400	21.706	0.000	3798.679	3769.002	3785.618	3776.278	3753.867	633
2:39:46	59.971	3737.892	23.199	22.229	0.000	3799.202	3768.918	3785.655	3776.278	3753.927	633
2:39:48	59.971	3737.892	23.199	22.568	0.000	3799.541	3768.836	3785.692	3776.278	3753.987	633
2:39:50	59.971	3737.892	23.199	22.789	0.000	3799.762	3768.753	3785.729	3776.278	3754.046	633
2:39:52	59.972	3740.329	22.400	22.653	0.000	3799.626	3768.678	3785.766	3776.278	3754.105	633
2:39:54	59.972	3740.329	22.400	22.564	0.000	3799.537	3768.603	3785.802	3776.278	3754.164	633
2:39:56	59.977	3742.524	18.399	21.107	0.000	3798.080	3768.534	3785.835	3776.278	3754.223	633
2:39:58	59.977	3742.524	18.399	20.159	0.000	3797.132	3768.466	3785.865	3776.278	3754.281	633

2:40:00	59.977	3742.524	18.399	19.543	0.000	3796.516	3768.398	3785.893	3776.278	3754.339	633
2:40:02	59.976	3741.723	19.199	19.422	0.000	3796.395	3768.328	3785.920	3776.278	3754.396	633
2:40:04	59.976	3741.723	19.199	19.344	0.000	3796.317	3768.258	3785.947	3776.278	3754.454	633
2:40:06	59.974	3739.964	20.801	19.854	0.000	3796.827	3768.185	3785.976	3776.278	3754.511	633
2:40:08	59.974	3739.964	20.801	20.185	0.000	3797.158	3768.111	3786.005	3776.278	3754.567	633
2:40:10	59.974	3739.964	20.801	20.401	0.000	3797.374	3768.038	3786.034	3776.278	3754.624	633
2:40:12	59.978	3742.833	17.599	19.420	0.000	3796.393	3767.973	3786.061	3776.278	3754.680	633
2:40:14	59.978	3742.833	17.599	18.783	0.000	3795.756	3767.909	3786.086	3776.278	3754.736	633
2:40:16	59.981	3738.966	15.201	17.529	0.000	3794.502	3767.834	3786.107	3776.278	3754.791	633
2:40:18	59.981	3738.966	15.201	16.714	0.000	3793.687	3767.760	3786.127	3776.278	3754.846	633
2:40:20	59.981	3738.966	15.201	16.185	0.000	3793.158	3767.686	3786.145	3776.278	3754.901	633
2:40:22	59.971	3738.879	23.199	18.640	0.000	3795.613	3767.613	3786.169	3776.278	3754.956	633
2:40:24	59.971	3738.879	23.199	20.236	0.000	3797.209	3767.540	3786.197	3776.278	3755.010	633
2:40:26	59.971	3738.558	23.199	21.273	0.000	3798.246	3767.466	3786.228	3776.278	3755.065	633
2:40:28	59.971	3738.558	23.199	21.947	0.000	3798.920	3767.393	3786.260	3776.278	3755.118	633
2:40:30	59.971	3738.558	23.199	22.386	0.000	3799.359	3767.320	3786.293	3776.278	3755.172	633
2:40:32	59.966	3743.419	27.200	24.071	0.000	3801.044	3767.260	3786.330	3776.278	3755.225	633
2:40:34	59.966	3743.419	27.200	25.166	0.000	3802.139	3767.200	3786.370	3776.278	3755.278	633
2:40:36	59.971	3747.340	23.199	24.478	0.000	3801.451	3767.150	3786.408	3776.278	3755.331	633
2:40:38	59.971	3747.340	23.199	24.030	0.000	3801.003	3767.101	3786.444	3776.278	3755.384	633
2:40:40	59.971	3747.340	23.199	23.740	0.000	3800.713	3767.052	3786.480	3776.278	3755.436	633
2:40:42	59.969	3749.750	24.799	24.110	0.000	3801.083	3767.009	3786.516	3776.278	3755.488	633
2:40:44	59.969	3749.750	24.799	24.351	0.000	3801.324	3766.966	3786.553	3776.278	3755.539	633
2:40:46	59.974	3743.745	20.801	23.109	0.000	3800.081	3766.908	3786.586	3776.278	3755.591	633
2:40:48	59.974	3743.745	20.801	22.301	0.000	3799.274	3766.851	3786.617	3776.278	3755.642	633
2:40:50	59.974	3743.745	20.801	21.776	0.000	3798.749	3766.794	3786.647	3776.278	3755.693	633
2:40:52	59.971	3740.299	23.199	22.274	0.000	3799.247	3766.729	3786.678	3776.278	3755.744	633
2:40:54	59.971	3740.299	23.199	22.598	0.000	3799.571	3766.664	3786.710	3776.278	3755.794	633
2:40:56	59.982	3731.830	14.401	19.729	0.000	3796.702	3766.579	3786.734	3776.278	3755.844	633
2:40:58	59.982	3731.830	14.401	17.864	0.000	3794.837	3766.494	3786.754	3776.278	3755.894	633
2:41:00	59.982	3731.830	14.401	16.652	0.000	3793.625	3766.410	3786.771	3776.278	3755.944	633
2:41:02	59.985	3736.229	12.000	15.024	0.000	3791.997	3766.337	3786.784	3776.278	3755.994	633
2:41:04	59.985	3736.229	12.000	13.965	0.000	3790.938	3766.264	3786.794	3776.278	3756.043	633
2:41:06	59.989	3733.115	8.801	12.158	0.000	3789.131	3766.184	3786.799	3776.278	3756.092	633
2:41:08	59.989	3733.115	8.801	10.983	0.000	3787.956	3766.104	3786.802	3776.278	3756.141	633
2:41:10	59.989	3733.115	8.801	10.219	0.000	3787.192	3766.025	3786.803	3776.278	3756.189	633
2:41:12	59.987	3729.180	10.400	10.283	0.000	3787.256	3765.936	3786.804	3776.278	3756.237	633
2:41:14	59.987	3729.180	10.400	10.324	0.000	3787.297	3765.849	3786.805	3776.278	3756.285	633
2:41:16	59.994	3720.108	4.800	8.391	0.000	3785.364	3765.739	3786.802	3776.278	3756.333	633
2:41:18	59.994	3720.108	4.800	7.134	0.000	3784.107	3765.631	3786.795	3776.278	3756.381	633
2:41:20	59.994	3720.108	4.800	6.317	0.000	3783.290	3765.523	3786.787	3776.278	3756.428	633
2:41:22	60.003	3725.661	-2.399	3.267	0.000	3780.240	3765.428	3786.772	3776.278	3756.475	633
2:41:24	60.003	3725.661	-2.399	1.284	0.000	3778.257	3765.334	3786.751	3776.278	3756.522	633
2:41:26	60.006	3727.825	-4.800	-0.846	0.000	3776.127	3765.246	3786.726	3776.278	3756.569	633
2:41:28	60.006	3727.825	-4.800	-2.230	0.000	3774.743	3765.158	3786.698	3776.278	3756.616	633
2:41:30	60.006	3727.825	-4.800	-3.130	0.000	3773.843	3765.070	3786.668	3776.278	3756.662	633

2:41:32	60.019	3727.231	-15.201	-7.354	0.000	3769.619	3764.981	3786.628	3776.278	3756.708	633
2:41:34	60.019	3727.231	-15.201	-10.101	0.000	3766.872	3764.893	3786.582	3776.278	3756.754	633
2:41:36	60.025	3726.016	-20.001	-13.566	0.000	3763.407	3764.803	3786.528	3776.278	3756.799	633
2:41:38	60.025	3726.016	-20.001	-15.818	0.000	3761.155	3764.712	3786.469	3776.278	3756.845	633
2:41:40	60.025	3726.016	-20.001	-17.282	0.000	3759.691	3764.623	3786.407	3776.278	3756.890	633
2:41:42	60.029	3716.375	-23.199	-19.353	0.000	3757.620	3764.511	3786.340	3776.278	3756.935	633
2:41:44	60.029	3716.375	-23.199	-20.699	0.000	3756.274	3764.400	3786.271	3776.278	3756.980	633
2:41:46	60.037	3717.142	-29.599	-23.814	0.000	3753.159	3764.291	3786.194	3776.278	3757.024	633
2:41:48	60.037	3717.142	-29.599	-25.839	0.000	3751.134	3764.182	3786.114	3776.278	3757.069	633
2:41:50	60.037	3717.142	-29.599	-27.155	0.000	3749.818	3764.075	3786.031	3776.278	3757.113	633
2:41:52	60.037	3713.632	-29.599	-28.010	0.000	3748.963	3763.959	3785.946	3776.278	3757.157	633
2:41:54	60.037	3713.632	-29.599	-28.566	0.000	3748.407	3763.844	3785.860	3776.278	3757.200	633
2:41:56	60.041	3699.356	-32.800	-30.048	0.000	3746.925	3763.697	3785.771	3776.278	3757.244	633
2:41:58	60.041	3699.356	-32.800	-31.011	0.000	3745.962	3763.551	3785.681	3776.278	3757.287	633
2:42:00	60.041	3699.356	-32.800	-31.638	0.000	3745.335	3763.405	3785.589	3776.278	3757.330	633
2:42:02	60.043	3704.591	-34.399	-32.604	0.000	3744.369	3763.272	3785.496	3776.278	3757.373	633
2:42:04	60.043	3704.591	-34.399	-33.233	0.000	3743.740	3763.140	3785.402	3776.278	3757.416	633
2:42:06	60.048	3701.316	-38.400	-35.041	0.000	3741.932	3763.001	3785.304	3776.278	3757.459	633
2:42:08	60.048	3701.316	-38.400	-36.217	0.000	3740.756	3762.862	3785.204	3776.278	3757.501	633
2:42:10	60.048	3701.316	-38.400	-36.981	0.000	3739.992	3762.724	3785.102	3776.278	3757.543	633
2:42:12	60.043	3699.529	-34.399	-36.077	0.000	3740.895	3762.583	3785.004	3776.278	3757.585	633
2:42:14	60.043	3699.529	-34.399	-35.490	0.000	3741.483	3762.442	3784.906	3776.278	3757.627	633
2:42:16	60.044	3690.477	-35.199	-35.388	0.000	3741.585	3762.282	3784.810	3776.278	3757.669	633
2:42:18	60.044	3690.477	-35.199	-35.322	0.000	3741.651	3762.122	3784.714	3776.278	3757.710	633
2:42:20	60.044	3690.477	-35.199	-35.279	0.000	3741.694	3761.963	3784.619	3776.278	3757.752	633

A Point	2:27:18		
FPointA	60.0410	2:27:18 AM	
A Value	60.0413		
C Value	59.8520	2:27:24 AM	
Delta FCA	-0.189249039		
FR C	-334.5	MW/0.1 Hz	
Slope A-C dF/dT	-0.031500	Hz/second	
C Value Maximum Resource Loss	633		
Secondary C Value	No	n/a	Time

A Point	2:27:18		
FPointA	60.04100037	2:27:18	
A Value	60.04125023		
C Value	59.85200119	#N/A	
Delta FC			

	Value B 12 to 24 sec	FR B 12 to 24 sec	Value B 18 to 30 sec	FR B 18 to 30 sec	Value B 20 to 40 sec	FR B 20 to 40 sec	Value B 18 to 52 sec	FR B 18 to 52 sec	Value B 20 to 52 sec
B Frequency Value	59.8796		59.8833		59.8883		59.8876		59.8883
Delta FB	-0.1617	-391.834	-0.1580	-401.156	-0.1530	-415.813	-0.1537	-412.389	-0.1530
Slope B dF/dT	-0.0080839		-0.00789818		-0.0076478		-0.0076847		-0.0076478
RatioB-C	85.4314		83.4686		80.8225		81.2128		80.8225
Sustainability Index	-0.0147		-0.0184		-0.0234		-0.0227		-0.0234

Tzero	2:27:18		
FT+4	59.85200119		
FT+10	59.86899948		
FT+20	59.875		
FT+60	59.88800049		

Interconnection Evaluation

riod (indicates ramp direction during recovery period)

B Value Average Resource Loss	633	
B Value Average LaaR Loss	0	
B Value Average Net Loss	633	

			Interconnection Bias Total		
			EI	ERCOT	WECC
Interconnection Bias Setting	-660		-6349	-660	-2024
IPFR as a % of Bias Setting	0.00%				
Interconnection Total Energy	37446	60.07%			
Interconnection Peak Energy	62339				

Frequency and Interconnection Frequency Response @ different Average periods of B

Generator Trip MW	Generator Trip MW	Generator Trip MW	Generator Trip MW	Generator Trip MW	Generator Trip MW	LaaR Trip MW	Total Generation Trip MW	Interconne Primary Frequency Response	FR B 20 to 52 sec Average MW
								MW/0.1 Hz	
							0		
							0		
							0		
							0		

	Value B 12 to 24 sec Average Frequency	FR B 12 to 24 sec Average MW	Value B 18 to 30 sec Average Frequency	FR B 18 to 30 sec Average MW	Value B 20 to 40 sec Average Frequency	FR B 20 to 40 sec Average MW	Value B 18 to 52 sec Average Frequency	FR B 18 to 52 sec Average MW	Value B 20 to 52 sec Average Frequency
T-72 sec									
T-70 sec									
T-68 sec									

	0			T-66 sec									
	0			T-64 sec									
	0			T-62 sec									
	0			T-60 sec									
	0			T-58 sec									
	0			T-56 sec									
	0			T-54 sec									
	0			T-52 sec									
	0			T-50 sec									
	0			T-48 sec									
	0			T-46 sec									
	0			T-44 sec									
	0			T-42 sec									
	0			T-40 sec									
	0			T-38 sec									
	0			T-36 sec									
	0			T-34 sec									
	0			T-32 sec									
	0			T-30 sec									
	0			T-28 sec									
	0			T-26 sec									
	0			T-24 sec									
	0			T-22 sec									
	0			T-20 sec									
	0			T-18 sec									
	0			T-16 sec	60.041								
	0			T-14 sec	60.041								
	0			T-12 sec	60.041								
	0			T-10 sec	60.041								
	0			T-08 sec	60.041								
	0			T-06 sec	60.041								
	0			T-04 sec	60.041								
	0			T-02 sec	60.041								
	633	-334.48		T+0 sec									
	633	-334.48		T+02 sec									
	633	-334.48		T+04 sec									
0	633	-367.488		T+06 sec									
0	633	-367.488		T+08 sec									
0	633	-367.488		T+10 sec									
0	633	-392.56		T+12 sec	59.8796	-391.834							
0	633	-392.56		T+14 sec	59.8796	-391.834							
0	633	-380.751		T+16 sec	59.8796	-391.834							
0	633	-380.751		T+18 sec	59.8796	-391.834	59.8833	-401.156			59.8876	-412.389	
0	633	-380.751	-414.2499042	T+20 sec	59.8796	-391.834	59.8833	-401.156	59.8883	-415.813	59.8876	-412.389	59.8883
0	633	-407.733	-414.2499042	T+22 sec	59.8796	-391.834	59.8833	-401.156	59.8883	-415.813	59.8876	-412.389	59.8883
0	633	-407.733	-414.2499042	T+24 sec	59.8796	-391.834	59.8833	-401.156	59.8883	-415.813	59.8876	-412.389	59.8883

0	633	-410.375	-414.2499042	T+26 sec		59.8833	-401.156	59.8883	-415.813	59.8876	-412.389	59.8883
0	633	-410.375	-414.2499042	T+28 sec		59.8833	-401.156	59.8883	-415.813	59.8876	-412.389	59.8883
0	633	-410.375	-414.2499042	T+30 sec		59.8833	-401.156	59.8883	-415.813	59.8876	-412.389	59.8883
0	633	-432.821	-414.2499042	T+32 sec				59.8883	-415.813	59.8876	-412.389	59.8883
0	633	-432.821	-414.2499042	T+34 sec				59.8883	-415.813	59.8876	-412.389	59.8883
0	633	-426.985	-414.2499042	T+36 sec				59.8883	-415.813	59.8876	-412.389	59.8883
0	633	-426.985	-414.2499042	T+38 sec				59.8883	-415.813	59.8876	-412.389	59.8883
0	633	-426.985	-414.2499042	T+40 sec				59.8883	-415.813	59.8876	-412.389	59.8883
0	633	-421.294	-414.2499042	T+42 sec						59.8876	-412.389	59.8883
0	633	-421.294	-414.2499042	T+44 sec						59.8876	-412.389	59.8883
0	633	-405.115	-414.2499042	T+46 sec						59.8876	-412.389	59.8883
0	633	-405.115	-414.2499042	T+48 sec						59.8876	-412.389	59.8883
0	633	-405.115	-414.2499042	T+50 sec						59.8876	-412.389	59.8883
0	633	-410.375	-414.2499042	T+52 sec						59.8876	-412.389	59.8883
0	633	-410.375		T+54 sec								
0	633	-413.051		T+56 sec								
0	633	-413.051		T+58 sec								
0	633	-413.051		T+60 sec								
0	633	-397.488		T+62 sec								
0	633	-397.488		T+64 sec								
0	633	-343.552		T+66 sec								
0	633	-343.552		T+68 sec								
0	633	-343.552		T+70 sec								
0	633	-345.433		T+72 sec								
0	633	-345.433		T+74 sec								
0	633	-361.2		T+76 sec								
0	633	-361.2		T+78 sec								
0	633	-361.2		T+80 sec								
0	633	-361.2										
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0	633	-361.2										
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0	633	9377.629
0	633	36191.31
0	633	36191.31
0	633	23030.83
0	633	23030.83
0	633	23030.83

Non-Conforming Load sign convention + (Data is positive for Load then enter "+" else "-"

FR B
20 to 52 sec

-414.250

FR B
20 to 52 sec
Average
MW

Time of Freque
Value A Pre-Pert
Value B Post-Pertu
Pre
Value A Pre-Perturbati
Value B Post-Perturbatio
Pre to Pos

Frequency, Actual Interchange, Adjustment Data, Bias and Load used in the evaluation

12 to 24 second

	T	Frequency Hz	Net Actual Interchange MW	JOU Dynamic Schedules Imp(-) Exp (+) MW	Non-Conforming Load Load (-) MW	Pumped Hydro Load (-) Gen (+) MW	Ramping Units Gen (+) MW	Transferred Frequency Response Rec (-) Del (+) MW/0.1 Hz	Contingent BA Lost Generation Load (-) Gen (+) MW	BA Bias Setting MW/0.1 Hz	BA Load MW	Expected Primary Freq Response MW		T	Frequency Hz
T-72 sec	2:26:08	60.0190	3671.19	350.00	-329.99	0.00	84.50	10.00	15.00	-103.00	7555.77	-15.201	T-72 sec	2:26:08	
T-70 sec	2:26:10	60.0260	3671.19	350.00	-329.99	0.00	85.00	10.00	15.00	-103.00	7556.10	-20.801	T-70 sec	2:26:10	
T-68 sec	2:26:12	60.0260	3671.19	350.00	-329.99	0.00	85.00	10.00	15.00	-103.00	7556.10	-20.801	T-68 sec	2:26:12	

	T-66 sec	2:26:14	60.0260	3671.19	350.00	-329.99	0.00	85.00	10.00	15.00	-103.00	7556.10	-20.801	T-66 sec	2:26:14	
	T-64 sec	2:26:16	60.0190	3664.50	350.00	-329.99	0.00	85.50	10.00	15.00	-103.00	7556.43	-15.201	T-64 sec	2:26:16	
	T-62 sec	2:26:18	60.0190	3664.50	350.00	-329.99	0.00	85.50	10.00	15.00	-103.00	7556.43	-15.201	T-62 sec	2:26:18	
	T-60 sec	2:26:20	60.0200	3666.82	350.00	-329.99	0.00	86.00	10.00	15.00	-103.00	7556.76	-16.000	T-60 sec	2:26:20	
	T-58 sec	2:26:22	60.0200	3666.82	350.00	-329.99	0.00	86.00	10.00	15.00	-103.00	7556.76	-16.000	T-58 sec	2:26:22	
	T-56 sec	2:26:24	60.0200	3666.82	350.00	-329.99	0.00	86.00	10.00	15.00	-103.00	7556.76	-16.000	T-56 sec	2:26:24	
	T-54 sec	2:26:26	60.0210	3670.27	350.00	-255.44	0.00	86.50	10.00	15.00	-103.00	7557.09	-16.800	T-54 sec	2:26:26	
	T-52 sec	2:26:28	60.0210	3670.27	350.00	-255.44	0.00	86.50	10.00	15.00	-103.00	7557.09	-16.800	T-52 sec	2:26:28	
	T-50 sec	2:26:30	60.0190	3672.49	350.00	-165.10	0.00	87.00	10.00	15.00	-103.00	7557.42	-15.201	T-50 sec	2:26:30	
	T-48 sec	2:26:32	60.0190	3672.49	350.00	-165.10	0.00	87.00	10.00	15.00	-103.00	7557.42	-15.201	T-48 sec	2:26:32	
	T-46 sec	2:26:34	60.0190	3672.49	350.00	-165.10	0.00	87.00	10.00	15.00	-103.00	7557.42	-15.201	T-46 sec	2:26:34	
	T-44 sec	2:26:36	60.0220	3672.16	350.00	-165.10	0.00	87.50	10.00	15.00	-103.00	7557.75	-17.599	T-44 sec	2:26:36	
	T-42 sec	2:26:38	60.0220	3672.16	350.00	-165.10	0.00	87.50	10.00	15.00	-103.00	7557.75	-17.599	T-42 sec	2:26:38	
	T-40 sec	2:26:40	60.0370	3669.98	350.00	-165.10	0.00	88.00	10.00	15.00	-103.00	7558.08	-29.599	T-40 sec	2:26:40	
	T-38 sec	2:26:42	60.0370	3669.98	350.00	-165.10	0.00	88.00	10.00	15.00	-103.00	7558.08	-29.599	T-38 sec	2:26:42	
	T-36 sec	2:26:44	60.0370	3669.98	350.00	-165.10	0.00	88.00	10.00	15.00	-103.00	7558.08	-29.599	T-36 sec	2:26:44	
	T-34 sec	2:26:46	60.0370	3661.60	350.00	-165.10	0.00	88.50	10.00	15.00	-103.00	7558.41	-29.599	T-34 sec	2:26:46	
	T-32 sec	2:26:48	60.0370	3661.60	350.00	-165.10	0.00	88.50	10.00	15.00	-103.00	7558.41	-29.599	T-32 sec	2:26:48	
	T-30 sec	2:26:50	60.0480	3651.49	350.00	-165.10	0.00	89.00	10.00	15.00	-103.00	7558.74	-38.400	T-30 sec	2:26:50	
	T-28 sec	2:26:52	60.0480	3651.49	350.00	-165.10	0.00	89.00	10.00	15.00	-103.00	7558.74	-38.400	T-28 sec	2:26:52	
	T-26 sec	2:26:54	60.0480	3651.49	350.00	-165.10	0.00	89.00	10.00	15.00	-103.00	7558.74	-38.400	T-26 sec	2:26:54	
	T-24 sec	2:26:56	60.0410	3648.25	350.00	-165.48	0.00	89.50	10.00	15.00	-103.00	7559.07	-32.800	T-24 sec	2:26:56	
	T-22 sec	2:26:58	60.0410	3648.25	350.00	-165.48	0.00	89.50	10.00	15.00	-103.00	7559.07	-32.800	T-22 sec	2:26:58	
	T-20 sec	2:27:00	60.0390	3654.29	350.00	-165.48	0.00	90.00	10.00	15.00	-103.00	7559.40	-31.201	T-20 sec	2:27:00	
	T-18 sec	2:27:02	60.0390	3654.29	350.00	-165.48	0.00	90.00	10.00	15.00	-103.00	7559.40	-31.201	T-18 sec	2:27:02	
	T-16 sec	2:27:04	60.0390	3654.29	350.00	-165.48	0.00	90.00	10.00	15.00	-103.00	7559.40	-31.201	T-16 sec	2:27:04	60.041
	T-14 sec	2:27:06	60.0430	3651.06	350.00	-165.48	0.00	90.50	10.00	15.00	-103.00	7559.73	-34.399	T-14 sec	2:27:06	60.041
	T-12 sec	2:27:08	60.0430	3651.06	350.00	-165.48	0.00	90.50	10.00	15.00	-103.00	7559.73	-34.399	T-12 sec	2:27:08	60.041
	T-10 sec	2:27:10	60.0410	3648.24	350.00	-165.48	0.00	91.00	10.00	15.00	-103.00	7560.06	-32.800	T-10 sec	2:27:10	60.041
	T-08 sec	2:27:12	60.0410	3648.24	350.00	-165.48	0.00	91.00	10.00	15.00	-103.00	7560.06	-32.800	T-08 sec	2:27:12	60.041
	T-06 sec	2:27:14	60.0410	3648.24	350.00	-165.48	0.00	91.00	10.00	15.00	-103.00	7560.06	-32.800	T-06 sec	2:27:14	60.041
	T-04 sec	2:27:16	60.0410	3645.45	350.00	-165.48	0.00	91.50	10.00	15.00	-103.00	7560.39	-32.800	T-04 sec	2:27:16	60.041
	T-02 sec	2:27:18	60.0410	3645.45	350.00	-165.48	0.00	91.50	10.00	15.00	-103.00	7560.39	-32.800	T-02 sec	2:27:18	60.041
	T+0 sec	2:27:20	59.8520	3641.19	335.00	-206.46	1.00	92.00	10.00	0.00	-103.00	7560.72	118.399	T+0 sec	2:27:20	
	T+02 sec	2:27:22	59.8520	3641.19	335.00	-206.46	1.00	92.00	10.00	0.00	-103.00	7560.72	118.399	T+02 sec	2:27:22	
	T+04 sec	2:27:24	59.8520	3641.19	335.00	-206.46	1.00	92.00	10.00	0.00	-103.00	7560.72	118.399	T+04 sec	2:27:24	
	T+06 sec	2:27:26	59.8690	3734.90	335.00	-206.46	1.00	92.50	10.00	0.00	-103.00	7561.05	104.800	T+06 sec	2:27:26	
	T+08 sec	2:27:28	59.8690	3734.90	335.00	-206.46	1.00	92.50	10.00	0.00	-103.00	7561.05	104.800	T+08 sec	2:27:28	
	T+10 sec	2:27:30	59.8690	3734.90	335.00	-206.46	1.00	92.50	10.00	0.00	-103.00	7561.05	104.800	T+10 sec	2:27:30	
	T+12 sec	2:27:32	59.8800	3737.16	335.00	-206.46	1.00	93.00	10.00	0.00	-103.00	7561.38	95.999	T+12 sec	2:27:32	59.880
	T+14 sec	2:27:34	59.8800	3737.16	335.00	-206.46	1.00	93.00	10.00	0.00	-103.00	7561.38	95.999	T+14 sec	2:27:34	59.880
	T+16 sec	2:27:36	59.8750	3766.19	335.00	-206.46	1.00	93.50	10.00	0.00	-103.00	7561.71	100.000	T+16 sec	2:27:36	59.880
	T+18 sec	2:27:38	59.8750	3766.19	335.00	-206.46	1.00	93.50	10.00	0.00	-103.00	7561.71	100.000	T+18 sec	2:27:38	59.880
-414.250	T+20 sec	2:27:40	59.8750	3766.19	335.00	-206.46	1.00	93.50	10.00	0.00	-103.00	7561.71	100.000	T+20 sec	2:27:40	59.880
-414.250	T+22 sec	2:27:42	59.8860	3769.93	335.00	-206.46	1.00	94.00	10.00	0.00	-103.00	7562.04	91.199	T+22 sec	2:27:42	59.880
-414.250	T+24 sec	2:27:44	59.8860	3769.93	335.00	-206.46	1.00	94.00	10.00	0.00	-103.00	7562.04	91.199	T+24 sec	2:27:44	59.880

-414.250	T+26 sec	2:27:46	59.8870	3782.50	335.00	-211.26	1.00	94.50	10.00	0.00	-103.00	7562.37	90.399	T+26 sec	2:27:46
-414.250	T+28 sec	2:27:48	59.8870	3782.50	335.00	-211.26	1.00	94.50	10.00	0.00	-103.00	7562.37	90.399	T+28 sec	2:27:48
-414.250	T+30 sec	2:27:50	59.8870	3782.50	335.00	-211.26	1.00	94.50	10.00	0.00	-103.00	7562.37	90.399	T+30 sec	2:27:50
-414.250	T+32 sec	2:27:52	59.8950	3784.73	335.00	-211.26	1.00	95.00	10.00	0.00	-103.00	7562.70	84.000	T+32 sec	2:27:52
-414.250	T+34 sec	2:27:54	59.8950	3784.73	335.00	-211.26	1.00	95.00	10.00	0.00	-103.00	7562.70	84.000	T+34 sec	2:27:54
-414.250	T+36 sec	2:27:56	59.8930	3788.33	335.00	-211.26	2.00	95.50	10.00	0.00	-103.00	7563.03	85.599	T+36 sec	2:27:56
-414.250	T+38 sec	2:27:58	59.8930	3788.33	335.00	-211.26	2.00	95.50	10.00	0.00	-103.00	7563.03	85.599	T+38 sec	2:27:58
-414.250	T+40 sec	2:28:00	59.8930	3788.33	335.00	-211.26	2.00	95.50	10.00	0.00	-103.00	7563.03	85.599	T+40 sec	2:28:00
-414.250	T+42 sec	2:28:02	59.8910	3788.47	335.00	-211.26	3.00	96.00	10.00	0.00	-103.00	7563.36	87.201	T+42 sec	2:28:02
-414.250	T+44 sec	2:28:04	59.8910	3788.47	335.00	-211.26	3.00	96.00	10.00	0.00	-103.00	7563.36	87.201	T+44 sec	2:28:04
-414.250	T+46 sec	2:28:06	59.8850	3794.37	335.00	-211.26	4.00	96.50	10.00	0.00	-103.00	7563.69	92.001	T+46 sec	2:28:06
-414.250	T+48 sec	2:28:08	59.8850	3794.37	335.00	-211.26	4.00	96.50	10.00	0.00	-103.00	7563.69	92.001	T+48 sec	2:28:08
-414.250	T+50 sec	2:28:10	59.8850	3794.37	335.00	-211.26	4.00	96.50	10.00	0.00	-103.00	7563.69	92.001	T+50 sec	2:28:10
-414.250	T+52 sec	2:28:12	59.8870	3800.43	335.00	-214.35	5.00	97.00	10.00	0.00	-103.00	7564.02	90.399	T+52 sec	2:28:12
	T+54 sec	2:28:14	59.8870	3800.43	335.00	-214.35	5.00	97.00	10.00	0.00	-103.00	7564.02	90.399	T+54 sec	2:28:14
	T+56 sec	2:28:16	59.8880	3802.93	335.00	-214.35	6.00	97.50	10.00	0.00	-103.00	7564.35	89.600	T+56 sec	2:28:16
	T+58 sec	2:28:18	59.8880	3802.93	335.00	-214.35	6.00	97.50	10.00	0.00	-103.00	7564.35	89.600	T+58 sec	2:28:18
	T+60 sec	2:28:20	59.8880	3802.93	335.00	-214.35	6.00	97.50	10.00	0.00	-103.00	7564.35	89.600	T+60 sec	2:28:20
	T+62 sec	2:28:22	59.8820	3804.39	335.00	-214.35	7.00	98.00	10.00	0.00	-103.00	7564.68	94.400	T+62 sec	2:28:22
	T+64 sec	2:28:24	59.8820	3804.39	335.00	-214.35	7.00	98.00	10.00	0.00	-103.00	7564.68	94.400	T+64 sec	2:28:24
	T+66 sec	2:28:26	59.8570	3809.24	335.00	-214.35	8.00	98.50	10.00	0.00	-103.00	7565.01	114.401	T+66 sec	2:28:26
	T+68 sec	2:28:28	59.8570	3809.24	335.00	-214.35	8.00	98.50	10.00	0.00	-103.00	7565.01	114.401	T+68 sec	2:28:28
	T+70 sec	2:28:30	59.8570	3809.24	335.00	-214.35	8.00	98.50	10.00	0.00	-103.00	7565.01	114.401	T+70 sec	2:28:30
	T+72 sec	2:28:32	59.8580	3814.86	335.00	-214.35	9.00	99.00	10.00	0.00	-103.00	7565.34	113.599	T+72 sec	2:28:32
	T+74 sec	2:28:34	59.8580	3814.86	335.00	-214.35	9.00	99.00	10.00	0.00	-103.00	7565.34	113.599	T+74 sec	2:28:34
	T+76 sec	2:28:36	59.8660	3826.05	335.00	-212.17	10.00	99.50	10.00	0.00	-103.00	7565.67	107.199	T+76 sec	2:28:36
	T+78 sec	2:28:38	59.8660	3826.05	335.00	-212.17	10.00	99.50	10.00	0.00	-103.00	7565.67	107.199	T+78 sec	2:28:38
	T+80 sec	2:28:40	59.8660	3826.05	335.00	-212.17	10.00	99.50	10.00	0.00	-103.00	7565.67	107.199	T+80 sec	2:28:40
		2:28:42	59.8660	3827.52	335.00	-212.17	11.00	100.00	10.00	0.00	-103.00	7566.00	107.199		
		2:28:44	59.8660	3827.52	335.00	-212.17	11.00	100.00	10.00	0.00	-103.00	7566.00	107.199		
		2:28:46	59.8740	3826.45	335.00	-212.17	12.00	100.50	10.00	0.00	-103.00	7566.33	100.800		
		2:28:48	59.8740	3826.45	335.00	-212.17	12.00	100.50	10.00	0.00	-103.00	7566.33	100.800		
		2:28:50	59.8740	3826.45	335.00	-212.17	12.00	100.50	10.00	0.00	-103.00	7566.33	100.800		
		2:28:52	59.8830	3823.83	335.00	-212.17	13.00	101.00	10.00	0.00	-103.00	7566.66	93.600		
		2:28:54	59.8830	3823.83	335.00	-212.17	13.00	101.00	10.00	0.00	-103.00	7566.66	93.600		
		2:28:56	59.8900	3818.06	335.00	-212.17	14.00	101.50	10.00	0.00	-103.00	7566.99	88.000		
		2:28:58	59.8900	3818.06	335.00	-212.17	14.00	101.50	10.00	0.00	-103.00	7566.99	88.000		
		2:29:00	59.8900	3818.06	335.00	-212.17	14.00	101.50	10.00	0.00	-103.00	7566.99	88.000		
		2:29:02	59.8930	3815.01	335.00	-215.60	15.00	102.00	10.00	0.00	-103.00	7567.32	85.599		
		2:29:04	59.8930	3815.01	335.00	-215.60	15.00	102.00	10.00	0.00	-103.00	7567.32	85.599		
		2:29:06	59.9030	3809.65	335.00	-215.60	16.00	102.50	10.00	0.00	-103.00	7567.65	77.600		
		2:29:08	59.9030	3809.65	335.00	-215.60	16.00	102.50	10.00	0.00	-103.00	7567.65	77.600		
		2:29:10	59.9030	3809.65	335.00	-215.60	16.00	102.50	10.00	0.00	-103.00	7567.65	77.600		
		2:29:12	59.9040	3805.59	335.00	-215.60	16.00	103.00	10.00	0.00	-103.00	7567.98	76.801		
		2:29:14	59.9040	3805.59	335.00	-215.60	16.00	103.00	10.00	0.00	-103.00	7567.98	76.801		

2:29:16	59.9110	3793.98	335.00	-215.60	16.00	103.50	10.00	0.00	-103.00	7568.31	71.201
2:29:18	59.9110	3793.98	335.00	-215.60	16.00	103.50	10.00	0.00	-103.00	7568.31	71.201
2:29:20	59.9110	3793.98	335.00	-215.60	16.00	103.50	10.00	0.00	-103.00	7568.31	71.201
2:29:22	59.9170	3791.50	335.00	-215.60	16.00	104.00	10.00	0.00	-103.00	7568.64	66.400
2:29:24	59.9170	3791.50	335.00	-215.60	16.00	104.00	10.00	0.00	-103.00	7568.64	66.400
2:29:26	59.9200	3784.56	335.00	-218.33	16.00	104.50	10.00	0.00	-103.00	7568.97	64.001
2:29:28	59.9200	3784.56	335.00	-218.33	16.00	104.50	10.00	0.00	-103.00	7568.97	64.001
2:29:30	59.9200	3784.56	335.00	-218.33	16.00	104.50	10.00	0.00	-103.00	7568.97	64.001
2:29:32	59.9170	3781.70	335.00	-218.33	16.00	105.00	10.00	0.00	-103.00	7569.30	66.400
2:29:34	59.9170	3781.70	335.00	-218.33	16.00	105.00	10.00	0.00	-103.00	7569.30	66.400
2:29:36	59.9210	3774.60	335.00	-218.33	16.00	105.50	10.00	0.00	-103.00	7569.63	63.199
2:29:38	59.9210	3774.60	335.00	-218.33	16.00	105.50	10.00	0.00	-103.00	7569.63	63.199
2:29:40	59.9210	3774.60	335.00	-218.33	16.00	105.50	10.00	0.00	-103.00	7569.63	63.199
2:29:42	59.9250	3773.96	335.00	-218.33	16.00	106.00	10.00	0.00	-103.00	7569.96	60.001
2:29:44	59.9250	3773.96	335.00	-218.33	16.00	106.00	10.00	0.00	-103.00	7569.96	60.001
2:29:46	59.9270	3769.63	335.00	-218.33	16.00	106.50	10.00	0.00	-103.00	7570.29	58.401
2:29:48	59.9270	3769.63	335.00	-218.33	16.00	106.50	10.00	0.00	-103.00	7570.29	58.401
2:29:50	59.9270	3769.63	335.00	-218.33	16.00	106.50	10.00	0.00	-103.00	7570.29	58.401
2:29:52	59.9280	3767.64	335.00	-217.38	0.00	107.00	10.00	0.00	-103.00	7570.62	57.599
2:29:54	59.9280	3767.64	335.00	-217.38	0.00	107.00	10.00	0.00	-103.00	7570.62	57.599
2:29:56	59.9290	3766.79	335.00	-217.38	0.00	107.50	10.00	0.00	-103.00	7570.95	56.799
2:29:58	59.9290	3766.79	335.00	-217.38	0.00	107.50	10.00	0.00	-103.00	7570.95	56.799
2:30:00	59.9290	3766.79	335.00	-217.38	0.00	107.50	10.00	0.00	-103.00	7570.95	56.799
2:30:02	59.9370	3765.67	335.00	-217.38	0.00	108.00	10.00	0.00	-103.00	7571.28	50.400
2:30:04	59.9370	3765.67	335.00	-217.38	0.00	108.00	10.00	0.00	-103.00	7571.28	50.400
2:30:06	59.9450	3765.10	335.00	-217.38	0.00	108.50	10.00	0.00	-103.00	7571.61	44.000
2:30:08	59.9450	3765.10	335.00	-217.38	0.00	108.50	10.00	0.00	-103.00	7571.61	44.000
2:30:10	59.9450	3765.10	335.00	-217.38	0.00	108.50	10.00	0.00	-103.00	7571.61	44.000
2:30:12	59.9420	3758.39	335.00	-217.38	0.00	109.00	10.00	0.00	-103.00	7571.94	46.399
2:30:14	59.9420	3758.39	335.00	-217.38	0.00	109.00	10.00	0.00	-103.00	7571.94	46.399
2:30:16	59.9420	3746.89	335.00	-214.83	0.00	109.50	10.00	0.00	-103.00	7572.27	46.399
2:30:18	59.9420	3746.89	335.00	-214.83	0.00	109.50	10.00	0.00	-103.00	7572.27	46.399
2:30:20	59.9420	3746.89	335.00	-214.83	0.00	109.50	10.00	0.00	-103.00	7572.27	46.399
2:30:22	59.9470	3749.59	335.00	-214.83	0.00	110.00	10.00	0.00	-103.00	7572.60	42.401
2:30:24	59.9470	3749.59	335.00	-214.83	0.00	110.00	10.00	0.00	-103.00	7572.60	42.401
2:30:26	59.9510	3749.08	335.00	-214.83	0.00	110.50	10.00	0.00	-103.00	7572.93	39.200
2:30:28	59.9510	3749.08	335.00	-214.83	0.00	110.50	10.00	0.00	-103.00	7572.93	39.200
2:30:30	59.9510	3749.08	335.00	-214.83	0.00	110.50	10.00	0.00	-103.00	7572.93	39.200
2:30:32	59.9510	3740.26	335.00	-214.83	0.00	111.00	10.00	0.00	-103.00	7573.26	39.200
2:30:34	59.9510	3740.26	335.00	-214.83	0.00	111.00	10.00	0.00	-103.00	7573.26	39.200
2:30:36	59.9520	3727.84	335.00	-214.83	0.00	111.50	10.00	0.00	-103.00	7573.59	38.400
2:30:38	59.9520	3727.84	335.00	-214.83	0.00	111.50	10.00	0.00	-103.00	7573.59	38.400
2:30:40	59.9520	3727.84	335.00	-214.83	0.00	111.50	10.00	0.00	-103.00	7573.59	38.400
2:30:42	59.9520	3722.65	335.00	-227.66	0.00	112.00	10.00	0.00	-103.00	7573.92	38.400
2:30:44	59.9520	3722.65	335.00	-227.66	0.00	112.00	10.00	0.00	-103.00	7573.92	38.400
2:30:46	59.9520	3718.14	335.00	-227.66	0.00	112.50	10.00	0.00	-103.00	7574.25	38.400

2:30:48	59.9520	3718.14	335.00	-227.66	0.00	112.50	10.00	0.00	-103.00	7574.25	38.400
2:30:50	59.9520	3718.14	335.00	-227.66	0.00	112.50	10.00	0.00	-103.00	7574.25	38.400
2:30:52	59.9520	3713.69	335.00	-227.66	0.00	113.00	10.00	0.00	-103.00	7574.58	38.400
2:30:54	59.9520	3713.69	335.00	-227.66	0.00	113.00	10.00	0.00	-103.00	7574.58	38.400
2:30:56	59.9540	3710.81	335.00	-227.66	0.00	113.50	10.00	0.00	-103.00	7574.91	36.801
2:30:58	59.9540	3710.81	335.00	-227.66	0.00	113.50	10.00	0.00	-103.00	7574.91	36.801
2:31:00	59.9540	3710.81	335.00	-227.66	0.00	113.50	10.00	0.00	-103.00	7574.91	36.801
2:31:02	59.9560	3714.62	335.00	-227.66	0.00	114.00	10.00	0.00	-103.00	7575.24	35.199
2:31:04	59.9560	3714.62	335.00	-227.66	0.00	114.00	10.00	0.00	-103.00	7575.24	35.199
2:31:06	59.9560	3716.46	335.00	-225.02	0.00	114.50	10.00	0.00	-103.00	7575.57	35.199
2:31:08	59.9560	3716.46	335.00	-225.02	0.00	114.50	10.00	0.00	-103.00	7575.57	35.199
2:31:10	59.9560	3716.46	335.00	-225.02	0.00	114.50	10.00	0.00	-103.00	7575.57	35.199
2:31:12	59.9610	3717.76	335.00	-225.02	0.00	115.00	10.00	0.00	-103.00	7575.90	31.201
2:31:14	59.9610	3717.76	335.00	-225.02	0.00	115.00	10.00	0.00	-103.00	7575.90	31.201
2:31:16	59.9620	3722.66	335.00	-225.02	0.00	115.50	10.00	0.00	-103.00	7576.23	30.399
2:31:18	59.9620	3722.66	335.00	-225.02	0.00	115.50	10.00	0.00	-103.00	7576.23	30.399
2:31:20	59.9620	3722.66	335.00	-225.02	0.00	115.50	10.00	0.00	-103.00	7576.23	30.399
2:31:22	59.9660	3722.28	335.00	-225.02	0.00	116.00	10.00	0.00	-103.00	7576.56	27.200
2:31:24	59.9660	3722.28	335.00	-225.02	0.00	116.00	10.00	0.00	-103.00	7576.56	27.200
2:31:26	59.9700	3723.98	335.00	-225.02	0.00	116.50	10.00	0.00	-103.00	7576.89	23.999
2:31:28	59.9700	3723.98	335.00	-225.02	0.00	116.50	10.00	0.00	-103.00	7576.89	23.999
2:31:30	59.9700	3723.98	335.00	-225.02	0.00	116.50	10.00	0.00	-103.00	7576.89	23.999
2:31:32	59.9690	3723.89	335.00	-228.37	0.00	117.00	10.00	0.00	-103.00	7577.22	24.799
2:31:34	59.9690	3723.89	335.00	-228.37	0.00	117.00	10.00	0.00	-103.00	7577.22	24.799
2:31:36	59.9700	3728.05	335.00	-228.37	0.00	117.50	10.00	0.00	-103.00	7577.55	23.999
2:31:38	59.9700	3728.05	335.00	-228.37	0.00	117.50	10.00	0.00	-103.00	7577.55	23.999
2:31:40	59.9700	3728.05	335.00	-228.37	0.00	117.50	10.00	0.00	-103.00	7577.55	23.999
2:31:42	59.9730	3732.53	335.00	-228.37	0.00	118.00	10.00	0.00	-103.00	7577.88	21.600
2:31:44	59.9730	3732.53	335.00	-228.37	0.00	118.00	10.00	0.00	-103.00	7577.88	21.600
2:31:46	59.9780	3736.91	335.00	-228.37	0.00	118.50	10.00	0.00	-103.00	7578.21	17.599
2:31:48	59.9780	3736.91	335.00	-228.37	0.00	118.50	10.00	0.00	-103.00	7578.21	17.599
2:31:50	59.9780	3736.91	335.00	-228.37	0.00	118.50	10.00	0.00	-103.00	7578.21	17.599
2:31:52	59.9780	3738.70	335.00	-228.37	0.00	119.00	10.00	0.00	-103.00	7578.54	17.599
2:31:54	59.9780	3738.70	335.00	-228.37	0.00	119.00	10.00	0.00	-103.00	7578.54	17.599
2:31:56	59.9780	3741.79	335.00	-234.08	0.00	119.50	10.00	0.00	-103.00	7578.87	17.599
2:31:58	59.9780	3741.79	335.00	-234.08	0.00	119.50	10.00	0.00	-103.00	7578.87	17.599
2:32:00	59.9780	3741.79	335.00	-234.08	0.00	119.50	10.00	0.00	-103.00	7578.87	17.599
2:32:02	59.9820	3746.61	335.00	-234.08	0.00	120.00	10.00	0.00	-103.00	7579.20	14.401
2:32:04	59.9820	3746.61	335.00	-234.08	0.00	120.00	10.00	0.00	-103.00	7579.20	14.401
2:32:06	59.9800	3751.56	335.00	-234.08	0.00	120.50	10.00	0.00	-103.00	7579.53	16.000
2:32:08	59.9800	3751.56	335.00	-234.08	0.00	120.50	10.00	0.00	-103.00	7579.53	16.000
2:32:10	59.9800	3751.56	335.00	-234.08	0.00	120.50	10.00	0.00	-103.00	7579.53	16.000
2:32:12	59.9790	3755.60	335.00	-234.08	0.00	121.00	10.00	0.00	-103.00	7579.86	16.800
2:32:14	59.9790	3755.60	335.00	-234.08	0.00	121.00	10.00	0.00	-103.00	7579.86	16.800
2:32:16	59.9830	3760.41	335.00	-234.08	0.00	121.50	10.00	0.00	-103.00	7580.19	13.599
2:32:18	59.9830	3760.41	335.00	-234.08	0.00	121.50	10.00	0.00	-103.00	7580.19	13.599

2:32:20	59.9830	3760.41	335.00	-234.08	0.00	121.50	10.00	0.00	-103.00	7580.19	13.599
2:32:22	59.9890	3761.41	335.00	-228.80	0.00	122.00	10.00	0.00	-103.00	7580.52	8.801
2:32:24	59.9890	3761.41	335.00	-228.80	0.00	122.00	10.00	0.00	-103.00	7580.52	8.801
2:32:26	59.9870	3764.96	335.00	-228.80	0.00	122.50	10.00	0.00	-103.00	7580.85	10.400
2:32:28	59.9870	3764.96	335.00	-228.80	0.00	122.50	10.00	0.00	-103.00	7580.85	10.400
2:32:30	59.9870	3764.96	335.00	-228.80	0.00	122.50	10.00	0.00	-103.00	7580.85	10.400
2:32:32	59.9920	3766.43	335.00	-354.90	0.00	123.00	10.00	0.00	-103.00	7581.18	6.400
2:32:34	59.9920	3766.43	335.00	-354.90	0.00	123.00	10.00	0.00	-103.00	7581.18	6.400
2:32:36	59.9890	3768.63	335.00	-354.90	0.00	123.50	10.00	0.00	-103.00	7581.51	8.801
2:32:38	59.9890	3768.63	335.00	-354.90	0.00	123.50	10.00	0.00	-103.00	7581.51	8.801
2:32:40	59.9890	3768.63	335.00	-354.90	0.00	123.50	10.00	0.00	-103.00	7581.51	8.801
2:32:42	59.9830	3772.44	335.00	-340.47	0.00	124.00	10.00	0.00	-103.00	7581.84	13.599
2:32:44	59.9830	3772.44	335.00	-340.47	0.00	124.00	10.00	0.00	-103.00	7581.84	13.599
2:32:46	59.9930	3775.84	335.00	-340.47	0.00	124.50	10.00	0.00	-103.00	7582.17	5.600
2:32:48	59.9930	3775.84	335.00	-340.47	0.00	124.50	10.00	0.00	-103.00	7582.17	5.600
2:32:50	59.9930	3775.84	335.00	-340.47	0.00	124.50	10.00	0.00	-103.00	7582.17	5.600
2:32:52	59.9990	3774.87	335.00	-340.47	0.00	125.00	10.00	0.00	-103.00	7582.50	0.800
2:32:54	59.9990	3774.87	335.00	-340.47	0.00	125.00	10.00	0.00	-103.00	7582.50	0.800
2:32:56	59.9990	3778.55	335.00	-340.47	0.00	125.50	10.00	0.00	-103.00	7582.83	0.800
2:32:58	59.9990	3778.55	335.00	-340.47	0.00	125.50	10.00	0.00	-103.00	7582.83	0.800
2:33:00	59.9990	3778.55	335.00	-340.47	0.00	125.50	10.00	0.00	-103.00	7582.83	0.800
2:33:02	60.0020	3781.26	335.00	-340.47	0.00	126.00	10.00	0.00	-103.00	7583.16	-1.599
2:33:04	60.0020	3781.26	335.00	-340.47	0.00	126.00	10.00	0.00	-103.00	7583.16	-1.599
2:33:06	60.0070	3783.90	335.00	-337.64	0.00	126.50	10.00	0.00	-103.00	7583.49	-5.600
2:33:08	60.0070	3783.90	335.00	-337.64	0.00	126.50	10.00	0.00	-103.00	7583.49	-5.600
2:33:10	60.0070	3783.90	335.00	-337.64	0.00	126.50	10.00	0.00	-103.00	7583.49	-5.600
2:33:12	60.0140	3785.77	335.00	-337.64	0.00	127.00	10.00	0.00	-103.00	7583.82	-11.200
2:33:14	60.0140	3785.77	335.00	-337.64	0.00	127.00	10.00	0.00	-103.00	7583.82	-11.200
2:33:16	60.0190	3786.30	335.00	-337.64	0.00	127.50	10.00	0.00	-103.00	7584.15	-15.201
2:33:18	60.0190	3786.30	335.00	-337.64	0.00	127.50	10.00	0.00	-103.00	7584.15	-15.201
2:33:20	60.0190	3786.30	335.00	-337.64	0.00	127.50	10.00	0.00	-103.00	7584.15	-15.201
2:33:22	60.0170	3787.52	335.00	-337.64	0.00	128.00	10.00	0.00	-103.00	7584.48	-13.599
2:33:24	60.0170	3787.52	335.00	-337.64	0.00	128.00	10.00	0.00	-103.00	7584.48	-13.599
2:33:26	60.0230	3788.61	335.00	-337.64	0.00	128.50	10.00	0.00	-103.00	7584.81	-18.399
2:33:28	60.0230	3788.61	335.00	-337.64	0.00	128.50	10.00	0.00	-103.00	7584.81	-18.399
2:33:30	60.0230	3788.61	335.00	-337.64	0.00	128.50	10.00	0.00	-103.00	7584.81	-18.399
2:33:32	60.0210	3787.54	335.00	-284.36	0.00	129.00	10.00	0.00	-103.00	7585.14	-16.800
2:33:34	60.0210	3787.54	335.00	-284.36	0.00	129.00	10.00	0.00	-103.00	7585.14	-16.800
2:33:36	60.0240	3787.93	335.00	-284.36	0.00	129.50	10.00	0.00	-103.00	7585.47	-19.199
2:33:38	60.0240	3787.93	335.00	-284.36	0.00	129.50	10.00	0.00	-103.00	7585.47	-19.199
2:33:40	60.0240	3787.93	335.00	-284.36	0.00	129.50	10.00	0.00	-103.00	7585.47	-19.199
2:33:42	60.0200	3786.87	350.00	-284.36	0.00	130.00	10.00	0.00	-103.00	7585.80	-16.000
2:33:44	60.0200	3786.87	350.00	-284.36	0.00	130.00	10.00	0.00	-103.00	7585.80	-16.000
2:33:46	60.0240	3785.02	350.00	-284.36	0.00	130.50	10.00	0.00	-103.00	7586.13	-19.199
2:33:48	60.0240	3785.02	350.00	-284.36	0.00	130.50	10.00	0.00	-103.00	7586.13	-19.199
2:33:50	60.0240	3785.02	350.00	-284.36	0.00	130.50	10.00	0.00	-103.00	7586.13	-19.199

2:33:52	60.0220	3785.95	350.00	-284.36	0.00	131.00	10.00	0.00	-103.00	7586.46	-17.599
2:33:54	60.0220	3785.95	350.00	-284.36	0.00	131.00	10.00	0.00	-103.00	7586.46	-17.599
2:33:56	60.0220	3786.88	350.00	-260.47	0.00	131.50	10.00	0.00	-103.00	7586.79	-17.599
2:33:58	60.0220	3786.88	350.00	-260.47	0.00	131.50	10.00	0.00	-103.00	7586.79	-17.599
2:34:00	60.0220	3786.88	350.00	-260.47	0.00	131.50	10.00	0.00	-103.00	7586.79	-17.599
2:34:02	60.0230	3785.73	350.00	-260.47	0.00	132.00	10.00	0.00	-103.00	7587.12	-18.399
2:34:04	60.0230	3785.73	350.00	-260.47	0.00	132.00	10.00	0.00	-103.00	7587.12	-18.399
2:34:06	60.0220	3785.80	350.00	-260.47	0.00	132.50	10.00	0.00	-103.00	7587.45	-17.599
2:34:08	60.0220	3785.80	350.00	-260.47	0.00	132.50	10.00	0.00	-103.00	7587.45	-17.599
2:34:10	60.0220	3785.80	350.00	-260.47	0.00	132.50	10.00	0.00	-103.00	7587.45	-17.599
2:34:12	60.0180	3786.94	350.00	-260.47	0.00	133.00	10.00	0.00	-103.00	7587.78	-14.401
2:34:14	60.0180	3786.94	350.00	-260.47	0.00	133.00	10.00	0.00	-103.00	7587.78	-14.401
2:34:16	60.0180	3789.67	350.00	-260.47	0.00	133.50	10.00	0.00	-103.00	7588.11	-14.401
2:34:18	60.0180	3789.67	350.00	-260.47	0.00	133.50	10.00	0.00	-103.00	7588.11	-14.401
2:34:20	60.0180	3789.67	350.00	-260.47	0.00	133.50	10.00	0.00	-103.00	7588.11	-14.401
2:34:22	60.0160	3788.48	350.00	-253.14	0.00	134.00	10.00	0.00	-103.00	7588.44	-12.799
2:34:24	60.0160	3788.48	350.00	-253.14	0.00	134.00	10.00	0.00	-103.00	7588.44	-12.799
2:34:26	60.0160	3789.00	350.00	-253.14	0.00	134.50	10.00	0.00	-103.00	7588.77	-12.799
2:34:28	60.0160	3789.00	350.00	-253.14	0.00	134.50	10.00	0.00	-103.00	7588.77	-12.799
2:34:30	60.0160	3789.00	350.00	-253.14	0.00	134.50	10.00	0.00	-103.00	7588.77	-12.799
2:34:32	60.0120	3788.93	350.00	-253.14	0.00	135.00	10.00	0.00	-103.00	7589.10	-9.601
2:34:34	60.0120	3788.93	350.00	-253.14	0.00	135.00	10.00	0.00	-103.00	7589.10	-9.601
2:34:36	60.0100	3790.41	350.00	-253.14	0.00	135.50	10.00	0.00	-103.00	7589.43	-7.999
2:34:38	60.0100	3790.41	350.00	-253.14	0.00	135.50	10.00	0.00	-103.00	7589.43	-7.999
2:34:40	60.0100	3790.41	350.00	-253.14	0.00	135.50	10.00	0.00	-103.00	7589.43	-7.999
2:34:42	60.0090	3791.54	350.00	-253.14	0.00	136.00	10.00	0.00	-103.00	7589.76	-7.199
2:34:44	60.0090	3791.54	350.00	-253.14	0.00	136.00	10.00	0.00	-103.00	7589.76	-7.199
2:34:46	60.0100	3791.44	350.00	-251.93	0.00	136.50	10.00	0.00	-103.00	7590.09	-7.999
2:34:48	60.0100	3791.44	350.00	-251.93	0.00	136.50	10.00	0.00	-103.00	7590.09	-7.999
2:34:50	60.0100	3791.44	350.00	-251.93	0.00	136.50	10.00	0.00	-103.00	7590.09	-7.999
2:34:52	59.9950	3790.60	350.00	-251.93	0.00	137.00	10.00	0.00	-103.00	7590.42	4.001
2:34:54	59.9950	3790.60	350.00	-251.93	0.00	137.00	10.00	0.00	-103.00	7590.42	4.001
2:34:56	59.9910	3789.58	350.00	-251.93	0.00	137.50	10.00	0.00	-103.00	7590.75	7.199
2:34:58	59.9910	3789.58	350.00	-251.93	0.00	137.50	10.00	0.00	-103.00	7590.75	7.199
2:35:00	59.9910	3789.58	350.00	-251.93	0.00	137.50	10.00	0.00	-103.00	7590.75	7.199
2:35:02	59.9880	3788.10	350.00	-251.93	0.00	138.00	10.00	0.00	-103.00	7591.08	9.601
2:35:04	59.9880	3788.10	350.00	-251.93	0.00	138.00	10.00	0.00	-103.00	7591.08	9.601
2:35:06	59.9850	3788.50	350.00	-251.93	0.00	138.50	10.00	0.00	-103.00	7591.41	12.000
2:35:08	59.9850	3788.50	350.00	-251.93	0.00	138.50	10.00	0.00	-103.00	7591.41	12.000
2:35:10	59.9850	3788.50	350.00	-251.93	0.00	138.50	10.00	0.00	-103.00	7591.41	12.000
2:35:12	59.9840	3788.57	350.00	-250.67	0.00	139.00	10.00	0.00	-103.00	7591.74	12.799
2:35:14	59.9840	3788.57	350.00	-250.67	0.00	139.00	10.00	0.00	-103.00	7591.74	12.799
2:35:16	59.9810	3786.45	350.00	-250.67	0.00	139.50	10.00	0.00	-103.00	7592.07	15.201
2:35:18	59.9810	3786.45	350.00	-250.67	0.00	139.50	10.00	0.00	-103.00	7592.07	15.201
2:35:20	59.9810	3786.45	350.00	-250.67	0.00	139.50	10.00	0.00	-103.00	7592.07	15.201
2:35:22	59.9770	3788.81	350.00	-250.67	0.00	140.00	10.00	0.00	-103.00	7592.40	18.399

2:35:24	59.9770	3788.81	350.00	-250.67	0.00	140.00	10.00	0.00	-103.00	7592.40	18.399
2:35:26	59.9760	3788.41	350.00	-250.67	0.00	140.50	10.00	0.00	-103.00	7592.73	19.199
2:35:28	59.9760	3788.41	350.00	-250.67	0.00	140.50	10.00	0.00	-103.00	7592.73	19.199
2:35:30	59.9760	3788.41	350.00	-250.67	0.00	140.50	10.00	0.00	-103.00	7592.73	19.199
2:35:32	59.9780	3790.66	350.00	-250.67	0.00	141.00	10.00	0.00	-103.00	7593.06	17.599
2:35:34	59.9780	3790.66	350.00	-250.67	0.00	141.00	10.00	0.00	-103.00	7593.06	17.599
2:35:36	59.9740	3789.27	350.00	-253.63	0.00	141.50	10.00	0.00	-103.00	7593.39	20.801
2:35:38	59.9740	3789.27	350.00	-253.63	0.00	141.50	10.00	0.00	-103.00	7593.39	20.801
2:35:40	59.9740	3789.27	350.00	-253.63	0.00	141.50	10.00	0.00	-103.00	7593.39	20.801
2:35:42	59.9770	3790.43	350.00	-253.63	0.00	142.00	10.00	0.00	-103.00	7593.72	18.399
2:35:44	59.9770	3790.43	350.00	-253.63	0.00	142.00	10.00	0.00	-103.00	7593.72	18.399
2:35:46	59.9730	3787.44	350.00	-253.63	0.00	142.50	10.00	0.00	-103.00	7594.05	21.600
2:35:48	59.9730	3787.44	350.00	-253.63	0.00	142.50	10.00	0.00	-103.00	7594.05	21.600
2:35:50	59.9730	3787.44	350.00	-253.63	0.00	142.50	10.00	0.00	-103.00	7594.05	21.600
2:35:52	59.9710	3790.60	350.00	-253.63	0.00	143.00	10.00	0.00	-103.00	7594.38	23.199
2:35:54	59.9710	3790.60	350.00	-253.63	0.00	143.00	10.00	0.00	-103.00	7594.38	23.199
2:35:56	59.9780	3792.31	350.00	-253.63	0.00	143.50	10.00	0.00	-103.00	7594.71	17.599
2:35:58	59.9780	3792.31	350.00	-253.63	0.00	143.50	10.00	0.00	-103.00	7594.71	17.599
2:36:00	59.9780	3792.31	350.00	-253.63	0.00	143.50	10.00	0.00	-103.00	7594.71	17.599
2:36:02	59.9750	3788.08	350.00	-246.96	0.00	144.00	10.00	15.00	-103.00	7595.04	20.001
2:36:04	59.9750	3788.08	350.00	-246.96	0.00	144.00	10.00	15.00	-103.00	7595.04	20.001
2:36:06	59.9760	3787.16	350.00	-246.96	0.00	144.50	10.00	15.00	-103.00	7595.37	19.199
2:36:08	59.9760	3787.16	350.00	-246.96	0.00	144.50	10.00	15.00	-103.00	7595.37	19.199
2:36:10	59.9760	3787.16	350.00	-246.96	0.00	144.50	10.00	15.00	-103.00	7595.37	19.199
2:36:12	59.9690	3787.40	350.00	-246.96	0.00	145.00	10.00	15.00	-103.00	7595.70	24.799
2:36:14	59.9690	3787.40	350.00	-246.96	0.00	145.00	10.00	15.00	-103.00	7595.70	24.799
2:36:16	59.9650	3789.21	350.00	-246.96	0.00	145.50	10.00	15.00	-103.00	7596.03	28.000
2:36:18	59.9650	3789.21	350.00	-246.96	0.00	145.50	10.00	15.00	-103.00	7596.03	28.000
2:36:20	59.9650	3789.21	350.00	-246.96	0.00	145.50	10.00	15.00	-103.00	7596.03	28.000
2:36:22	59.9700	3791.22	350.00	-246.96	0.00	146.00	10.00	15.00	-103.00	7596.36	23.999
2:36:24	59.9700	3791.22	350.00	-246.96	0.00	146.00	10.00	15.00	-103.00	7596.36	23.999
2:36:26	59.9650	3788.82	350.00	-254.54	0.00	146.50	10.00	15.00	-103.00	7596.69	28.000
2:36:28	59.9650	3788.82	350.00	-254.54	0.00	146.50	10.00	15.00	-103.00	7596.69	28.000
2:36:30	59.9650	3788.82	350.00	-254.54	0.00	146.50	10.00	15.00	-103.00	7596.69	28.000
2:36:32	59.9720	3789.17	350.00	-254.54	0.00	147.00	10.00	15.00	-103.00	7597.02	22.400
2:36:34	59.9720	3789.17	350.00	-254.54	0.00	147.00	10.00	15.00	-103.00	7597.02	22.400
2:36:36	59.9670	3784.83	350.00	-254.54	0.00	147.50	10.00	15.00	-103.00	7597.35	26.401
2:36:38	59.9670	3784.83	350.00	-254.54	0.00	147.50	10.00	15.00	-103.00	7597.35	26.401
2:36:40	59.9670	3784.83	350.00	-254.54	0.00	147.50	10.00	15.00	-103.00	7597.35	26.401
2:36:42	59.9690	3784.32	350.00	-254.54	0.00	148.00	10.00	15.00	-103.00	7597.68	24.799
2:36:44	59.9690	3784.32	350.00	-254.54	0.00	148.00	10.00	15.00	-103.00	7597.68	24.799
2:36:46	59.9670	3779.35	350.00	-254.54	0.00	148.50	10.00	15.00	-103.00	7598.01	26.401
2:36:48	59.9670	3779.35	350.00	-254.54	0.00	148.50	10.00	15.00	-103.00	7598.01	26.401
2:36:50	59.9670	3779.35	350.00	-254.54	0.00	148.50	10.00	15.00	-103.00	7598.01	26.401
2:36:52	59.9710	3778.63	350.00	-256.57	0.00	149.00	10.00	15.00	-103.00	7598.34	23.199
2:36:54	59.9710	3778.63	350.00	-256.57	0.00	149.00	10.00	15.00	-103.00	7598.34	23.199

2:36:56	59.9650	3776.43	350.00	-256.57	0.00	149.50	10.00	15.00	-103.00	7598.67	28.000
2:36:58	59.9650	3776.43	350.00	-256.57	0.00	149.50	10.00	15.00	-103.00	7598.67	28.000
2:37:00	59.9650	3776.43	350.00	-256.57	0.00	149.50	10.00	15.00	-103.00	7598.67	28.000
2:37:02	59.9700	3776.60	350.00	-256.57	0.00	150.00	10.00	15.00	-103.00	7599.00	23.999
2:37:04	59.9700	3776.60	350.00	-256.57	0.00	150.00	10.00	15.00	-103.00	7599.00	23.999
2:37:06	59.9690	3773.17	350.00	-256.57	0.00	150.50	10.00	15.00	-103.00	7599.33	24.799
2:37:08	59.9690	3773.17	350.00	-256.57	0.00	150.50	10.00	15.00	-103.00	7599.33	24.799
2:37:10	59.9690	3773.17	350.00	-256.57	0.00	150.50	10.00	15.00	-103.00	7599.33	24.799
2:37:12	59.9650	3768.79	350.00	-256.57	0.00	151.00	10.00	15.00	-103.00	7599.66	28.000
2:37:14	59.9650	3768.79	350.00	-256.57	0.00	151.00	10.00	15.00	-103.00	7599.66	28.000
2:37:16	59.9730	3767.37	350.00	-258.37	0.00	151.50	10.00	15.00	-103.00	7599.99	21.600
2:37:18	59.9730	3767.37	350.00	-258.37	0.00	151.50	10.00	15.00	-103.00	7599.99	21.600
2:37:20	59.9730	3767.37	350.00	-258.37	0.00	151.50	10.00	15.00	-103.00	7599.99	21.600
2:37:22	59.9680	3760.30	350.00	-258.37	0.00	152.00	10.00	15.00	-103.00	7600.32	25.601
2:37:24	59.9680	3760.30	350.00	-258.37	0.00	152.00	10.00	15.00	-103.00	7600.32	25.601
2:37:26	59.9670	3761.78	350.00	-258.37	0.00	152.50	10.00	15.00	-103.00	7600.65	26.401
2:37:28	59.9670	3761.78	350.00	-258.37	0.00	152.50	10.00	15.00	-103.00	7600.65	26.401
2:37:30	59.9670	3761.78	350.00	-258.37	0.00	152.50	10.00	15.00	-103.00	7600.65	26.401
2:37:32	59.9790	3760.16	350.00	-258.37	0.00	153.00	10.00	15.00	-103.00	7600.98	16.800
2:37:34	59.9790	3760.16	350.00	-258.37	0.00	153.00	10.00	15.00	-103.00	7600.98	16.800
2:37:36	59.9830	3757.77	350.00	-258.37	0.00	153.50	10.00	15.00	-103.00	7601.31	13.599
2:37:38	59.9830	3757.77	350.00	-258.37	0.00	153.50	10.00	15.00	-103.00	7601.31	13.599
2:37:40	59.9830	3757.77	350.00	-258.37	0.00	153.50	10.00	15.00	-103.00	7601.31	13.599
2:37:42	59.9650	3753.09	350.00	-263.05	0.00	154.00	10.00	15.00	-103.00	7601.64	28.000
2:37:44	59.9650	3753.09	350.00	-263.05	0.00	154.00	10.00	15.00	-103.00	7601.64	28.000
2:37:46	59.9620	3758.22	350.00	-263.05	0.00	154.50	10.00	15.00	-103.00	7601.97	30.399
2:37:48	59.9620	3758.22	350.00	-263.05	0.00	154.50	10.00	15.00	-103.00	7601.97	30.399
2:37:50	59.9620	3758.22	350.00	-263.05	0.00	154.50	10.00	15.00	-103.00	7601.97	30.399
2:37:52	59.9600	3758.04	350.00	-263.05	0.00	155.00	10.00	15.00	-103.00	7602.30	32.001
2:37:54	59.9600	3758.04	350.00	-263.05	0.00	155.00	10.00	15.00	-103.00	7602.30	32.001
2:37:56	59.9590	3763.82	350.00	-263.05	0.00	155.50	10.00	15.00	-103.00	7602.63	32.800
2:37:58	59.9590	3763.82	350.00	-263.05	0.00	155.50	10.00	15.00	-103.00	7602.63	32.800
2:38:00	59.9590	3763.82	350.00	-263.05	0.00	155.50	10.00	15.00	-103.00	7602.63	32.800
2:38:02	59.9530	3763.86	350.00	-263.05	0.00	156.00	10.00	15.00	-103.00	7602.96	37.601
2:38:04	59.9530	3763.86	350.00	-263.05	0.00	156.00	10.00	15.00	-103.00	7602.96	37.601
2:38:06	59.9570	3768.34	350.00	-260.98	0.00	156.50	10.00	15.00	-103.00	7603.29	34.399
2:38:08	59.9570	3768.34	350.00	-260.98	0.00	156.50	10.00	15.00	-103.00	7603.29	34.399
2:38:10	59.9570	3768.34	350.00	-260.98	0.00	156.50	10.00	15.00	-103.00	7603.29	34.399
2:38:12	59.9630	3767.44	350.00	-260.98	0.00	157.00	10.00	15.00	-103.00	7603.62	29.599
2:38:14	59.9630	3767.44	350.00	-260.98	0.00	157.00	10.00	15.00	-103.00	7603.62	29.599
2:38:16	59.9590	3761.57	350.00	-260.98	0.00	157.50	10.00	15.00	-103.00	7603.95	32.800
2:38:18	59.9590	3761.57	350.00	-260.98	0.00	157.50	10.00	15.00	-103.00	7603.95	32.800
2:38:20	59.9590	3761.57	350.00	-260.98	0.00	157.50	10.00	15.00	-103.00	7603.95	32.800
2:38:22	59.9650	3759.63	350.00	-260.98	0.00	158.00	10.00	15.00	-103.00	7604.28	28.000
2:38:24	59.9650	3759.63	350.00	-260.98	0.00	158.00	10.00	15.00	-103.00	7604.28	28.000
2:38:26	59.9680	3750.10	350.00	-260.98	0.00	158.50	10.00	15.00	-103.00	7604.61	25.601

2:38:28	59.9680	3750.10	350.00	-260.98	0.00	158.50	10.00	15.00	-103.00	7604.61	25.601
2:38:30	59.9680	3750.10	350.00	-260.98	0.00	158.50	10.00	15.00	-103.00	7604.61	25.601
2:38:32	59.9730	3753.51	350.00	-261.32	0.00	159.00	10.00	15.00	-103.00	7604.94	21.600
2:38:34	59.9730	3753.51	350.00	-261.32	0.00	159.00	10.00	15.00	-103.00	7604.94	21.600
2:38:36	59.9650	3753.18	350.00	-261.32	0.00	159.50	10.00	15.00	-103.00	7605.27	28.000
2:38:38	59.9650	3753.18	350.00	-261.32	0.00	159.50	10.00	15.00	-103.00	7605.27	28.000
2:38:40	59.9650	3753.18	350.00	-261.32	0.00	159.50	10.00	15.00	-103.00	7605.27	28.000
2:38:42	59.9720	3753.29	350.00	-261.32	0.00	160.00	10.00	15.00	-103.00	7605.60	22.400
2:38:44	59.9720	3753.29	350.00	-261.32	0.00	160.00	10.00	15.00	-103.00	7605.60	22.400
2:38:46	59.9750	3749.40	350.00	-261.32	0.00	160.50	10.00	15.00	-103.00	7605.93	20.001
2:38:48	59.9750	3749.40	350.00	-261.32	0.00	160.50	10.00	15.00	-103.00	7605.93	20.001
2:38:50	59.9750	3749.40	350.00	-261.32	0.00	160.50	10.00	15.00	-103.00	7605.93	20.001
2:38:52	59.9740	3740.37	350.00	-261.32	0.00	161.00	10.00	15.00	-103.00	7606.26	20.801
2:38:54	59.9740	3740.37	350.00	-261.32	0.00	161.00	10.00	15.00	-103.00	7606.26	20.801
2:38:56	59.9810	3745.74	350.00	-262.10	0.00	161.50	10.00	15.00	-103.00	7606.59	15.201
2:38:58	59.9810	3745.74	350.00	-262.10	0.00	161.50	10.00	15.00	-103.00	7606.59	15.201
2:39:00	59.9810	3745.74	350.00	-262.10	0.00	161.50	10.00	15.00	-103.00	7606.59	15.201
2:39:02	59.9820	3741.62	350.00	-262.10	0.00	162.00	10.00	15.00	-103.00	7606.92	14.401
2:39:04	59.9820	3741.62	350.00	-262.10	0.00	162.00	10.00	15.00	-103.00	7606.92	14.401
2:39:06	59.9840	3738.90	350.00	-262.10	0.00	162.50	10.00	15.00	-103.00	7607.25	12.799
2:39:08	59.9840	3738.90	350.00	-262.10	0.00	162.50	10.00	15.00	-103.00	7607.25	12.799
2:39:10	59.9840	3738.90	350.00	-262.10	0.00	162.50	10.00	15.00	-103.00	7607.25	12.799
2:39:12	59.9790	3737.27	350.00	-262.10	0.00	163.00	10.00	15.00	-103.00	7607.58	16.800
2:39:14	59.9790	3737.27	350.00	-262.10	0.00	163.00	10.00	15.00	-103.00	7607.58	16.800
2:39:16	59.9780	3735.45	350.00	-262.10	0.00	163.50	10.00	15.00	-103.00	7607.91	17.599
2:39:18	59.9780	3735.45	350.00	-262.10	0.00	163.50	10.00	15.00	-103.00	7607.91	17.599
2:39:20	59.9780	3735.45	350.00	-262.10	0.00	163.50	10.00	15.00	-103.00	7607.91	17.599
2:39:22	59.9810	3737.54	350.00	-262.72	0.00	164.00	10.00	15.00	-103.00	7608.24	15.201
2:39:24	59.9810	3737.54	350.00	-262.72	0.00	164.00	10.00	15.00	-103.00	7608.24	15.201
2:39:26	59.9780	3736.69	350.00	-262.72	0.00	164.50	10.00	15.00	-103.00	7608.57	17.599
2:39:28	59.9780	3736.69	350.00	-262.72	0.00	164.50	10.00	15.00	-103.00	7608.57	17.599
2:39:30	59.9780	3736.69	350.00	-262.72	0.00	164.50	10.00	15.00	-103.00	7608.57	17.599
2:39:32	59.9710	3736.09	350.00	-262.72	0.00	165.00	10.00	15.00	-103.00	7608.90	23.199
2:39:34	59.9710	3736.09	350.00	-262.72	0.00	165.00	10.00	15.00	-103.00	7608.90	23.199
2:39:36	59.9740	3738.87	350.00	-262.72	0.00	165.50	10.00	15.00	-103.00	7609.23	20.801
2:39:38	59.9740	3738.87	350.00	-262.72	0.00	165.50	10.00	15.00	-103.00	7609.23	20.801
2:39:40	59.9740	3738.87	350.00	-262.72	0.00	165.50	10.00	15.00	-103.00	7609.23	20.801
2:39:42	59.9720	3738.65	350.00	-262.72	0.00	166.00	10.00	15.00	-103.00	7609.56	22.400
2:39:44	59.9720	3738.65	350.00	-262.72	0.00	166.00	10.00	15.00	-103.00	7609.56	22.400
2:39:46	59.9710	3737.89	350.00	-260.02	0.00	166.50	10.00	15.00	-103.00	7609.89	23.199
2:39:48	59.9710	3737.89	350.00	-260.02	0.00	166.50	10.00	15.00	-103.00	7609.89	23.199
2:39:50	59.9710	3737.89	350.00	-260.02	0.00	166.50	10.00	15.00	-103.00	7609.89	23.199
2:39:52	59.9720	3740.33	350.00	-260.02	0.00	167.00	10.00	15.00	-103.00	7610.22	22.400
2:39:54	59.9720	3740.33	350.00	-260.02	0.00	167.00	10.00	15.00	-103.00	7610.22	22.400
2:39:56	59.9770	3742.52	350.00	-260.02	0.00	167.50	10.00	15.00	-103.00	7610.55	18.399
2:39:58	59.9770	3742.52	350.00	-260.02	0.00	167.50	10.00	15.00	-103.00	7610.55	18.399

2:40:00	59.9770	3742.52	350.00	-260.02	0.00	167.50	10.00	15.00	-103.00	7610.55	18.399
2:40:02	59.9760	3741.72	350.00	-260.02	0.00	168.00	10.00	15.00	-103.00	7610.88	19.199
2:40:04	59.9760	3741.72	350.00	-260.02	0.00	168.00	10.00	15.00	-103.00	7610.88	19.199
2:40:06	59.9740	3739.96	350.00	-260.02	0.00	168.50	10.00	15.00	-103.00	7611.21	20.801
2:40:08	59.9740	3739.96	350.00	-260.02	0.00	168.50	10.00	15.00	-103.00	7611.21	20.801
2:40:10	59.9740	3739.96	350.00	-260.02	0.00	168.50	10.00	15.00	-103.00	7611.21	20.801
2:40:12	59.9780	3742.83	350.00	-263.87	0.00	169.00	10.00	15.00	-103.00	7611.54	17.599
2:40:14	59.9780	3742.83	350.00	-263.87	0.00	169.00	10.00	15.00	-103.00	7611.54	17.599
2:40:16	59.9810	3738.97	350.00	-263.87	0.00	169.50	10.00	15.00	-103.00	7611.87	15.201
2:40:18	59.9810	3738.97	350.00	-263.87	0.00	169.50	10.00	15.00	-103.00	7611.87	15.201
2:40:20	59.9810	3738.97	350.00	-263.87	0.00	169.50	10.00	15.00	-103.00	7611.87	15.201
2:40:22	59.9710	3738.88	350.00	-263.87	0.00	170.00	10.00	15.00	-103.00	7612.20	23.199
2:40:24	59.9710	3738.88	350.00	-263.87	0.00	170.00	10.00	15.00	-103.00	7612.20	23.199
2:40:26	59.9710	3738.56	350.00	-263.87	0.00	170.50	10.00	15.00	-103.00	7612.53	23.199
2:40:28	59.9710	3738.56	350.00	-263.87	0.00	170.50	10.00	15.00	-103.00	7612.53	23.199
2:40:30	59.9710	3738.56	350.00	-263.87	0.00	170.50	10.00	15.00	-103.00	7612.53	23.199
2:40:32	59.9660	3743.42	350.00	-263.87	0.00	171.00	10.00	15.00	-103.00	7612.86	27.200
2:40:34	59.9660	3743.42	350.00	-263.87	0.00	171.00	10.00	15.00	-103.00	7612.86	27.200
2:40:36	59.9710	3747.34	350.00	-264.60	0.00	171.50	10.00	15.00	-103.00	7613.19	23.199
2:40:38	59.9710	3747.34	350.00	-264.60	0.00	171.50	10.00	15.00	-103.00	7613.19	23.199
2:40:40	59.9710	3747.34	350.00	-264.60	0.00	171.50	10.00	15.00	-103.00	7613.19	23.199
2:40:42	59.9690	3749.75	350.00	-264.60	0.00	172.00	10.00	15.00	-103.00	7613.52	24.799
2:40:44	59.9690	3749.75	350.00	-264.60	0.00	172.00	10.00	15.00	-103.00	7613.52	24.799
2:40:46	59.9740	3743.75	350.00	-264.60	0.00	172.50	10.00	15.00	-103.00	7613.85	20.801
2:40:48	59.9740	3743.75	350.00	-264.60	0.00	172.50	10.00	15.00	-103.00	7613.85	20.801
2:40:50	59.9740	3743.75	350.00	-264.60	0.00	172.50	10.00	15.00	-103.00	7613.85	20.801
2:40:52	59.9710	3740.30	350.00	-264.60	0.00	173.00	10.00	15.00	-103.00	7614.18	23.199
2:40:54	59.9710	3740.30	350.00	-264.60	0.00	173.00	10.00	15.00	-103.00	7614.18	23.199
2:40:56	59.9820	3731.83	350.00	-264.60	0.00	173.50	10.00	15.00	-103.00	7614.51	14.401
2:40:58	59.9820	3731.83	350.00	-264.60	0.00	173.50	10.00	15.00	-103.00	7614.51	14.401
2:41:00	59.9820	3731.83	350.00	-264.60	0.00	173.50	10.00	15.00	-103.00	7614.51	14.401
2:41:02	59.9850	3736.23	350.00	-262.42	0.00	174.00	10.00	15.00	-103.00	7614.84	12.000
2:41:04	59.9850	3736.23	350.00	-262.42	0.00	174.00	10.00	15.00	-103.00	7614.84	12.000
2:41:06	59.9890	3733.12	350.00	-262.42	0.00	174.50	10.00	15.00	-103.00	7615.17	8.801
2:41:08	59.9890	3733.12	350.00	-262.42	0.00	174.50	10.00	15.00	-103.00	7615.17	8.801
2:41:10	59.9890	3733.12	350.00	-262.42	0.00	174.50	10.00	15.00	-103.00	7615.17	8.801
2:41:12	59.9870	3729.18	350.00	-262.42	0.00	175.00	10.00	15.00	-103.00	7615.50	10.400
2:41:14	59.9870	3729.18	350.00	-262.42	0.00	175.00	10.00	15.00	-103.00	7615.50	10.400
2:41:16	59.9940	3720.11	350.00	-262.42	0.00	175.50	10.00	15.00	-103.00	7615.83	4.800
2:41:18	59.9940	3720.11	350.00	-262.42	0.00	175.50	10.00	15.00	-103.00	7615.83	4.800
2:41:20	59.9940	3720.11	350.00	-262.42	0.00	175.50	10.00	15.00	-103.00	7615.83	4.800
2:41:22	60.0030	3725.66	350.00	-262.42	0.00	176.00	10.00	15.00	-103.00	7616.16	-2.399
2:41:24	60.0030	3725.66	350.00	-262.42	0.00	176.00	10.00	15.00	-103.00	7616.16	-2.399
2:41:26	60.0060	3727.82	350.00	-259.69	0.00	176.50	10.00	15.00	-103.00	7616.49	-4.800
2:41:28	60.0060	3727.82	350.00	-259.69	0.00	176.50	10.00	15.00	-103.00	7616.49	-4.800
2:41:30	60.0060	3727.82	350.00	-259.69	0.00	176.50	10.00	15.00	-103.00	7616.49	-4.800

2:41:32	60.0190	3727.23	350.00	-259.69	0.00	177.00	10.00	15.00	-103.00	7616.82	-15.201
2:41:34	60.0190	3727.23	350.00	-259.69	0.00	177.00	10.00	15.00	-103.00	7616.82	-15.201
2:41:36	60.0250	3726.02	350.00	-259.69	0.00	177.50	10.00	15.00	-103.00	7617.15	-20.001
2:41:38	60.0250	3726.02	350.00	-259.69	0.00	177.50	10.00	15.00	-103.00	7617.15	-20.001
2:41:40	60.0250	3726.02	350.00	-259.69	0.00	177.50	10.00	15.00	-103.00	7617.15	-20.001
2:41:42	60.0290	3716.37	350.00	-259.69	0.00	178.00	10.00	15.00	-103.00	7617.48	-23.199
2:41:44	60.0290	3716.37	350.00	-259.69	0.00	178.00	10.00	15.00	-103.00	7617.48	-23.199
2:41:46	60.0370	3717.14	350.00	-259.69	0.00	178.50	10.00	15.00	-103.00	7617.81	-29.599
2:41:48	60.0370	3717.14	350.00	-259.69	0.00	178.50	10.00	15.00	-103.00	7617.81	-29.599
2:41:50	60.0370	3717.14	350.00	-259.69	0.00	178.50	10.00	15.00	-103.00	7617.81	-29.599
2:41:52	60.0370	3713.63	350.00	-255.91	0.00	179.00	10.00	15.00	-103.00	7618.14	-29.599
2:41:54	60.0370	3713.63	350.00	-255.91	0.00	179.00	10.00	15.00	-103.00	7618.14	-29.599
2:41:56	60.0410	3699.36	350.00	-255.91	0.00	179.50	10.00	15.00	-103.00	7618.47	-32.800
2:41:58	60.0410	3699.36	350.00	-255.91	0.00	179.50	10.00	15.00	-103.00	7618.47	-32.800
2:42:00	60.0410	3699.36	350.00	-255.91	0.00	179.50	10.00	15.00	-103.00	7618.47	-32.800
2:42:02	60.0430	3704.59	350.00	-255.91	0.00	180.00	10.00	15.00	-103.00	7618.80	-34.399
2:42:04	60.0430	3704.59	350.00	-255.91	0.00	180.00	10.00	15.00	-103.00	7618.80	-34.399
2:42:06	60.0480	3701.32	350.00	-255.91	0.00	180.50	10.00	15.00	-103.00	7619.13	-38.400
2:42:08	60.0480	3701.32	350.00	-255.91	0.00	180.50	10.00	15.00	-103.00	7619.13	-38.400
2:42:10	60.0480	3701.32	350.00	-255.91	0.00	180.50	10.00	15.00	-103.00	7619.13	-38.400
2:42:12	60.0430	3699.53	350.00	-255.91	0.00	181.00	10.00	15.00	-103.00	7619.46	-34.399
2:42:14	60.0430	3699.53	350.00	-255.91	0.00	181.00	10.00	15.00	-103.00	7619.46	-34.399
2:42:16	60.0440	3690.48	350.00	-258.15	0.00	181.50	10.00	15.00	-103.00	7619.79	-35.199
2:42:18	60.0440	3690.48	350.00	-258.15	0.00	181.50	10.00	15.00	-103.00	7619.79	-35.199
2:42:20	60.0440	3690.48	350.00	-258.15	0.00	181.50	10.00	15.00	-103.00	7619.79	-35.199

Date:	Monday, October 12, 2009				
Time of T(0)	2:27:20				
ncy Recovery to 60 Hz or Pre-Perturbation Hz	2:33:00				
urbation Average Frequency [T(-2) to T(-16)]	60.0413	Hz			
rbation Average Frequency [T(+12 to T(+24)]	59.8796	Hz			
to Post Perturbation Delta Frequency Actual	-0.162	Hz			
on Average Interchange MW [T(-2) to T(-16)]	3649.00	MW			
n Average Interchange MW [T(+12 to T(+24)]	3758.96	MW			
st Perturbation Interchange Delta MW Actual	109.96	MW			
Net Total Adjustments	-51.19	MW			
EPFR for FRO Pre-Perturbation Average	-33.00	MW			
EPFR for FRO Post-Perturbation Average	96.34	MW			
EPFR for FRO Delta	129.34	MW			
EPFR for FRO Adjusted	78.15	MW			
Pre JOU Dynamic Schedules MW	350.00		Pre-Perturbation Bias Setting	-103.000	MW/0.1 Hz
Pre Non-Conforming Load MW	-165.48		Post-Perturbation Bias Setting	-103.000	MW/0.1 Hz
Pre Pumped Hydro MW	0.00		EPFR for Bias Setting Pre-Perturbation Average	-42.4877	MW
Pre Ramping Units MW	90.88		EPFR for Bias Setting Post-Perturbation Average	124.0406	MW
Pre Transferred Frequency Response MW	-4.13		EPFR for Bias Setting Delta	166.5284	MW
Pre Contingent BA Lost Generation MW	15.00		Primary Frequency Response Delivery of Bias	66.03%	
Sum of Pre Perturbation Adjustments	286.27				
Post JOU Dynamic Schedules MW	335.00		Pre-Perturbation BA Load	7559.978	MW
Post Non-Conforming Load MW	-206.46		Post-Perturbation BA Load	7561.710	MW
Post Pumped Hydro MW	1.00		Pre to Post Perturbation BA Load Change	1.733	MW
Post Ramping Units MW	93.50		Load Dampening Frequency Response	1.072	MW/0.1 Hz
Post Transferred Frequency Response MW	12.04		Load Dampening % of Total BA Frequency Response	-1.58%	
Post Contingent BA Lost Generation MW	0.00				
Sum of Post Perturbation Adjustments	235.08				
Net Total Adjustments MW	-51.19				

Average Period Evaluation

Initial P.U. Performance for FRO	0.850	P.U.
Initial P.U. Performance Adjusted for FRO	1.246	P.U.

Net Actual Interchange MW	JOU Dynamic Schedules Imp(-) Exp (+) MW	Non-Conforming Load Load (-) MW	Pumped Hydro Load (-) Gen (+) MW	Ramping Units Gen (+) MW	Transferred Frequency Response Rec (-) Del (+) MW/0.1 Hz	Contingent BA Lost Generation Load (-) Gen (+) MW	BA Bias Setting MW/0.1 Hz	BA Load MW	EPFR MW	Expected Net Actual Interchange MW

18 to 30 second Average Period Evalu

Initial P.U. Perfor		
Initial P.U. Performance Ac		

T	Frequency Hz	Net Actual Interchange MW	JOU Dynamic Schedules Imp(-) Exp (+) MW
T-72 sec	2:26:08		
T-70 sec	2:26:10		
T-68 sec	2:26:12		

Time of Frequency Recovery to 60 Hz or Pre-P	
Value A Pre-Perturbation Average Frequency [T	
Value B Post-Perturbation Average Frequency [T	
Pre to Post Perturbation Delta Fre	
Value A Pre-Perturbation Average Interchange MW [T	
Value B Post-Perturbation Average Interchange MW [T	
Pre to Post Perturbation Interchange De	
Net Tot	
EPFR for FRO Pre-Perturl	
EPFR for FRO Post-Perturl	
EPFI	
EPFR fo	
Pre JOU Dynamic	
Pre Non-Confor	
Pre Pump	
Pre Ram	
Pre Transferred Frequency	
Pre Contingent BA Lost G	
Sum of Pre Perturbatio	
Post JOU Dynamic	
Post Non-Confor	
Post Pump	
Post Ram	
Post Transferred Frequency	
Post Contingent BA Lost G	
Sum of Post Perturbatio	
Net Total Ad	

										T-66 sec	2:26:14			
										T-64 sec	2:26:16			
										T-62 sec	2:26:18			
										T-60 sec	2:26:20			
										T-58 sec	2:26:22			
										T-56 sec	2:26:24			
										T-54 sec	2:26:26			
										T-52 sec	2:26:28			
										T-50 sec	2:26:30			
										T-48 sec	2:26:32			
										T-46 sec	2:26:34			
										T-44 sec	2:26:36			
										T-42 sec	2:26:38			
										T-40 sec	2:26:40			
										T-38 sec	2:26:42			
										T-36 sec	2:26:44			
										T-34 sec	2:26:46			
										T-32 sec	2:26:48			
										T-30 sec	2:26:50			
										T-28 sec	2:26:52			
										T-26 sec	2:26:54			
										T-24 sec	2:26:56			
										T-22 sec	2:26:58			
										T-20 sec	2:27:00			
										T-18 sec	2:27:02			
3649.002	350.000	-165.476	0.000	90.875	10.000	15.000	-103.000	7559.978	-33.000	T-16 sec	2:27:04	60.041	3649.002	350.000
3649.002	350.000	-165.476	0.000	90.875	10.000	15.000	-103.000	7559.978	-33.000	T-14 sec	2:27:06	60.041	3649.002	350.000
3649.002	350.000	-165.476	0.000	90.875	10.000	15.000	-103.000	7559.978	-33.000	T-12 sec	2:27:08	60.041	3649.002	350.000
3649.002	350.000	-165.476	0.000	90.875	10.000	15.000	-103.000	7559.978	-33.000	T-10 sec	2:27:10	60.041	3649.002	350.000
3649.002	350.000	-165.476	0.000	90.875	10.000	15.000	-103.000	7559.978	-33.000	T-08 sec	2:27:12	60.041	3649.002	350.000
3649.002	350.000	-165.476	0.000	90.875	10.000	15.000	-103.000	7559.978	-33.000	T-06 sec	2:27:14	60.041	3649.002	350.000
3649.002	350.000	-165.476	0.000	90.875	10.000	15.000	-103.000	7559.978	-33.000	T-04 sec	2:27:16	60.041	3649.002	350.000
3649.002	350.000	-165.476	0.000	90.875	10.000	15.000	-103.000	7559.978	-33.000	T-02 sec	2:27:18	60.041	3649.002	350.000
										T+0 sec	2:27:20			
										T+02 sec	2:27:22			
										T+04 sec	2:27:24			
										T+06 sec	2:27:26			
										T+08 sec	2:27:28			
										T+10 sec	2:27:30			
3758.964	335.000	-206.459	1.000	93.500	10.000	0.000	-103.000	7561.710	96.342	3727.154	T+12 sec	2:27:32		
3758.964	335.000	-206.459	1.000	93.500	10.000	0.000	-103.000	7561.710	96.342	3727.154	T+14 sec	2:27:34		
3758.964	335.000	-206.459	1.000	93.500	10.000	0.000	-103.000	7561.710	96.342	3727.154	T+16 sec	2:27:36		
3758.964	335.000	-206.459	1.000	93.500	10.000	0.000	-103.000	7561.710	96.342	3727.154	T+18 sec	2:27:38	59.883	3774.248	335.000
3758.964	335.000	-206.459	1.000	93.500	10.000	0.000	-103.000	7561.710	96.342	3727.154	T+20 sec	2:27:40	59.883	3774.248	335.000
3758.964	335.000	-206.459	1.000	93.500	10.000	0.000	-103.000	7561.710	96.342	3727.154	T+22 sec	2:27:42	59.883	3774.248	335.000
3758.964	335.000	-206.459	1.000	93.500	10.000	0.000	-103.000	7561.710	96.342	3727.154	T+24 sec	2:27:44	59.883	3774.248	335.000

T+26 sec	2:27:46	59.883	3774.248	335.000
T+28 sec	2:27:48	59.883	3774.248	335.000
T+30 sec	2:27:50	59.883	3774.248	335.000
T+32 sec	2:27:52			
T+34 sec	2:27:54			
T+36 sec	2:27:56			
T+38 sec	2:27:58			
T+40 sec	2:28:00			
T+42 sec	2:28:02			
T+44 sec	2:28:04			
T+46 sec	2:28:06			
T+48 sec	2:28:08			
T+50 sec	2:28:10			
T+52 sec	2:28:12			
T+54 sec	2:28:14			
T+56 sec	2:28:16			
T+58 sec	2:28:18			
T+60 sec	2:28:20			
T+62 sec	2:28:22			
T+64 sec	2:28:24			
T+66 sec	2:28:26			
T+68 sec	2:28:28			
T+70 sec	2:28:30			
T+72 sec	2:28:32			
T+74 sec	2:28:34			
T+76 sec	2:28:36			
T+78 sec	2:28:38			
T+80 sec	2:28:40			

Date:	Monday, October 12, 2009				
Time of T(0)	2:27:20				
erturbation Hz	2:33:00				
T(-2) to T(-16)]	60.0413	Hz			
(+18 to T(+30)]	59.8833	Hz			
equency Actual	-0.158	Hz			
T(-2) to T(-16)]	3649.00	MW			
(+18 to T(+30)]	3774.25	MW			
elta MW Actual	125.25	MW			
al Adjustments	-53.05	MW			
bation Average	-33.00	MW			
bation Average	93.37	MW			
R for FRO Delta	126.37	MW			
r FRO Adjusted	73.33	MW			
Schedules MW	350.00		Pre-Perturbation Bias Setting	-103.000	MW/0.1 Hz
ming Load MW	-165.48		Post-Perturbation Bias Setting	-103.000	MW/0.1 Hz
ped Hydro MW	0.00		EPFR for Bias Setting Pre-Perturbation Average	-42.4877	MW
ping Units MW	90.88		EPFR for Bias Setting Post-Perturbation Average	120.2148	MW
Response MW	-4.13		EPFR for Bias Setting Delta	162.7025	MW
ieneration MW	15.00		Primary Frequency Response Delivery of Bias	76.98%	
n Adjustments	286.27				
Schedules MW	335.00		Pre-Perturbation BA Load	7559.978	MW
ming Load MW	-208.51		Post-Perturbation BA Load	7562.087	MW
ped Hydro MW	1.00		Pre to Post Perturbation BA Load Change	2.110	MW
ping Units MW	94.07		Load Dampening Frequency Response	1.336	MW/0.1 Hz
Response MW	11.67		Load Dampening % of Total BA Frequency Response	-1.68%	
ieneration MW	0.00				
n Adjustments	233.23				
justments MW	-53.05				

Date:	Monday, October 12, 2009		
Time of T(0)	2:27:20		
Time of Frequency Recovery to 60 Hz or Pre-Perturbation Hz	2:33:00		
Value A Pre-Perturbation Average Frequency [T(-2) to T(-16)]	60.0413		
Value B Post-Perturbation Average Frequency [T(+20 to T(+40)]	59.8888		
Pre to Post Perturbation Delta Frequency Actual	-0.152		
Value A Pre-Perturbation Average Interchange MW [T(-2) to T(-16)]	3649.00		
Value B Post-Perturbation Average Interchange MW [T(+20 to T(+40)]	3780.73		
Pre to Post Perturbation Interchange Delta MW Actual	131.72		
Net Total Adjustments	-54.15		
EPFR for FRO Pre-Perturbation Average	-33.00		
EPFR for FRO Post-Perturbation Average	88.94		
EPFR for FRO Delta	121.94		
EPFR for FRO Adjusted	67.80		
Pre JOU Dynamic Schedules MW	350.00		
Pre Non-Conforming Load MW	-165.48		
Pre Pumped Hydro MW	0.00		
Pre Ramping Units MW	90.88		
Pre Transferred Frequency Response MW	-4.13		
Pre Contingent BA Lost Generation MW	15.00		
Sum of Pre Perturbation Adjustments	286.27		
Post JOU Dynamic Schedules MW	335.00		
Post Non-Conforming Load MW	-209.95		
Post Pumped Hydro MW	1.27		
Post Ramping Units MW	94.68		
Post Transferred Frequency Response MW	11.12		
Post Contingent BA Lost Generation MW	0.00		
Sum of Post Perturbation Adjustments	232.12		
Net Total Adjustments MW	-54.15		

uation

mance for FRO	0.991	P.U.
djusted for FRO	1.411	P.U.

20 to 40 second Average Period Evaluation

Initial P.U. Performance for FRO	1.080	
Initial P.U. Performance Adjusted for FRO	1.524	

Non-Conforming Load Load (-) MW	Pumped Hydro Load (-) Gen (+) MW	Ramping Units Gen (+) MW	Transferred Frequency Response Rec (-) Del (+) MW/0.1 Hz	Contingent BA Lost Generation Load (-) Gen (+) MW	BA Bias Setting MW/0.1 Hz	BA Load MW	EPFR MW	Expected Net Actual Interchange MW

T	Frequency Hz	Net Actual Interchange MW	JOU Dynamic Schedules Imp(-) Exp (+) MW	Non-Conforming Load Load (-) MW	Pumped Hydro Load (-) Gen (+) MW
T-72 sec	2:26:08				
T-70 sec	2:26:10				
T-68 sec	2:26:12				

								T-66 sec	2:26:14						
								T-64 sec	2:26:16						
								T-62 sec	2:26:18						
								T-60 sec	2:26:20						
								T-58 sec	2:26:22						
								T-56 sec	2:26:24						
								T-54 sec	2:26:26						
								T-52 sec	2:26:28						
								T-50 sec	2:26:30						
								T-48 sec	2:26:32						
								T-46 sec	2:26:34						
								T-44 sec	2:26:36						
								T-42 sec	2:26:38						
								T-40 sec	2:26:40						
								T-38 sec	2:26:42						
								T-36 sec	2:26:44						
								T-34 sec	2:26:46						
								T-32 sec	2:26:48						
								T-30 sec	2:26:50						
								T-28 sec	2:26:52						
								T-26 sec	2:26:54						
								T-24 sec	2:26:56						
								T-22 sec	2:26:58						
								T-20 sec	2:27:00						
								T-18 sec	2:27:02						
-165.476	0.000	90.875	10.000	15.000	-103.000	7559.978	-33.000	T-16 sec	2:27:04	60.041	3649.002	350.000	-165.476	0.000	
-165.476	0.000	90.875	10.000	15.000	-103.000	7559.978	-33.000	T-14 sec	2:27:06	60.041	3649.002	350.000	-165.476	0.000	
-165.476	0.000	90.875	10.000	15.000	-103.000	7559.978	-33.000	T-12 sec	2:27:08	60.041	3649.002	350.000	-165.476	0.000	
-165.476	0.000	90.875	10.000	15.000	-103.000	7559.978	-33.000	T-10 sec	2:27:10	60.041	3649.002	350.000	-165.476	0.000	
-165.476	0.000	90.875	10.000	15.000	-103.000	7559.978	-33.000	T-08 sec	2:27:12	60.041	3649.002	350.000	-165.476	0.000	
-165.476	0.000	90.875	10.000	15.000	-103.000	7559.978	-33.000	T-06 sec	2:27:14	60.041	3649.002	350.000	-165.476	0.000	
-165.476	0.000	90.875	10.000	15.000	-103.000	7559.978	-33.000	T-04 sec	2:27:16	60.041	3649.002	350.000	-165.476	0.000	
-165.476	0.000	90.875	10.000	15.000	-103.000	7559.978	-33.000	T-02 sec	2:27:18	60.041	3649.002	350.000	-165.476	0.000	
								T+0 sec	2:27:20						
								T+02 sec	2:27:22						
								T+04 sec	2:27:24						
								T+06 sec	2:27:26						
								T+08 sec	2:27:28						
								T+10 sec	2:27:30						
								T+12 sec	2:27:32						
								T+14 sec	2:27:34						
								T+16 sec	2:27:36						
-208.515	1.000	94.071	10.000	0.000	-103.000	7562.087	93.371	3722.327	T+18 sec	2:27:38					
-208.515	1.000	94.071	10.000	0.000	-103.000	7562.087	93.371	3722.327	T+20 sec	2:27:40	59.889	3780.726	335.000	-209.948	1.273
-208.515	1.000	94.071	10.000	0.000	-103.000	7562.087	93.371	3722.327	T+22 sec	2:27:42	59.889	3780.726	335.000	-209.948	1.273
-208.515	1.000	94.071	10.000	0.000	-103.000	7562.087	93.371	3722.327	T+24 sec	2:27:44	59.889	3780.726	335.000	-209.948	1.273

-208.515	1.000	94.071	10.000	0.000	-103.000	7562.087	93.371	3722.327	T+26 sec	2:27:46	59.889	3780.726	335.000	-209.948	1.273
-208.515	1.000	94.071	10.000	0.000	-103.000	7562.087	93.371	3722.327	T+28 sec	2:27:48	59.889	3780.726	335.000	-209.948	1.273
-208.515	1.000	94.071	10.000	0.000	-103.000	7562.087	93.371	3722.327	T+30 sec	2:27:50	59.889	3780.726	335.000	-209.948	1.273
									T+32 sec	2:27:52	59.889	3780.726	335.000	-209.948	1.273
									T+34 sec	2:27:54	59.889	3780.726	335.000	-209.948	1.273
									T+36 sec	2:27:56	59.889	3780.726	335.000	-209.948	1.273
									T+38 sec	2:27:58	59.889	3780.726	335.000	-209.948	1.273
									T+40 sec	2:28:00	59.889	3780.726	335.000	-209.948	1.273
									T+42 sec	2:28:02					
									T+44 sec	2:28:04					
									T+46 sec	2:28:06					
									T+48 sec	2:28:08					
									T+50 sec	2:28:10					
									T+52 sec	2:28:12					
									T+54 sec	2:28:14					
									T+56 sec	2:28:16					
									T+58 sec	2:28:18					
									T+60 sec	2:28:20					
									T+62 sec	2:28:22					
									T+64 sec	2:28:24					
									T+66 sec	2:28:26					
									T+68 sec	2:28:28					
									T+70 sec	2:28:30					
									T+72 sec	2:28:32					
									T+74 sec	2:28:34					
									T+76 sec	2:28:36					
									T+78 sec	2:28:38					
									T+80 sec	2:28:40					

				Date:	Monday, October 12, 2009		
				Time of T(0)	2:27:20		
				Time of Frequency Recovery to 60 Hz or Pre-Perturbation Hz	2:33:00		
Hz				Value A Pre-Perturbation Average Frequency [T(-2) to T(-16)]	60.0413	Hz	
Hz				Value B Post-Perturbation Average Frequency [T(+18 to T(+52)]	59.8876	Hz	
Hz				Pre to Post Perturbation Delta Frequency Actual	-0.154	Hz	
MW				Value A Pre-Perturbation Average Interchange MW [T(-2) to T(-16)]	3649.00	MW	
MW				Value B Post-Perturbation Average Interchange MW [T(+18 to T(+52)]	3784.15	MW	
MW				Pre to Post Perturbation Interchange Delta MW Actual	135.15	MW	
MW				Net Total Adjustments	-53.09	MW	
MW				EPFR for FRO Pre-Perturbation Average	-33.00	MW	
MW				EPFR for FRO Post-Perturbation Average	89.96	MW	
MW				EPFR for FRO Delta	122.96	MW	
MW				EPFR for FRO Adjusted	69.87	MW	
MW	Pre-Perturbation Bias Setting	-103.000	MW/0.1 Hz	Pre JOU Dynamic Schedules MW	350.00	MW	
MW	Post-Perturbation Bias Setting	-103.000	MW/0.1 Hz	Pre Non-Conforming Load MW	-165.48	MW	
MW	EPFR for Bias Setting Pre-Perturbation Average	-42.4877	MW	Pre Pumped Hydro MW	0.00	MW	EPFR
MW	EPFR for Bias Setting Post-Perturbation Average	114.5162	MW	Pre Ramping Units MW	90.88	MW	EPFR
MW	EPFR for Bias Setting Delta	157.0039	MW	Pre Transferred Frequency Response MW	-4.13	MW	
MW	Primary Frequency Response Delivery of Bias	83.90%		Pre Contingent BA Lost Generation MW	15.00	MW	Pri
MW				Sum of Pre Perturbation Adjustments	286.27	MW	
MW	Pre-Perturbation BA Load	7559.978	MW	Post JOU Dynamic Schedules MW	335.00	MW	
MW	Post-Perturbation BA Load	7562.490	MW	Post Non-Conforming Load MW	-210.36	MW	
MW	Pre to Post Perturbation BA Load Change	2.512	MW	Post Pumped Hydro MW	2.11	MW	
MW	Load Dampening Frequency Response	1.648	MW/0.1 Hz	Post Ramping Units MW	95.19	MW	
MW	Load Dampening % of Total BA Frequency Response	-1.91%		Post Transferred Frequency Response MW	11.24	MW	Load Dam
MW				Post Contingent BA Lost Generation MW	0.00	MW	
MW				Sum of Post Perturbation Adjustments	233.19	MW	
MW				Net Total Adjustments MW	-53.09	MW	

18 to 52 second Average Period Evaluation

P.U.	Initial P.U. Performance for FRO	1.099	P.U.
P.U.	Initial P.U. Performance Adjusted for FRO	1.531	P.U.

Ramping Units Gen (+) MW	Transferred Frequency Response Rec (-) Del (+) MW/0.1 Hz	Contingent BA Lost Generation Load (-) Gen (+) MW	BA Bias Setting MW/0.1 Hz	BA Load MW	EPFR MW	Expected Net Actual Interchange MW	T		Frequency Hz	Net Actual Interchange MW	JOU Dynamic Schedules Imp(-) Exp (+) MW	Non-Conforming Load Load (-) MW	Pumped Hydro Load (-) Gen (+) MW	Ramping Units Gen (+) MW	Transferred Frequency Response Rec (-) Del (+) MW/0.1 Hz
							T-72 sec	2:26:08							
							T-70 sec	2:26:10							
							T-68 sec	2:26:12							

							T-66 sec	2:26:14							
							T-64 sec	2:26:16							
							T-62 sec	2:26:18							
							T-60 sec	2:26:20							
							T-58 sec	2:26:22							
							T-56 sec	2:26:24							
							T-54 sec	2:26:26							
							T-52 sec	2:26:28							
							T-50 sec	2:26:30							
							T-48 sec	2:26:32							
							T-46 sec	2:26:34							
							T-44 sec	2:26:36							
							T-42 sec	2:26:38							
							T-40 sec	2:26:40							
							T-38 sec	2:26:42							
							T-36 sec	2:26:44							
							T-34 sec	2:26:46							
							T-32 sec	2:26:48							
							T-30 sec	2:26:50							
							T-28 sec	2:26:52							
							T-26 sec	2:26:54							
							T-24 sec	2:26:56							
							T-22 sec	2:26:58							
							T-20 sec	2:27:00							
							T-18 sec	2:27:02							
90.875	10.000	15.000	-103.000	7559.978	-33.000		T-16 sec	2:27:04	60.041	3649.002	350.000	-165.476	0.000	90.875	10.000
90.875	10.000	15.000	-103.000	7559.978	-33.000		T-14 sec	2:27:06	60.041	3649.002	350.000	-165.476	0.000	90.875	10.000
90.875	10.000	15.000	-103.000	7559.978	-33.000		T-12 sec	2:27:08	60.041	3649.002	350.000	-165.476	0.000	90.875	10.000
90.875	10.000	15.000	-103.000	7559.978	-33.000		T-10 sec	2:27:10	60.041	3649.002	350.000	-165.476	0.000	90.875	10.000
90.875	10.000	15.000	-103.000	7559.978	-33.000		T-08 sec	2:27:12	60.041	3649.002	350.000	-165.476	0.000	90.875	10.000
90.875	10.000	15.000	-103.000	7559.978	-33.000		T-06 sec	2:27:14	60.041	3649.002	350.000	-165.476	0.000	90.875	10.000
90.875	10.000	15.000	-103.000	7559.978	-33.000		T-04 sec	2:27:16	60.041	3649.002	350.000	-165.476	0.000	90.875	10.000
90.875	10.000	15.000	-103.000	7559.978	-33.000		T-02 sec	2:27:18	60.041	3649.002	350.000	-165.476	0.000	90.875	10.000
							T+0 sec	2:27:20							
							T+02 sec	2:27:22							
							T+04 sec	2:27:24							
							T+06 sec	2:27:26							
							T+08 sec	2:27:28							
							T+10 sec	2:27:30							
							T+12 sec	2:27:32							
							T+14 sec	2:27:34							
							T+16 sec	2:27:36							
							T+18 sec	2:27:38	59.888	3784.148	335.000	-210.362	2.111	95.194	10.000
94.682	10.000	0.000	-103.000	7562.490	88.945	3716.798	T+20 sec	2:27:40	59.888	3784.148	335.000	-210.362	2.111	95.194	10.000
94.682	10.000	0.000	-103.000	7562.490	88.945	3716.798	T+22 sec	2:27:42	59.888	3784.148	335.000	-210.362	2.111	95.194	10.000
94.682	10.000	0.000	-103.000	7562.490	88.945	3716.798	T+24 sec	2:27:44	59.888	3784.148	335.000	-210.362	2.111	95.194	10.000

94.682	10.000	0.000	-103.000	7562.490	88.945	3716.798	T+26 sec	2:27:46	59.888	3784.148	335.000	-210.362	2.111	95.194	10.000
94.682	10.000	0.000	-103.000	7562.490	88.945	3716.798	T+28 sec	2:27:48	59.888	3784.148	335.000	-210.362	2.111	95.194	10.000
94.682	10.000	0.000	-103.000	7562.490	88.945	3716.798	T+30 sec	2:27:50	59.888	3784.148	335.000	-210.362	2.111	95.194	10.000
94.682	10.000	0.000	-103.000	7562.490	88.945	3716.798	T+32 sec	2:27:52	59.888	3784.148	335.000	-210.362	2.111	95.194	10.000
94.682	10.000	0.000	-103.000	7562.490	88.945	3716.798	T+34 sec	2:27:54	59.888	3784.148	335.000	-210.362	2.111	95.194	10.000
94.682	10.000	0.000	-103.000	7562.490	88.945	3716.798	T+36 sec	2:27:56	59.888	3784.148	335.000	-210.362	2.111	95.194	10.000
94.682	10.000	0.000	-103.000	7562.490	88.945	3716.798	T+38 sec	2:27:58	59.888	3784.148	335.000	-210.362	2.111	95.194	10.000
94.682	10.000	0.000	-103.000	7562.490	88.945	3716.798	T+40 sec	2:28:00	59.888	3784.148	335.000	-210.362	2.111	95.194	10.000
							T+42 sec	2:28:02	59.888	3784.148	335.000	-210.362	2.111	95.194	10.000
							T+44 sec	2:28:04	59.888	3784.148	335.000	-210.362	2.111	95.194	10.000
							T+46 sec	2:28:06	59.888	3784.148	335.000	-210.362	2.111	95.194	10.000
							T+48 sec	2:28:08	59.888	3784.148	335.000	-210.362	2.111	95.194	10.000
							T+50 sec	2:28:10	59.888	3784.148	335.000	-210.362	2.111	95.194	10.000
							T+52 sec	2:28:12	59.888	3784.148	335.000	-210.362	2.111	95.194	10.000
							T+54 sec	2:28:14							
							T+56 sec	2:28:16							
							T+58 sec	2:28:18							
							T+60 sec	2:28:20							
							T+62 sec	2:28:22							
							T+64 sec	2:28:24							
							T+66 sec	2:28:26							
							T+68 sec	2:28:28							
							T+70 sec	2:28:30							
							T+72 sec	2:28:32							
							T+74 sec	2:28:34							
							T+76 sec	2:28:36							
							T+78 sec	2:28:38							
							T+80 sec	2:28:40							

Date:	Monday, October 12, 2009	
Time of T(0)	2:27:20	
Time of Frequency Recovery to 60 Hz or Pre-Perturbation Hz	2:33:00	
Value A Pre-Perturbation Average Frequency [T(-2) to T(-16)]	60.0413	Hz
Value B Post-Perturbation Average Frequency [T(+20 to T(+52)]	59.8883	Hz
Pre to Post Perturbation Delta Frequency Actual	-0.153	Hz
Value A Pre-Perturbation Average Interchange MW [T(-2) to T(-16)]	3649.00	MW
Value B Post-Perturbation Average Interchange MW [T(+20 to T(+52)]	3785.20	MW
Pre to Post Perturbation Interchange Delta MW Actual	136.20	MW
Net Total Adjustments	-53.22	MW
EPFR for FRO Pre-Perturbation Average	-33.00	MW
EPFR for FRO Post-Perturbation Average	89.36	MW
EPFR for FRO Delta	122.36	MW
EPFR for FRO Adjusted	69.14	MW
Pre JOU Dynamic Schedules MW	350.00	MW
Pre Non-Conforming Load MW	-165.48	MW
Pre Pumped Hydro MW	0.00	MW
Pre Ramping Units MW	90.88	MW
Pre Transferred Frequency Response MW	-4.13	MW
Pre Contingent BA Lost Generation MW	15.00	MW
Sum of Pre Perturbation Adjustments	286.27	MW
Post JOU Dynamic Schedules MW	335.00	MW
Post Non-Conforming Load MW	-210.59	MW
Post Pumped Hydro MW	2.18	MW
Post Ramping Units MW	95.29	MW
Post Transferred Frequency Response MW	11.17	MW
Post Contingent BA Lost Generation MW	0.00	MW
Sum of Post Perturbation Adjustments	233.05	MW
Net Total Adjustments MW	-53.22	MW

Pre-Perturbation Bias Setting	-103.000	MW/0.1 Hz
Post-Perturbation Bias Setting	-103.000	MW/0.1 Hz
t for Bias Setting Pre-Perturbation Average	-42.4877	MW
for Bias Setting Post-Perturbation Average	115.8175	MW
EPFR for Bias Setting Delta	158.3052	MW
mary Frequency Response Delivery of Bias	85.37%	
Pre-Perturbation BA Load	7559.978	MW
Post-Perturbation BA Load	7562.828	MW
Pre to Post Perturbation BA Load Change	2.851	MW
Load Dampening Frequency Response	1.855	MW/0.1 Hz
npening % of Total BA Frequency Response	-2.11%	

20 to 52 second Average Period Evaluation

Initial P.U. Performance for FRO	1.113	P.U.
Initial P.U. Performance Adjusted for FRO	1.548	P.U.

T	Frequency Hz	Net Actual Interchange MW	JOU Dynamic Schedules Imp(-) Exp (+) MW	Non-Conforming Load Load (-) MW	Pumped Hydro Load (-) Gen (+) MW	Ramping Units Gen (+) MW	Transferred Frequency Response Rec (-) Del (+) MW/0.1 Hz	Contingent BA Lost Generation Load (-) Gen (+) MW	Contingent BA Lost Generation MW	BA Bias Setting MW/0.1 Hz	BA Load MW	EPFR MW	Expected Net Actual Interchange MW
T-72 sec	2:26:08												
T-70 sec	2:26:10												
T-68 sec	2:26:12												

					T-66 sec	2:26:14								
					T-64 sec	2:26:16								
					T-62 sec	2:26:18								
					T-60 sec	2:26:20								
					T-58 sec	2:26:22								
					T-56 sec	2:26:24								
					T-54 sec	2:26:26								
					T-52 sec	2:26:28								
					T-50 sec	2:26:30								
					T-48 sec	2:26:32								
					T-46 sec	2:26:34								
					T-44 sec	2:26:36								
					T-42 sec	2:26:38								
					T-40 sec	2:26:40								
					T-38 sec	2:26:42								
					T-36 sec	2:26:44								
					T-34 sec	2:26:46								
					T-32 sec	2:26:48								
					T-30 sec	2:26:50								
					T-28 sec	2:26:52								
					T-26 sec	2:26:54								
					T-24 sec	2:26:56								
					T-22 sec	2:26:58								
					T-20 sec	2:27:00								
					T-18 sec	2:27:02								
15.000	-103.000	7559.978	-33.000		T-16 sec	2:27:04	60.041	3649.002	350.000	-165.476		0.000	90.875	10.000	15.000
15.000	-103.000	7559.978	-33.000		T-14 sec	2:27:06	60.041	3649.002	350.000	-165.476		0.000	90.875	10.000	15.000
15.000	-103.000	7559.978	-33.000		T-12 sec	2:27:08	60.041	3649.002	350.000	-165.476		0.000	90.875	10.000	15.000
15.000	-103.000	7559.978	-33.000		T-10 sec	2:27:10	60.041	3649.002	350.000	-165.476		0.000	90.875	10.000	15.000
15.000	-103.000	7559.978	-33.000		T-08 sec	2:27:12	60.041	3649.002	350.000	-165.476		0.000	90.875	10.000	15.000
15.000	-103.000	7559.978	-33.000		T-06 sec	2:27:14	60.041	3649.002	350.000	-165.476		0.000	90.875	10.000	15.000
15.000	-103.000	7559.978	-33.000		T-04 sec	2:27:16	60.041	3649.002	350.000	-165.476		0.000	90.875	10.000	15.000
15.000	-103.000	7559.978	-33.000		T-02 sec	2:27:18	60.041	3649.002	350.000	-165.476		0.000	90.875	10.000	15.000
					T+0 sec	2:27:20								
					T+02 sec	2:27:22								
					T+04 sec	2:27:24								
					T+06 sec	2:27:26								
					T+08 sec	2:27:28								
					T+10 sec	2:27:30								
					T+12 sec	2:27:32								
					T+14 sec	2:27:34								
					T+16 sec	2:27:36								
0.000	-103.000	7562.828	89.955	3718.872	T+18 sec	2:27:38								
0.000	-103.000	7562.828	89.955	3718.872	T+20 sec	2:27:40	59.888	3785.205	335.000	-210.591		2.176	95.294	10.000	0.000
0.000	-103.000	7562.828	89.955	3718.872	T+22 sec	2:27:42	59.888	3785.205	335.000	-210.591		2.176	95.294	10.000	0.000
0.000	-103.000	7562.828	89.955	3718.872	T+24 sec	2:27:44	59.888	3785.205	335.000	-210.591		2.176	95.294	10.000	0.000

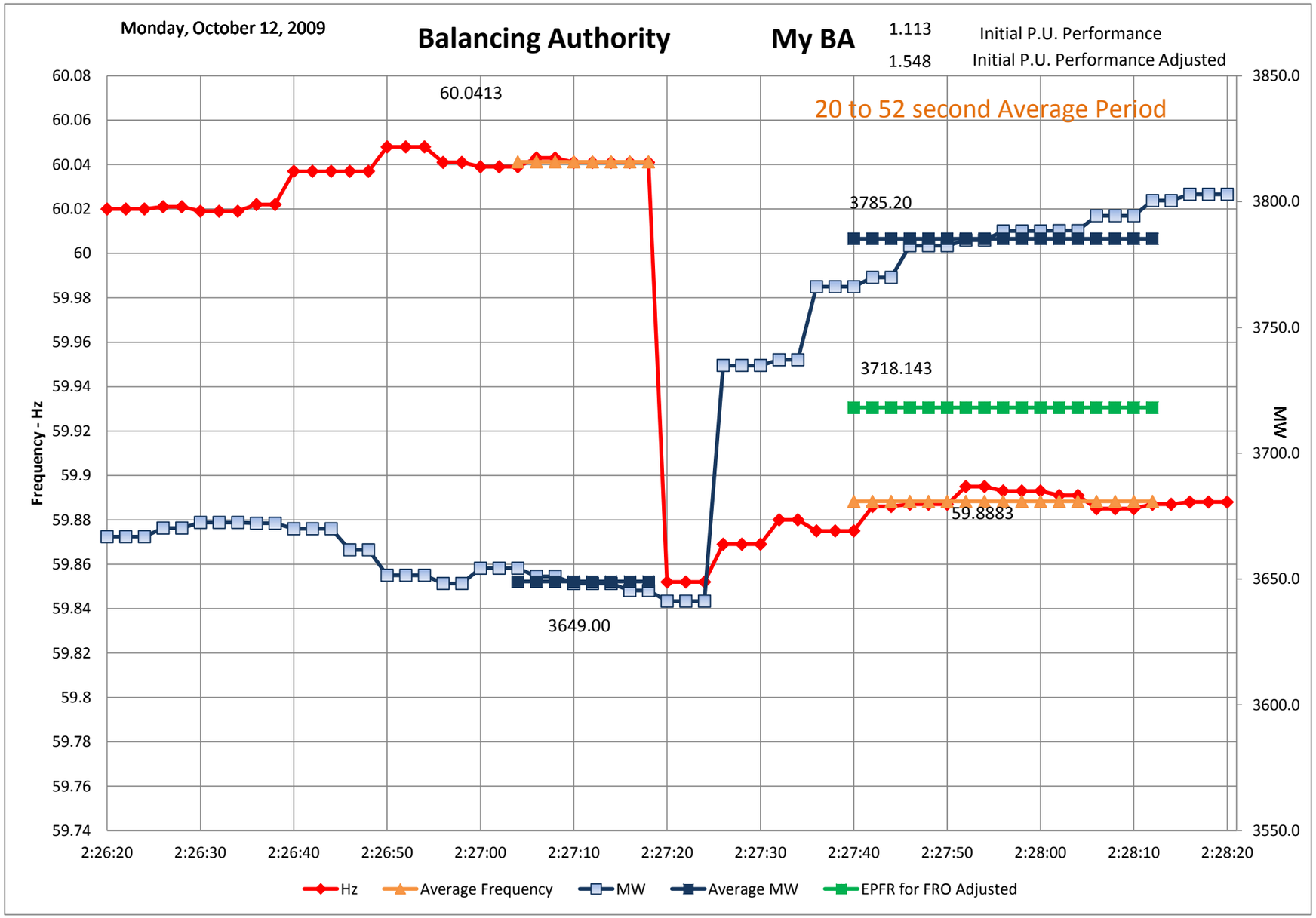
0.000	-103.000	7562.828	89.955	3718.872	T+26 sec	2:27:46	59.888	3785.205	335.000	-210.591	2.176	95.294	10.000	0.000
0.000	-103.000	7562.828	89.955	3718.872	T+28 sec	2:27:48	59.888	3785.205	335.000	-210.591	2.176	95.294	10.000	0.000
0.000	-103.000	7562.828	89.955	3718.872	T+30 sec	2:27:50	59.888	3785.205	335.000	-210.591	2.176	95.294	10.000	0.000
0.000	-103.000	7562.828	89.955	3718.872	T+32 sec	2:27:52	59.888	3785.205	335.000	-210.591	2.176	95.294	10.000	0.000
0.000	-103.000	7562.828	89.955	3718.872	T+34 sec	2:27:54	59.888	3785.205	335.000	-210.591	2.176	95.294	10.000	0.000
0.000	-103.000	7562.828	89.955	3718.872	T+36 sec	2:27:56	59.888	3785.205	335.000	-210.591	2.176	95.294	10.000	0.000
0.000	-103.000	7562.828	89.955	3718.872	T+38 sec	2:27:58	59.888	3785.205	335.000	-210.591	2.176	95.294	10.000	0.000
0.000	-103.000	7562.828	89.955	3718.872	T+40 sec	2:28:00	59.888	3785.205	335.000	-210.591	2.176	95.294	10.000	0.000
0.000	-103.000	7562.828	89.955	3718.872	T+42 sec	2:28:02	59.888	3785.205	335.000	-210.591	2.176	95.294	10.000	0.000
0.000	-103.000	7562.828	89.955	3718.872	T+44 sec	2:28:04	59.888	3785.205	335.000	-210.591	2.176	95.294	10.000	0.000
0.000	-103.000	7562.828	89.955	3718.872	T+46 sec	2:28:06	59.888	3785.205	335.000	-210.591	2.176	95.294	10.000	0.000
0.000	-103.000	7562.828	89.955	3718.872	T+48 sec	2:28:08	59.888	3785.205	335.000	-210.591	2.176	95.294	10.000	0.000
0.000	-103.000	7562.828	89.955	3718.872	T+50 sec	2:28:10	59.888	3785.205	335.000	-210.591	2.176	95.294	10.000	0.000
0.000	-103.000	7562.828	89.955	3718.872	T+52 sec	2:28:12	59.888	3785.205	335.000	-210.591	2.176	95.294	10.000	0.000
					T+54 sec	2:28:14								
					T+56 sec	2:28:16								
					T+58 sec	2:28:18								
					T+60 sec	2:28:20								
					T+62 sec	2:28:22								
					T+64 sec	2:28:24								
					T+66 sec	2:28:26								
					T+68 sec	2:28:28								
					T+70 sec	2:28:30								
					T+72 sec	2:28:32								
					T+74 sec	2:28:34								
					T+76 sec	2:28:36								
					T+78 sec	2:28:38								
					T+80 sec	2:28:40								

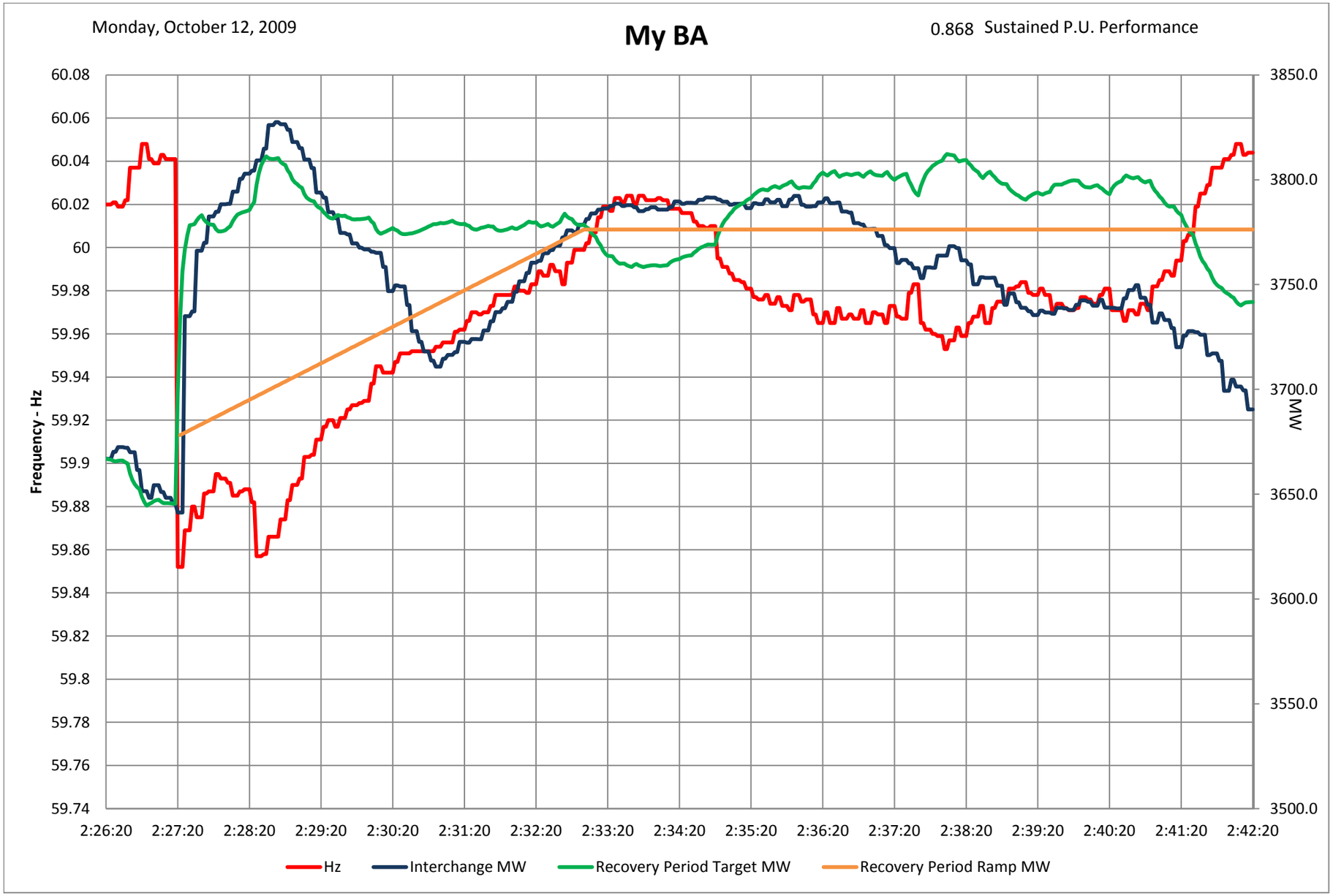
erturbation Bias Setting	-103.000	MW/0.1 Hz
erturbation Bias Setting	-103.000	MW/0.1 Hz
e-Perturbation Average	-42.4877	MW
it-Perturbation Average	115.0567	MW
FR for Bias Setting Delta	157.5445	MW
esponse Delivery of Bias	86.45%	
e-Perturbation BA Load	7559.978	MW
it-Perturbation BA Load	7562.894	MW
bation BA Load Change	2.917	MW
ng Frequency Response	1.907	MW/0.1 Hz
BA Frequency Response	-2.14%	

BA Bias Setting MW/0.1 Hz	BA Load MW	EPFR MW	Expected Net Actual Interchange MW

-103.000	7559.978	-33.000	
-103.000	7559.978	-33.000	
-103.000	7559.978	-33.000	
-103.000	7559.978	-33.000	
-103.000	7559.978	-33.000	
-103.000	7559.978	-33.000	
-103.000	7559.978	-33.000	
-103.000	7559.978	-33.000	
-103.000	7562.894	89.364	3718.143
-103.000	7562.894	89.364	3718.143
-103.000	7562.894	89.364	3718.143

-103.000	7562.894	89.364	3718.143
-103.000	7562.894	89.364	3718.143
-103.000	7562.894	89.364	3718.143
-103.000	7562.894	89.364	3718.143
-103.000	7562.894	89.364	3718.143
-103.000	7562.894	89.364	3718.143
-103.000	7562.894	89.364	3718.143
-103.000	7562.894	89.364	3718.143
-103.000	7562.894	89.364	3718.143
-103.000	7562.894	89.364	3718.143
-103.000	7562.894	89.364	3718.143
-103.000	7562.894	89.364	3718.143
-103.000	7562.894	89.364	3718.143
-103.000	7562.894	89.364	3718.143
-103.000	7562.894	89.364	3718.143


Monday, October 12, 2009
Balancing Authority
My BA
1.113
Initial P.U. Performance
1.548
Initial P.U. Performance Adjusted
60.0413
20 to 52 second Average Period
3785.20
3718.143
59.8883
3649.00
Frequency - Hz
MW
60.08
60.06
60.04
60.02
60
59.98
59.96
59.94
59.92
59.9
59.88
59.86
59.84
59.82
59.8
59.78
59.76
59.74
3850.0
3800.0
3750.0
3700.0
3650.0
3600.0
3550.0
2:26:20
2:26:30
2:26:40
2:26:50
2:27:00
2:27:10
2:27:20
2:27:30
2:27:40
2:27:50
2:28:00
2:28:10
2:28:20
Hz
Average Frequency
MW
Average MW
EPFR for FRO Adjusted


Monday, October 12, 2009
My BA
0.868 Sustained P.U. Performance
Frequency - Hz
MW
60.08
60.06
60.04
60.02
60
59.98
59.96
59.94
59.92
59.9
59.88
59.86
59.84
59.82
59.8
59.78
59.76
59.74
3850.0
3800.0
3750.0
3700.0
3650.0
3600.0
3550.0
3500.0
2:26:20
2:27:20
2:28:20
2:29:20
2:30:20
2:31:20
2:32:20
2:33:20
2:34:20
2:35:20
2:36:20
2:37:20
2:38:20
2:39:20
2:40:20
2:41:20
2:42:20
Hz
Interchange MW
Recovery Period Target MW
Recovery Period Ramp MW

Interconnection Performance

Date	A Point Time	FPointA Hz	A Value Hz	t(0) Time	C Value Hz
Monday, October 12, 2009	2:27:18	60.0410	60.0413	2:27:20	59.8520

Value B 12 to 24 sec Average Frequency	FR B 12 to 24 sec Average MW	Value B 18 to 30 sec Average Frequency	FR B 18 to 30 sec Average MW	Value B 20 to 40 sec Average Frequency	FR B 20 to 40 sec Average MW	Value B 18 to 52 sec Average Frequency	FR B 18 to 52 sec Average MW	Value B 20 to 52 sec Average Frequency	FR B 20 to 52 sec Average MW
59.8795722	-391.83436	59.8832866	-401.15622	59.8882944	-415.81276	59.8875559	-412.38887	59.8882944	-414.2499

Value A Data BA Performance

Frequency Hz	Net Actual Interchange MW	JOU Dynamic Schedules Imp(-) Exp (+) MW	Non-Conforming Load Load (-) MW	Pumped Hydro Load (-) Gen (+) MW	Ramping Units Gen (+) MW	Transferred Frequency Response Rec (-) Del (+) MW	Contingent BA Lost Generation Load (-) Gen (+) MW	BA Bias Setting MW/0.1 Hz	BA Load MW	Bias Setting EPFR MW
60.04125	3649.00	350.00	-165.48	0.00	90.88	-4.13	15.00	-103	7559.978	-42.4877

Value B 12 to 24 second Average Period Evaluation

Frequency Hz	Net Actual Interchange MW	JOU Dynamic Schedules Imp(-) Exp (+) MW	Non-Conforming Load Load (-) MW	Pumped Hydro Load (-) Gen (+) MW	Ramping Units Gen (+) MW	Transferred Frequency Response Rec (-) Del (+) MW
59.879572	3758.96	335.00	-206.46	1.00	93.50	12.04

Value B 18 to 30 second Average Period Evaluation

Contingent BA Lost Generation Load (-) Gen (+) MW	Initial Performance Adjusted P.U.	Initial Performance Unadjusted P.U.	Sustained Performance P.U.	BA Bias Setting MW/0.1 Hz	BA Load MW	Bias Setting EPFR MW	Frequency Hz	Net Actual Interchange MW	JOU Dynamic Schedules Imp(-) Exp (+) MW	Non-Conforming Load Load (-) MW	Pumped Hydro Load (-) Gen (+) MW	Ramping Units Gen (+) MW	Transferred Frequency Response Rec (-) Del (+) MW/0.1 Hz	Contingent BA Lost Generation Load (-) Gen (+) MW	Initial Performance Adjusted P.U.
0.00	1.246	0.850	0.868	-103	7561.71	124.0406	59.883287	3774.25	335.00	-208.51	1.00	94.07	11.67	0.00	1.411

Value B 20 to 40 second Average Period Evaluation

Initial Performance Unadjusted P.U.	Sustained Performance P.U.	BA Bias Setting MW	BA Load MW	Bias Setting EPFR MW	Frequency Hz	Net Actual Interchange MW	JOU Dynamic Schedules Imp(-) Exp (+) MW	Non-Conforming Load Load (-) MW	Pumped Hydro Load (-) Gen (+) MW	Ramping Units Gen (+) MW	Transferred Frequency Response Rec (-) Del (+) MW/0.1 Hz	Contingent BA Lost Generation Load (-) Gen (+) MW	Initial Performance Adjusted P.U.	Initial Performance Unadjusted P.U.	Sustained Performance P.U.
0.991	0.868	-103	7562.087	120.2148	59.888819	3780.73	335.00	-209.95	1.27	94.68	11.12	0.00	1.524	1.080	0.868

Value B

18 to 52 second Average Period Evaluation

Value B

BA Bias Setting MW	BA Load MW	Bias Setting EPFR MW	Frequency Hz	Net Actual Interchange MW	JOU Dynamic Schedules Imp(-) Exp (+) MW	Non-Conforming Load Load (-) MW	Pumped Hydro Load (-) Gen (+) MW	Ramping Units Gen (+) MW	Transferred Frequency Response Rec (-) Del (+) MW	Contingent BA Lost Generation Load (-) Gen (+) MW	Initial Performance Adjusted P.U.	Initial Performance Unadjusted P.U.	Sustained Performance P.U.	BA Bias Setting MW/0.1 Hz	BA Load MW	Bias Setting EPFR MW	Frequency Hz
-103	7562.49	114.5162	59.887556	3784.15	335.00	-210.36	2.11	95.19	11.24	0.00	1.531	1.099	0.868	-103	7562.828	115.8175	59.888294

20 to 52 second Average Period Evaluation

Net Actual Interchange MW	JOU Dynamic Schedules Imp(-) Exp (+) MW	Non-Conforming Load Load (-) MW	Pumped Hydro Load (-) Gen (+) MW	Ramping Units Gen (+) MW	Transferred Frequency Response Rec (-) Del (+) MW	Contingent BA Lost Generation Load (-) Gen (+) MW	Initial Performance Adjusted P.U.	Initial Performance Unadjusted P.U.	Sustained Performance P.U.	BA Bias Setting MW/0.1 Hz	BA Load MW	Bias Setting EPFR MW
3785.20	335.00	-165.48	2.18	95.29	11.17	0.00	1.548	1.113	0.868	-103	7562.894	115.0567

Steps **To be completed for each event evaluated.**

1 Set-up Data collection in exact same order as the "Data" sheet of this work book. Data should be in this order:
Column A: Date and Time in this format, mm/dd/yy HH:MM:SS
Column B: Frequency Hz
Column C: Net Actual Interchange
Column D: Joint Owned Unit dynamic schedule
Column E: Non Conforming Load
Column F: Pumped Hydro
Column G: Ramping units
Column H: Transferred Frequency Response
Column I: Contingent BA Lost load or generation
Column J: BA Bias Setting
Column K: BA Load

2 Note: Columns D, E, F, G and H are optional data. If you choose not to use these, leave the columns blank. Do not delete the columns. Use the sign (+/-) convention defined in FRS Form 1.

3 Data compression must be turned off for each data point. Quality data will give you quality results in the evaluation.

4 Data must be at 6 second sample rate for the full 25 minute minimum collection period that starts a minimum of two (2) minutes before the event begins and includes a minimum of 15 minutes after the beginning of the event.
The spreadsheet will work with up to 60 minutes of data. Be sure "Data" worksheet is clear of any old data.
If using PI historian as your data source, use "PasteSpecial/Values" to enter data into the spreadsheet. Do not include historian data collection formulas in the data. The data must be numbers not text.

5 Once data is in place in the "Data" worksheet, determine when the beginning of the event occurred. This is accomplished by knowing the UTC event time from the master event list.
Convert the UTC event time to your PI data time and then scroll through the Data worksheet column B data of frequency and observe when frequency moves from the normal, pre-event frequency.
This will usually be a single change in frequency of 0.008 to 0.010 Hz more or less. Note the row number in the worksheet that this change occurs. In this sample data spreadsheet this occurs in row 160 of the data.

6 Edit cell "C8" of the "Entry Data" worksheet, change the formula in the cell "C8" to reference the row number identified in step 5 above. In the sample data of this workbook this formula is: "=Data!A160"
If the correct row is selected, the "Graph 20 to 52s" worksheet will indicate the first change in frequency of the event on the center vertical grid line of the graph (Red Trend).

7 Determine the end of the event to be evaluated. Use the same rules that are used for DCS only look at frequency instead of ACE. Scroll down the frequency data in column B of the "Data" worksheet until frequency reaches 60 Hz or the pre-disturbance value. Note the row number in the worksheet that this occurs. In this sample data spreadsheet this occurs in row 217.

8 Edit cell "C11" of the "Entry Data" worksheet, change the formula in the cell "C11" to reference the row number identified in step 7 above. In the sample data of this workbook this formula is: "=Data!A217"

9 In cell "R41" of the "Evaluation" spreadsheet, enter the MW value of the unit(s) that tripped (from the Master Event List). This is only necessary for the "Interconnection" evaluation if your interested.
It is not necessary to do this for the BA evaluation but it will provide a comparison of the BA frequency response as compared to the Interconnection frequency response.

10 Use the "copy" button provided to copy the evaluation and event specific data for the "FRS Form 1" of this field trial. This data is summarized in the correct order on worksheet "Form 1 Summary Data" of this workbook.
Use PasteSpecial/Values when pasting the data into FRS Form 1 on the appropriate event row.

Steps **To be completed once at the initial setup of the evaluation spreadsheet for your BA.**

A Enter the Balancing Authority name as you want it to appear on the graphs in cell "B1" of the "Entry Data" worksheet. For example: "NYISO".

B Enter your Balancing Authorities Frequency Response Obligation in cell "B2" of the "Entry Data" worksheet. For example: -80 MW/0.1 Hz (This value could change annually)

C For informational and educational purposes, a "Sustained" performance evaluation is provided in the "Evaluation" worksheet and in the "Sustained" Graph. This evaluation uses a Time Constant (TC) to model the frequency response of your BA.
The time constant is located in cell "L13" of the "Evaluation" spreadsheet and should be edited for the types of generators in your BA. Presently this time constant is set at 0.35.
The higher the value of the time constant, the faster the delivery of frequency response is expected. Setting the TC to 1.0 effectively turns off the delay and instantaneous frequency response will be modeled. Do not set higher than 1.0.
This time constant is only used in the "Sustained" evaluation and is not used for the Field Trial evaluation of performance to the FRO.
A typical setting for this time constant is 0.08 to 0.15 for hydro units, 0.10 to 0.20 for large steam turbines and 0.20 to 0.40 for combustion turbines.
By observing the slope of your "Interchange Actual" on the "Sustained" Graph, adjust the time constant until the initial slope of the "Target" is similar.
When set appropriately, the "Target" trend on the "Sustained" graph will model what Interchange Actual should have done during the event recovery period.

Note: For ease of use, only the necessary worksheets are displayed. If you are interested in viewing graphs and other hidded worksheets, select the "tab" at the bottom, right click, select unhide and select the worksheet you wish to unhide.

Time (T)	Hz	Net Actual Interchange MW	JOU Dynamic Schedules Imp(-) Exp (+) MW	Non-Conforming Load Load (-) MW	Pumped Hydro Load (-) Gen (+) MW	Ramping Units Gen (+) MW	Transferred Frequency Response Rec (-) Del (+) MW/0.1 Hz	Contingent BA Lost Generation Load (-) Gen (+) MW	BA Bias Setting MW/0.1 Hz	BA Load MW
10/12/09 02:12:00	59.981	3669.878	350	351.361511	0	0	10	15	-103	7500
10/12/09 02:12:06	59.98	3670.949	350	351.361511	0	0.5	10	15	-103	7500.99
10/12/09 02:12:12	59.981	3672.31	350	351.361511	0	1	10	15	-103	7501.98
10/12/09 02:12:18	59.982	3672.276	350	357.94751	0	1.5	10	15	-103	7502.97
10/12/09 02:12:24	59.98	3673.844	350	357.94751	0	2	10	15	-103	7503.96
10/12/09 02:12:30	59.986	3669.33	350	357.94751	0	2.5	10	15	-103	7504.95
10/12/09 02:12:36	59.976	3673.56	350	357.94751	0	3	10	15	-103	7505.94
10/12/09 02:12:42	59.981	3671.887	350	357.94751	0	3.5	10	15	-103	7506.93
10/12/09 02:12:48	59.99	3671.56	350	360.234741	0	4	10	15	-103	7507.92
10/12/09 02:12:54	59.995	3668.362	350	360.234741	0	4.5	10	15	-103	7508.91
10/12/09 02:13:00	59.995	3669.291	350	360.234741	0	5	10	15	-103	7509.9
10/12/09 02:13:06	59.994	3670.683	350	360.234741	0	5.5	10	15	-103	7510.89
10/12/09 02:13:12	60.001	3670.712	350	360.234741	0	6	10	15	-103	7511.88
10/12/09 02:13:18	60.003	3671.227	350	346.525879	0	6.5	10	15	-103	7512.87
10/12/09 02:13:24	60.003	3671.092	350	346.525879	0	7	10	15	-103	7513.86
10/12/09 02:13:30	60.003	3669.899	350	346.525879	0	7.5	10	15	-103	7514.85
10/12/09 02:13:36	60.001	3671.628	350	346.525879	0	8	10	15	-103	7515.84
10/12/09 02:13:42	60.004	3671.444	350	346.525879	0	8.5	10	15	-103	7516.83
10/12/09 02:13:48	60.004	3671.066	350	296.443359	0	9	10	15	-103	7517.82
10/12/09 02:13:54	60.002	3673.498	350	296.443359	0	9.5	10	15	-103	7518.81
10/12/09 02:14:00	59.999	3673.186	350	296.443359	0	10	10	15	-103	7519.8
10/12/09 02:14:06	59.998	3673.365	350	296.443359	0	10.5	10	15	-103	7520.79
10/12/09 02:14:12	59.993	3671.998	350	296.443359	0	11	10	15	-103	7521.78
10/12/09 02:14:18	59.999	3670.957	350	341.061157	0	11.5	10	15	-103	7522.77
10/12/09 02:14:24	60.007	3670.162	350	341.061157	0	12	10	15	-103	7523.76
10/12/09 02:14:30	60.002	3672.713	350	341.061157	0	12.5	10	15	-103	7524.75
10/12/09 02:14:36	59.999	3670.826	350	341.061157	0	13	10	15	-103	7525.74
10/12/09 02:14:42	60.01	3673.363	350	341.061157	0	13.5	10	15	-103	7526.73
10/12/09 02:14:48	60.003	3674.415	350	322.826294	0	14	10	15	-103	7527.72
10/12/09 02:14:54	59.994	3674.29	350	322.826294	0	14.5	10	15	-103	7528.71
10/12/09 02:15:00	60.001	3675.166	350	322.826294	0	15	10	15	-103	7529.7
10/12/09 02:15:06	59.995	3674.906	350	322.826294	0	15.5	10	15	-103	7530.69
10/12/09 02:15:12	59.986	3677.791	350	322.826294	0	16	10	15	-103	7531.68
10/12/09 02:15:18	59.989	3676.593	350	321.544403	0	16.5	10	15	-103	7532.67
10/12/09 02:15:24	59.985	3677.067	350	321.544403	0	17	10	15	-103	7533.66
10/12/09 02:15:30	59.982	3679.228	350	321.544403	0	17.5	10	15	-103	7534.65
10/12/09 02:15:36	59.985	3677.627	350	321.544403	0	18	10	15	-103	7535.64
10/12/09 02:15:42	59.99	3677.528	350	321.544403	0	18.5	10	15	-103	7536.63
10/12/09 02:15:48	59.983	3678.086	350	362.136261	0	19	10	15	-103	7537.62
10/12/09 02:15:54	59.983	3679.213	350	362.136261	0	19.5	10	15	-103	7538.61
10/12/09 02:16:00	59.988	3677.678	350	362.136261	0	20	10	15	-103	7539.6

10/12/09 02:16:06	59.978	3678.729	350	362.136261	0	20.5	10	15	-103	7540.59
10/12/09 02:16:12	59.989	3679.026	350	362.136261	0	21	10	15	-103	7541.58
10/12/09 02:16:18	59.983	3678.72	350	336.311798	0	21.5	10	15	-103	7542.57
10/12/09 02:16:24	59.989	3679.39	350	336.311798	0	22	10	15	-103	7543.56
10/12/09 02:16:30	59.995	3678.49	350	336.311798	0	22.5	10	15	-103	7544.55
10/12/09 02:16:36	59.998	3678.951	350	336.311798	0	23	10	15	-103	7545.54
10/12/09 02:16:42	59.995	3679.903	350	336.311798	0	23.5	10	15	-103	7546.53
10/12/09 02:16:48	59.995	3677.86	350	316.443054	0	24	10	15	-103	7547.52
10/12/09 02:16:54	60.003	3677.686	350	316.443054	0	24.5	10	15	-103	7548.51
10/12/09 02:17:00	60.009	3679.209	350	316.443054	0	25	10	15	-103	7549.5
10/12/09 02:17:06	60.011	3679.057	350	316.443054	0	25.5	10	15	-103	7550.49
10/12/09 02:17:12	60.007	3679.806	350	316.443054	0	26	10	15	-103	7551.48
10/12/09 02:17:18	60.013	3679.851	350	325.464294	0	26.5	10	15	-103	7552.47
10/12/09 02:17:24	60.007	3679.44	350	325.464294	0	27	10	15	-103	7553.46
10/12/09 02:17:30	60.006	3679.888	350	325.464294	0	27.5	10	15	-103	7554.45
10/12/09 02:17:36	60.009	3679.261	350	325.464294	0	28	10	15	-103	7555.44
10/12/09 02:17:42	60.009	3679.152	350	325.464294	0	28.5	10	15	-103	7556.43
10/12/09 02:17:48	60.001	3678.249	350	336.614166	0	29	10	15	-103	7557.42
10/12/09 02:17:54	59.991	3677.955	350	336.614166	0	29.5	10	15	-103	7558.41
10/12/09 02:18:00	59.994	3677.093	350	336.614166	0	30	10	15	-103	7559.4
10/12/09 02:18:06	59.995	3678.516	350	336.614166	0	30.5	10	15	-103	7560.39
10/12/09 02:18:12	59.99	3678.743	350	336.614166	0	31	10	15	-103	7561.38
10/12/09 02:18:18	59.977	3680.254	350	316.726166	0	31.5	10	15	-103	7562.37
10/12/09 02:18:24	59.995	3678.656	350	316.726166	0	32	10	15	-103	7563.36
10/12/09 02:18:30	59.989	3678.427	350	316.726166	0	32.5	10	15	-103	7564.35
10/12/09 02:18:36	59.984	3677.822	350	316.726166	0	33	10	15	-103	7565.34
10/12/09 02:18:42	59.986	3677.917	350	316.726166	0	33.5	10	15	-103	7566.33
10/12/09 02:18:48	59.98	3678.963	350	320.195526	0	34	10	15	-103	7567.32
10/12/09 02:18:54	59.989	3680.045	350	320.195526	0	34.5	10	15	-103	7568.31
10/12/09 02:19:00	60.007	3676.222	350	320.195526	0	35	10	15	-103	7569.3
10/12/09 02:19:06	59.981	3677.49	350	320.195526	0	35.5	10	15	-103	7570.29
10/12/09 02:19:12	59.976	3680.451	350	320.195526	0	36	10	15	-103	7571.28
10/12/09 02:19:18	59.977	3682.843	350	341.86615	0	36.5	10	15	-103	7572.27
10/12/09 02:19:24	59.982	3678.229	350	341.86615	0	37	10	15	-103	7573.26
10/12/09 02:19:30	59.988	3671.942	350	341.86615	0	37.5	10	15	-103	7574.25
10/12/09 02:19:36	59.987	3670.129	350	341.86615	0	38	10	15	-103	7575.24
10/12/09 02:19:42	59.984	3671.576	350	341.86615	0	38.5	10	15	-103	7576.23
10/12/09 02:19:48	59.989	3671.882	350	348.597839	0	39	10	15	-103	7577.22
10/12/09 02:19:54	59.984	3670.726	350	348.597839	0	39.5	10	15	-103	7578.21
10/12/09 02:20:00	59.981	3671.401	350	348.597839	0	40	10	15	-103	7579.2
10/12/09 02:20:06	59.986	3670.296	350	348.597839	0	40.5	10	15	-103	7580.19
10/12/09 02:20:12	59.985	3669.908	350	348.597839	0	41	10	15	-103	7581.18
10/12/09 02:20:18	59.983	3669.382	350	329.085022	0	41.5	10	15	-103	7582.17
10/12/09 02:20:24	59.979	3671.403	350	329.085022	0	42	10	15	-103	7583.16
10/12/09 02:20:30	59.98	3671.947	350	329.085022	0	42.5	10	15	-103	7584.15
10/12/09 02:20:36	59.98	3670.137	350	329.085022	0	43	10	15	-103	7585.14

10/12/09 02:20:42	59.979	3672.558	350	329.085022	0	43.5	10	15	-103	7586.13
10/12/09 02:20:48	59.976	3671.8	350	342.418243	0	44	10	15	-103	7587.12
10/12/09 02:20:54	59.971	3676.263	350	342.418243	0	44.5	10	15	-103	7588.11
10/12/09 02:21:00	59.973	3676.543	350	342.418243	0	45	10	15	-103	7589.1
10/12/09 02:21:06	59.975	3675.256	350	342.418243	0	45.5	10	15	-103	7590.09
10/12/09 02:21:12	59.975	3671.593	350	342.418243	0	46	10	15	-103	7591.08
10/12/09 02:21:18	59.979	3669.54	350	338.794647	0	46.5	10	15	-103	7592.07
10/12/09 02:21:24	59.982	3667.677	350	338.794647	0	47	10	15	-103	7593.06
10/12/09 02:21:30	59.981	3666.911	350	338.794647	0	47.5	10	15	-103	7594.05
10/12/09 02:21:36	59.985	3667.456	350	338.794647	0	48	10	15	-103	7595.04
10/12/09 02:21:42	59.993	3664.031	350	338.794647	0	48.5	10	15	-103	7596.03
10/12/09 02:21:48	59.998	3662.055	350	335.931	0	49	10	15	-103	7597.02
10/12/09 02:21:54	60.01	3662.224	350	335.931	0	49.5	10	15	-103	7598.01
10/12/09 02:22:00	60.013	3664.139	350	335.931	0	50	10	15	-103	7599
10/12/09 02:22:06	60.01	3663.265	350	335.931	0	50.5	10	15	-103	7599.99
10/12/09 02:22:12	60.023	3661.512	350	335.931	0	51	10	15	-103	7600.98
10/12/09 02:22:18	60.021	3656.785	350	339.712402	0	51.5	10	15	-103	7601.97
10/12/09 02:22:24	60.019	3657.71	350	339.712402	0	52	10	15	-103	7602.96
10/12/09 02:22:30	60.025	3659.224	350	339.712402	0	52.5	10	15	-103	7603.95
10/12/09 02:22:36	60.02	3658.155	350	339.712402	0	53	10	15	-103	7604.94
10/12/09 02:22:42	60.018	3660.82	350	339.712402	0	53.5	10	15	-103	7605.93
10/12/09 02:22:48	60.019	3662.079	350	332.024658	0	54	10	15	-103	7606.92
10/12/09 02:22:54	60.022	3663.577	350	332.024658	0	54.5	10	15	-103	7607.91
10/12/09 02:23:00	60.02	3662.552	350	332.024658	0	55	10	15	-103	7608.9
10/12/09 02:23:06	60.02	3663.91	350	332.024658	0	55.5	10	15	-103	7609.89
10/12/09 02:23:12	60.018	3663.396	350	332.024658	0	56	10	15	-103	7610.88
10/12/09 02:23:18	60.014	3665.313	350	330.759033	0	56.5	10	15	-103	7611.87
10/12/09 02:23:24	60.01	3666.726	350	330.759033	0	57	10	15	-103	7612.86
10/12/09 02:23:30	60.011	3666.688	350	330.759033	0	57.5	10	15	-103	7613.85
10/12/09 02:23:36	60.009	3667.696	350	330.759033	0	58	10	15	-103	7614.84
10/12/09 02:23:42	60.009	3666.624	350	330.759033	0	58.5	10	15	-103	7615.83
10/12/09 02:23:48	59.999	3665.403	350	323.419952	0	59	10	15	-103	7616.82
10/12/09 02:23:54	59.997	3665.352	350	323.419952	0	59.5	10	15	-103	7617.81
10/12/09 02:24:00	59.998	3666.133	350	323.419952	0	60	10	15	-103	7618.8
10/12/09 02:24:06	59.995	3667.084	350	323.419952	0	60.5	10	15	-103	7619.79
10/12/09 02:24:12	59.988	3667.853	350	323.419952	0	61	10	15	-103	7620.78
10/12/09 02:24:18	59.982	3669.399	350	342.350922	0	61.5	10	15	-103	7621.77
10/12/09 02:24:24	59.984	3670.25	350	342.350922	0	62	10	15	-103	7622.76
10/12/09 02:24:30	59.978	3673.243	350	342.350922	0	62.5	10	15	-103	7623.75
10/12/09 02:24:36	59.974	3676.418	350	342.350922	0	63	10	15	-103	7624.74
10/12/09 02:24:42	59.98	3675.329	350	342.350922	0	63.5	10	15	-103	7625.73
10/12/09 02:24:48	59.984	3674.399	350	345.081818	0	64	10	15	-103	7626.72
10/12/09 02:24:54	59.988	3672.442	350	345.081818	0	64.5	10	15	-103	7627.71
10/12/09 02:25:00	59.991	3671.493	350	345.081818	0	65	10	15	-103	7628.7
10/12/09 02:25:06	59.993	3670.028	350	345.081818	0	65.5	10	15	-103	7629.69
10/12/09 02:25:12	60.002	3672.625	350	345.081818	0	66	10	15	-103	7630.68

10/12/09 02:25:18	60.004	3673.25	350	346.537384	0	66.5	10	15	-103	7631.67
10/12/09 02:25:24	60.002	3672.418	350	346.537384	0	67	10	15	-103	7632.66
10/12/09 02:25:30	60.01	3672.261	350	346.537384	0	67.5	10	15	-103	7633.65
10/12/09 02:25:36	60.011	3673.553	350	346.537384	0	68	10	15	-103	7634.64
10/12/09 02:25:42	60.013	3673.813	350	346.537384	0	68.5	10	15	-103	7635.63
10/12/09 02:25:48	60.011	3673.068	350	342.905762	0	69	10	15	-103	7636.62
10/12/09 02:25:54	60.017	3671.25	350	342.905762	0	69.5	10	15	-103	7637.61
10/12/09 02:26:00	60.014	3672.982	350	342.905762	0	70	10	15	-103	7638.6
10/12/09 02:26:06	60.019	3671.193	350	342.905762	0	70.5	10	15	-103	7639.59
10/12/09 02:26:12	60.027	3668.611	350	165.476395	0	71	10	15	-103	7640.58
10/12/09 02:26:18	60.022	3666.062	350	165.476395	0	71.5	10	15	-103	7641.57
10/12/09 02:26:24	60.019	3670.454	350	165.476395	0	72	10	15	-103	7642.56
10/12/09 02:26:30	60.021	3672.493	350	165.476395	0	72.5	10	15	-103	7643.55
10/12/09 02:26:36	60.019	3672.164	350	165.476395	0	73	10	15	-103	7644.54
10/12/09 02:26:42	60.031	3666.467	350	165.476395	0	73.5	10	15	-103	7645.53
10/12/09 02:26:48	60.036	3660.672	350	165.476395	0	74	10	15	-103	7646.52
10/12/09 02:26:54	60.048	3650.025	350	165.476395	0	74.5	10	15	-103	7647.51
10/12/09 02:27:00	60.041	3654.294	350	165.476395	0	75	10	15	-103	7648.5
10/12/09 02:27:06	60.039	3651.059	350	165.476395	0	75.5	10	15	-103	7649.49
10/12/09 02:27:12	60.045	3645.387	350	165.476395	0	76	10	15	-103	7650.48
10/12/09 02:27:18	60.041	3640.682	350	165.476395	0	76.5	10	15	-103	7651.47
10/12/09 02:27:24	59.978	3696.362	350	206.459106	0	77	10	15	-103	7645
10/12/09 02:27:30	59.869	3737.157	335	206.459106	0	77.5	10	0	-103	7639
10/12/09 02:27:36	59.88	3766.194	335	206.459106	0	78	10	0	-103	7631
10/12/09 02:27:42	59.883	3780.621	335	206.459106	0	78.5	10	0	-103	7630
10/12/09 02:27:48	59.885	3784.962	335	206.459106	0	79	10	0	-103	7631
10/12/09 02:27:54	59.89	3788.072	335	211.256042	0	79.5	10	0	-103	7630
10/12/09 02:28:00	59.893	3788.472	335	211.256042	0	80	10	0	-103	7632
10/12/09 02:28:06	59.891	3794.374	335	211.256042	0	80.5	10	0	-103	7633
10/12/09 02:28:12	59.885	3799.959	335	211.256042	0	81	10	0	-103	7634
10/12/09 02:28:18	59.888	3802.951	335	211.256042	0	81.5	10	0	-103	7635
10/12/09 02:28:24	59.889	3805.617	335	214.346695	0	82	10	0	-103	7636
10/12/09 02:28:30	59.857	3814.862	335	214.346695	0	82.5	10	0	-103	7637
10/12/09 02:28:36	59.858	3826.053	335	214.346695	0	83	10	0	-103	7638
10/12/09 02:28:42	59.865	3826.753	335	214.346695	0	83.5	10	0	-103	7641
10/12/09 02:28:48	59.871	3825.713	335	214.346695	0	84	10	0	-103	7642
10/12/09 02:28:54	59.88	3819.081	335	212.172699	0	84.5	10	0	-103	7629
10/12/09 02:29:00	59.89	3815.01	335	212.172699	0	85	10	0	-103	7630
10/12/09 02:29:06	59.893	3809.652	335	212.172699	0	85.5	10	0	-103	7630
10/12/09 02:29:12	59.902	3804.188	335	329.98822	0	86	10	0	-103	7631
10/12/09 02:29:18	59.907	3792.169	335	255.444168	0	86.5	10	0	-103	7633
10/12/09 02:29:24	59.916	3788.132	335	255.444168	0	87	10	0	-103	7636
10/12/09 02:29:30	59.92	3781.701	335	255.444168	0	87.5	10	0	-103	7640
10/12/09 02:29:36	59.917	3774.604	335	255.444168	0	88	10	0	-103	7644
10/12/09 02:29:42	59.923	3772.722	335	255.444168	0	88.5	10	0	-103	7648
10/12/09 02:29:48	59.928	3768.707	335	254.838303	0	89	10	0	-103	7652

10/12/09 02:29:54	59.927	3767.408	335	254.838303	0	89.5	10	0	-103	7656
10/12/09 02:30:00	59.929	3765.672	350	254.838303	0	90	10	0	-103	7662
10/12/09 02:30:06	59.937	3765.105	350	254.838303	0	90.5	10	0	-103	7665
10/12/09 02:30:12	59.949	3753.922	350	254.838303	0	91	10	0	-103	7670
10/12/09 02:30:18	59.941	3747.875	350	257.146973	0	91.5	10	0	-103	7674
10/12/09 02:30:24	59.948	3746.706	350	257.146973	0	92	10	0	-103	7679
10/12/09 02:30:30	59.951	3740.259	350	257.146973	0	92.5	10	0	-103	7682
10/12/09 02:30:36	59.951	3727.838	350	257.146973	0	93	10	0	-103	7684
10/12/09 02:30:42	59.952	3720.578	350	257.146973	0	93.5	10	0	-103	7686
10/12/09 02:30:48	59.954	3715.753	350	262.289368	0	94	10	0	-103	7688
10/12/09 02:30:54	59.953	3710.848	350	262.289368	0	94.5	10	0	-103	7689
10/12/09 02:31:00	59.954	3714.623	350	262.289368	0	95	10	0	-103	7689
10/12/09 02:31:06	59.956	3716.461	350	262.289368	0	95.5	10	0	-103	7690
10/12/09 02:31:12	59.955	3722.361	350	262.289368	0	96	10	0	-103	7690.08
10/12/09 02:31:18	59.962	3722.267	350	256.647949	0	96.5	10	0	-103	7690
10/12/09 02:31:24	59.966	3723.091	350	256.647949	0	97	10	0	-103	7692.06
10/12/09 02:31:30	59.97	3723.893	350	256.647949	0	97.5	10	0	-103	7693.05
10/12/09 02:31:36	59.969	3728.053	350	256.647949	0	98	10	0	-103	7694.04
10/12/09 02:31:42	59.971	3733.327	350	256.647949	0	98.5	10	0	-103	7695.03
10/12/09 02:31:48	59.976	3736.822	350	256.307251	0	99	10	0	-103	7696.02
10/12/09 02:31:54	59.976	3740.877	350	256.307251	0	99.5	10	0	-103	7697.01
10/12/09 02:32:00	59.978	3746.608	350	256.307251	0	100	10	0	-103	7698
10/12/09 02:32:06	59.982	3751.558	350	256.307251	0	100.5	10	0	-103	7699
10/12/09 02:32:12	59.979	3756.407	350	256.307251	0	101	10	0	-103	7699.98
10/12/09 02:32:18	59.983	3760.982	350	249.086395	0	101.5	10	0	-103	7700.97
10/12/09 02:32:24	59.988	3763.212	350	249.086395	0	102	10	0	-103	7701.96
10/12/09 02:32:30	59.987	3766.433	350	249.086395	0	102.5	10	0	-103	7702.95
10/12/09 02:32:36	59.992	3768.634	350	249.086395	0	103	10	0	-103	7703.94
10/12/09 02:32:42	59.986	3773.695	350	249.086395	0	103.5	10	0	-103	7704.93
10/12/09 02:32:48	59.988	3775.363	350	253.742477	0	104	10	0	-103	7705.92
10/12/09 02:32:54	59.998	3776.42	350	253.742477	0	104.5	10	0	-103	7706.91
10/12/09 02:33:00	59.999	3781.256	350	253.742477	0	105	10	0	-103	7707.9
10/12/09 02:33:06	60.002	3783.896	350	253.742477	0	105.5	10	0	-103	7708.89
10/12/09 02:33:12	60.008	3785.463	350	253.742477	0	106	10	0	-103	7709.88
10/12/09 02:33:18	60.017	3787.259	350	257.421204	0	106.5	10	0	-103	7710.87
10/12/09 02:33:24	60.017	3788.03	350	257.421204	0	107	10	0	-103	7711.86
10/12/09 02:33:30	60.023	3787.537	350	257.421204	0	107.5	10	0	-103	7712.85
10/12/09 02:33:36	60.021	3787.93	350	257.421204	0	108	10	0	-103	7713.84
10/12/09 02:33:42	60.024	3786.55	350	257.421204	0	108.5	10	0	-103	7714.83
10/12/09 02:33:48	60.025	3785.614	350	261.73822	0	109	10	0	-103	7715.82
10/12/09 02:33:54	60.02	3786.864	350	261.73822	0	109.5	10	0	-103	7716.81
10/12/09 02:34:00	60.022	3785.726	350	261.73822	0	110	10	0	-103	7717.8
10/12/09 02:34:06	60.023	3785.798	350	261.73822	0	110.5	10	0	-103	7718.79
10/12/09 02:34:12	60.019	3787.627	350	261.73822	0	111	10	0	-103	7719.78
10/12/09 02:34:18	60.018	3789.404	350	271.875977	0	111.5	10	0	-103	7720.77
10/12/09 02:34:24	60.019	3789.369	350	271.875977	0	112	10	0	-103	7721.76

10/12/09 02:34:30	60.016	3788.933	350	271.875977	0	112.5	10	0	-103	7722.75
10/12/09 02:34:36	60.012	3790.411	350	271.875977	0	113	10	0	-103	7723.74
10/12/09 02:34:42	60.007	3792.945	350	271.875977	0	113.5	10	0	-103	7724.73
10/12/09 02:34:48	60.009	3791.426	350	262.073486	0	114	10	0	-103	7725.72
10/12/09 02:34:54	59.999	3790.216	350	262.073486	0	114.5	10	0	-103	7726.71
10/12/09 02:35:00	59.991	3788.105	350	262.073486	0	115	10	0	-103	7727.7
10/12/09 02:35:06	59.988	3788.497	350	262.073486	0	115.5	10	0	-103	7728.69
10/12/09 02:35:12	59.984	3788.101	350	262.073486	0	116	10	0	-103	7729.68
10/12/09 02:35:18	59.982	3787.732	350	260.36441	0	116.5	10	0	-103	7730.67
10/12/09 02:35:24	59.979	3788.256	350	260.36441	0	117	10	0	-103	7731.66
10/12/09 02:35:30	59.976	3790.665	350	260.36441	0	117.5	10	0	-103	7732.65
10/12/09 02:35:36	59.978	3789.267	350	260.36441	0	118	10	0	-103	7733.64
10/12/09 02:35:42	59.976	3789.914	350	260.36441	0	118.5	10	0	-103	7734.63
10/12/09 02:35:48	59.975	3788.963	350	352.644379	0	119	10	0	-103	7735.62
10/12/09 02:35:54	59.97	3792.911	350	352.644379	0	119.5	10	0	-103	7736.61
10/12/09 02:36:00	59.978	3788.08	350	352.644379	0	120	10	0	-103	7737.6
10/12/09 02:36:06	59.975	3787.164	350	352.644379	0	120.5	10	0	-103	7738.59
10/12/09 02:36:12	59.975	3786.487	350	352.644379	0	121	10	0	-103	7739.58
10/12/09 02:36:18	59.966	3790.512	350	354.89566	0	121.5	10	0	-103	7740.57
10/12/09 02:36:24	59.969	3790.959	350	354.89566	0	122	10	0	-103	7741.56
10/12/09 02:36:30	59.965	3789.167	350	354.89566	0	122.5	10	0	-103	7742.55
10/12/09 02:36:36	59.972	3784.831	350	354.89566	0	123	10	0	-103	7743.54
10/12/09 02:36:42	59.969	3782.809	350	354.89566	0	123.5	10	0	-103	7744.53
10/12/09 02:36:48	59.967	3779.056	350	340.46936	0	124	10	0	-103	7745.52
10/12/09 02:36:54	59.965	3779.335	350	340.46936	0	124.5	10	0	-103	7746.51
10/12/09 02:37:00	59.965	3776.597	350	340.46936	0	125	10	0	-103	7747.5
10/12/09 02:37:06	59.97	3773.17	350	340.46936	0	125.5	10	0	-103	7748.49
10/12/09 02:37:12	59.968	3768.503	350	340.46936	0	126	10	0	-103	7749.48
10/12/09 02:37:18	59.97	3764.786	350	337.642914	0	126.5	10	0	-103	7750.47
10/12/09 02:37:24	59.965	3761.894	350	337.642914	0	127	10	0	-103	7751.46
10/12/09 02:37:30	59.967	3760.157	350	337.642914	0	127.5	10	0	-103	7752.45
10/12/09 02:37:36	59.979	3757.773	350	337.642914	0	128	10	0	-103	7753.44
10/12/09 02:37:42	59.974	3751.637	350	337.642914	0	128.5	10	0	-103	7754.43
10/12/09 02:37:48	59.962	3759.25	350	284.36084	0	129	10	0	-103	7755.42
10/12/09 02:37:54	59.961	3762.022	350	284.36084	0	129.5	10	0	-103	7756.41
10/12/09 02:38:00	59.959	3763.858	350	284.36084	0	130	10	0	-103	7757.4
10/12/09 02:38:06	59.953	3768.339	350	284.36084	0	130.5	10	0	-103	7758.39
10/12/09 02:38:12	59.956	3765.606	350	284.36084	0	131	10	0	-103	7759.38
10/12/09 02:38:18	59.961	3761.92	350	260.467987	0	131.5	10	0	-103	7760.37
10/12/09 02:38:24	59.963	3752.429	350	260.467987	0	132	10	0	-103	7761.36
10/12/09 02:38:30	59.968	3753.51	350	260.467987	0	132.5	10	0	-103	7762.35
10/12/09 02:38:36	59.973	3753.178	350	260.467987	0	133	10	0	-103	7763.34
10/12/09 02:38:42	59.967	3752.872	350	260.467987	0	133.5	10	0	-103	7764.33
10/12/09 02:38:48	59.976	3747.476	350	253.141541	0	134	10	0	-103	7765.32
10/12/09 02:38:54	59.973	3746.651	350	253.141541	0	134.5	10	0	-103	7766.31
10/12/09 02:39:00	59.981	3741.618	350	253.141541	0	135	10	0	-103	7767.3

10/12/09 02:39:06	59.982	3738.901	350	253.141541	0	135.5	10	0	-103	7768.29
10/12/09 02:39:12	59.982	3736.308	350	253.141541	0	136	10	0	-103	7769.28
10/12/09 02:39:18	59.98	3735.65	350	251.929871	0	136.5	10	0	-103	7770.27
10/12/09 02:39:24	59.98	3736.748	350	251.929871	0	137	10	0	-103	7771.26
10/12/09 02:39:30	59.978	3736.094	350	251.929871	0	137.5	10	0	-103	7772.25
10/12/09 02:39:36	59.971	3738.875	350	251.929871	0	138	10	0	-103	7773.24
10/12/09 02:39:42	59.975	3737.684	350	251.929871	0	138.5	10	0	-103	7774.23
10/12/09 02:39:48	59.969	3740.017	350	250.674194	0	139	10	0	-103	7775.22
10/12/09 02:39:54	59.972	3742.424	350	250.674194	0	139.5	10	0	-103	7776.21
10/12/09 02:40:00	59.977	3741.723	350	250.674194	0	140	10	0	-103	7777.2
10/12/09 02:40:06	59.976	3739.964	350	250.674194	0	140.5	10	0	-103	7778.19
10/12/09 02:40:12	59.977	3741.268	350	250.674194	0	141	10	0	-103	7779.18
10/12/09 02:40:18	59.979	3738.706	350	253.631866	0	141.5	10	0	-103	7780.17
10/12/09 02:40:24	59.974	3738.102	350	253.631866	0	142	10	0	-103	7781.16
10/12/09 02:40:30	59.971	3743.419	350	253.631866	0	142.5	10	0	-103	7782.15
10/12/09 02:40:36	59.966	3747.34	350	253.631866	0	143	10	0	-103	7783.14
10/12/09 02:40:42	59.973	3746.217	350	253.631866	0	143.5	10	0	-103	7784.13
10/12/09 02:40:48	59.972	3743.149	350	246.957306	0	144	10	0	-103	7785.12
10/12/09 02:40:54	59.97	3733.376	350	246.957306	0	144.5	10	0	-103	7786.11
10/12/09 02:41:00	59.982	3736.229	350	246.957306	0	145	10	0	-103	7787.1
10/12/09 02:41:06	59.985	3733.115	350	246.957306	0	145.5	10	0	-103	7788.09
10/12/09 02:41:12	59.989	3725.459	350	246.957306	0	146	10	0	-103	7789.08
10/12/09 02:41:18	59.99	3720.938	350	254.541779	0	146.5	10	0	-103	7790.07
10/12/09 02:41:24	60.001	3727.754	350	254.541779	0	147	10	0	-103	7791.06
10/12/09 02:41:30	60.006	3727.231	350	254.541779	0	147.5	10	0	-103	7792.05
10/12/09 02:41:36	60.019	3726.016	350	254.541779	0	148	10	0	-103	7793.04
10/12/09 02:41:42	60.026	3717.333	350	254.541779	0	148.5	10	0	-103	7794.03
10/12/09 02:41:48	60.029	3715.166	350	256.571594	0	149	10	0	-103	7795.02
10/12/09 02:41:54	60.037	3710.158	350	256.571594	0	149.5	10	0	-103	7796.01
10/12/09 02:42:00	60.041	3704.591	350	256.571594	0	150	10	0	-103	7797
10/12/09 02:42:06	60.043	3701.316	350	256.571594	0	150.5	10	0	-103	7797.99
10/12/09 02:42:12	60.046	3699.726	350	256.571594	0	151	10	0	-103	7798.98
10/12/09 02:42:18	60.043	3696.865	350	258.37262	0	151.5	10	0	-103	7799.97
10/12/09 02:42:24	60.043	3696.541	350	258.37262	0	152	10	0	-103	7800.96
10/12/09 02:42:30	60.041	3699.631	350	258.37262	0	152.5	10	0	-103	7801.95
10/12/09 02:42:36	60.036	3700.106	350	258.37262	0	153	10	0	-103	7802.94
10/12/09 02:42:42	60.034	3701.865	350	258.37262	0	153.5	10	0	-103	7803.93
10/12/09 02:42:48	60.035	3702.913	350	263.047363	0	154	10	0	-103	7804.92
10/12/09 02:42:54	60.036	3704.967	350	263.047363	0	154.5	10	0	-103	7805.91
10/12/09 02:43:00	60.032	3703.706	350	263.047363	0	155	10	0	-103	7806.9
10/12/09 02:43:06	60.033	3704.36	350	263.047363	0	155.5	10	0	-103	7807.89
10/12/09 02:43:12	60.035	3701.942	350	263.047363	0	156	10	0	-103	7808.88
10/12/09 02:43:18	60.037	3702.457	350	260.984375	0	156.5	10	0	-103	7809.87
10/12/09 02:43:24	60.034	3703.844	350	260.984375	0	157	10	0	-103	7810.86
10/12/09 02:43:30	60.037	3702.28	350	260.984375	0	157.5	10	0	-103	7811.85
10/12/09 02:43:36	60.04	3700.276	350	260.984375	0	158	10	0	-103	7812.84

10/12/09 02:43:42	60.045	3696.916	350	260.984375	0	158.5	10	0	-103	7813.83
10/12/09 02:43:48	60.04	3698.429	350	261.318329	0	159	10	0	-103	7814.82
10/12/09 02:43:54	60.042	3693.241	350	261.318329	0	159.5	10	0	-103	7815.81
10/12/09 02:44:00	60.039	3701.791	350	261.318329	0	160	10	0	-103	7816.8
10/12/09 02:44:06	60.034	3702.148	350	261.318329	0	160.5	10	0	-103	7817.79
10/12/09 02:44:12	60.031	3707.287	350	261.318329	0	161	10	0	-103	7818.78
10/12/09 02:44:18	60.031	3707.917	350	262.1026	0	161.5	10	0	-103	7819.77
10/12/09 02:44:24	60.031	3707.615	350	262.1026	0	162	10	0	-103	7820.76
10/12/09 02:44:30	60.039	3701.582	350	262.1026	0	162.5	10	0	-103	7821.75
10/12/09 02:44:36	60.035	3702.212	350	262.1026	0	163	10	0	-103	7822.74
10/12/09 02:44:42	60.042	3699.69	350	262.1026	0	163.5	10	0	-103	7823.73
10/12/09 02:44:48	60.04	3700.662	350	262.71701	0	164	10	0	-103	7824.72
10/12/09 02:44:54	60.048	3695.819	350	262.71701	0	164.5	10	0	-103	7825.71
10/12/09 02:45:00	60.044	3696.897	350	262.71701	0	165	10	0	-103	7826.7
10/12/09 02:45:06	60.04	3698.424	350	262.71701	0	165.5	10	0	-103	7827.69
10/12/09 02:45:12	60.044	3699.806	350	262.71701	0	166	10	0	-103	7828.68
10/12/09 02:45:18	60.042	3698.507	350	260.016479	0	166.5	10	0	-103	7829.67
10/12/09 02:45:24	60.038	3699.077	350	260.016479	0	167	10	0	-103	7830.66
10/12/09 02:45:30	60.039	3700.902	350	260.016479	0	167.5	10	0	-103	7831.65
10/12/09 02:45:36	60.039	3701.139	350	260.016479	0	168	10	0	-103	7832.64
10/12/09 02:45:42	60.039	3699.458	350	260.016479	0	168.5	10	0	-103	7833.63
10/12/09 02:45:48	60.037	3699.505	350	263.87323	0	169	10	0	-103	7834.62
10/12/09 02:45:54	60.038	3699.4	350	263.87323	0	169.5	10	0	-103	7835.61
10/12/09 02:46:00	60.033	3702.968	350	263.87323	0	170	10	0	-103	7836.6
10/12/09 02:46:06	60.032	3705.775	350	263.87323	0	170.5	10	0	-103	7837.59
10/12/09 02:46:12	60.042	3701.981	350	263.87323	0	171	10	0	-103	7838.58
10/12/09 02:46:18	60.031	3702.213	350	264.5979	0	171.5	10	0	-103	7839.57
10/12/09 02:46:24	60.034	3704.449	350	264.5979	0	172	10	0	-103	7840.56
10/12/09 02:46:30	60.038	3702.795	350	264.5979	0	172.5	10	0	-103	7841.55
10/12/09 02:46:36	60.042	3696.25	350	264.5979	0	173	10	0	-103	7842.54
10/12/09 02:46:42	60.04	3693.577	350	264.5979	0	173.5	10	0	-103	7843.53
10/12/09 02:46:48	60.041	3693.786	350	262.415924	0	174	10	0	-103	7844.52
10/12/09 02:46:54	60.043	3694.938	350	262.415924	0	174.5	10	0	-103	7845.51
10/12/09 02:47:00	60.036	3692.686	350	262.415924	0	175	10	0	-103	7846.5
10/12/09 02:47:06	60.042	3692.357	350	262.415924	0	175.5	10	0	-103	7847.49
10/12/09 02:47:12	60.036	3692.042	350	262.415924	0	176	10	0	-103	7848.48
10/12/09 02:47:18	60.037	3695.258	350	259.685242	0	176.5	10	0	-103	7849.47
10/12/09 02:47:24	60.035	3695.491	350	259.685242	0	177	10	0	-103	7850.46
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10/12/09 02:47:54	60.04	3693.736	350	255.911011	0	179.5	10	0	-103	7855.41
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10/12/09 02:48:30	60.041	3691.012	350	258.148193	0	182.5	10	0	-103	7861.35
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10/12/09 02:48:42	60.039	3688.159	350	258.148193	0	183.5	10	0	-103	7863.33
10/12/09 02:48:48	60.033	3690.092	350	258.873596	0	184	10	0	-103	7864.32
10/12/09 02:48:54	60.029	3694.593	350	258.873596	0	184.5	10	0	-103	7865.31
10/12/09 02:49:00	60.03	3693.412	350	258.873596	0	185	10	0	-103	7866.3
10/12/09 02:49:06	60.022	3698.012	350	258.873596	0	185.5	10	0	-103	7867.29
10/12/09 02:49:12	60.023	3698.935	350	258.873596	0	186	10	0	-103	7868.28
10/12/09 02:49:18	60.023	3700.486	350	249.33757	0	186.5	10	0	-103	7869.27
10/12/09 02:49:24	60.026	3699.914	350	249.33757	0	187	10	0	-103	7870.26
10/12/09 02:49:30	60.024	3701.45	350	249.33757	0	187.5	10	0	-103	7871.25
10/12/09 02:49:36	60.023	3701.702	350	249.33757	0	188	10	0	-103	7872.24
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10/12/09 02:50:00	60.024	3700.277	350	258.278168	0	190	10	0	-103	7876.2
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10/12/09 02:50:12	60.02	3700.965	350	258.278168	0	191	10	0	-103	7878.18
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10/12/09 02:50:24	60.015	3703.003	350	258.406372	0	192	10	0	-103	7880.16
10/12/09 02:50:30	60.012	3703.167	350	258.406372	0	192.5	10	0	-103	7881.15
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10/12/09 02:51:00	59.985	3699.854	350	260.538879	0	195	10	0	-103	7886.1
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10/12/09 02:51:12	59.977	3703.166	350	260.538879	0	196	10	0	-103	7888.08
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10/12/09 02:51:24	59.975	3706.543	350	257.88208	0	197	10	0	-103	7890.06
10/12/09 02:51:30	59.971	3710.118	350	257.88208	0	197.5	10	0	-103	7891.05
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10/12/09 02:51:42	59.982	3706.125	350	257.88208	0	198.5	10	0	-103	7893.03
10/12/09 02:51:48	59.979	3706.19	350	258.588654	0	199	10	0	-103	7894.02
10/12/09 02:51:54	59.978	3708.971	350	258.588654	0	199.5	10	0	-103	7895.01
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10/12/09 02:52:06	59.97	3711.75	350	258.588654	0	200.5	10	0	-103	7896.99
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10/12/09 02:52:18	59.999	3703.787	350	261.906158	0	201.5	10	0	-103	7898.97
10/12/09 02:52:24	60.003	3699.51	350	261.906158	0	202	10	0	-103	7899.96
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10/12/09 02:52:36	60.022	3697.868	350	261.906158	0	203	10	0	-103	7901.94
10/12/09 02:52:42	60.025	3693.418	350	261.906158	0	203.5	10	0	-103	7902.93
10/12/09 02:52:48	60.029	3689.143	350	256.747803	0	204	10	0	-103	7903.92

10/12/09 02:52:54	60.028	3687.026	350	256.747803	0	204.5	10	0	-103	7904.91
10/12/09 02:53:00	60.032	3685.576	350	256.747803	0	205	10	0	-103	7905.9
10/12/09 02:53:06	60.03	3687.159	350	256.747803	0	205.5	10	0	-103	7906.89
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10/12/09 02:53:18	60.017	3692.578	350	167.431976	0	206.5	10	0	-103	7908.87
10/12/09 02:53:24	60.015	3693.249	350	167.431976	0	207	10	0	-103	7909.86
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10/12/09 02:53:36	60.005	3693.75	350	167.431976	0	208	10	0	-103	7911.84
10/12/09 02:53:42	59.997	3691.15	350	167.431976	0	208.5	10	0	-103	7912.83
10/12/09 02:53:48	59.998	3690.588	350	164.973404	0	209	10	0	-103	7913.82
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10/12/09 02:55:18	59.979	3684.318	350	160.447235	0	216.5	10	0	-103	7928.67
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10/12/09 02:55:36	59.988	3671.761	350	160.447235	0	218	10	0	-103	7931.64
10/12/09 02:55:42	59.993	3679	350	160.447235	0	218.5	10	0	-103	7932.63
10/12/09 02:55:48	59.994	3682.7	350	163.958603	0	219	10	0	-103	7933.62
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10/12/09 02:56:06	59.986	3684.976	350	163.958603	0	220.5	10	0	-103	7936.59
10/12/09 02:56:12	59.982	3684.245	350	163.958603	0	221	10	0	-103	7937.58
10/12/09 02:56:18	59.987	3683.736	350	166.072449	0	221.5	10	0	-103	7938.57
10/12/09 02:56:24	60	3682.138	350	166.072449	0	222	10	0	-103	7939.56
10/12/09 02:56:30	60.003	3681.458	350	166.072449	0	222.5	10	0	-103	7940.55
10/12/09 02:56:36	60.002	3680.167	350	166.072449	0	223	10	0	-103	7941.54
10/12/09 02:56:42	60.005	3679.669	350	166.072449	0	223.5	10	0	-103	7942.53
10/12/09 02:56:48	60.012	3676.796	350	163.766586	0	224	10	0	-103	7943.52
10/12/09 02:56:54	60.022	3673.906	350	163.766586	0	224.5	10	0	-103	7944.51
10/12/09 02:57:00	60.018	3673.648	350	163.766586	0	225	10	0	-103	7945.5
10/12/09 02:57:06	60.02	3676.676	350	163.766586	0	225.5	10	0	-103	7946.49
10/12/09 02:57:12	60.019	3677.185	350	163.766586	0	226	10	0	-103	7947.48
10/12/09 02:57:18	60.017	3679.289	350	165.101685	0	226.5	10	0	-103	7948.47
10/12/09 02:57:24	60.016	3678.599	350	165.101685	0	227	10	0	-103	7949.46

10/12/09 02:57:30	60.014	3678.589	350	165.101685	0	227.5	10	0	-103	7950.45
10/12/09 02:57:36	60.015	3674.669	350	165.101685	0	228	10	0	-103	7951.44
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10/12/09 02:58:36	60.023	3671.332	335	206.459106	0	233	10	0	-103	7961.34
10/12/09 02:58:42	60.02	3673.833	335	206.459106	0	233.5	10	0	-103	7962.33
10/12/09 02:58:48	60.017	3675.971	335	211.256042	0	234	10	0	-103	7963.32
10/12/09 02:58:54	60.01	3679.393	335	211.256042	1	234.5	10	0	-103	7964.31
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10/12/09 02:59:06	60.012	3679.062	335	211.256042	1	235.5	10	0	-103	7966.29
10/12/09 02:59:12	60.013	3679.637	335	211.256042	1	236	10	0	-103	7967.28
10/12/09 02:59:18	60.01	3679.383	335	214.346695	1	236.5	10	0	-103	7968.27
10/12/09 02:59:24	60.011	3679.138	335	214.346695	1	237	10	0	-103	7969.26
10/12/09 02:59:30	60.018	3678.456	335	214.346695	1	237.5	10	0	-103	7970.25
10/12/09 02:59:36	60.019	3677.431	335	214.346695	2	238	10	0	-103	7971.24
10/12/09 02:59:42	60.018	3678.151	335	214.346695	3	238.5	10	0	-103	7972.23
10/12/09 02:59:48	60.016	3680.771	335	212.172699	4	239	10	0	-103	7973.22
10/12/09 02:59:54	60.022	3679.167	335	212.172699	5	239.5	10	0	-103	7974.21
10/12/09 03:00:00	60.016	3682.73	335	212.172699	6	240	10	0	-103	7975.2
10/12/09 03:00:06	60.01	3682.01	335	212.172699	7	240.5	10	0	-103	7976.19
10/12/09 03:00:12	59.995	3685.306	335	212.172699	8	241	10	0	-103	7977.18
10/12/09 03:00:18	59.974	3687.527	335	215.598175	9	241.5	10	0	-103	7978.17
10/12/09 03:00:24	59.968	3692.966	335	215.598175	10	242	10	0	-103	7979.16
10/12/09 03:00:30	59.972	3694.974	335	215.598175	11	242.5	10	0	-103	7980.15
10/12/09 03:00:36	59.964	3698.617	335	215.598175	12	243	10	0	-103	7981.14
10/12/09 03:00:42	59.963	3702.645	335	215.598175	13	243.5	10	0	-103	7982.13
10/12/09 03:00:48	59.968	3704.023	335	218.327255	14	244	10	0	-103	7983.12
10/12/09 03:00:54	59.97	3703.814	335	218.327255	15	244.5	10	0	-103	7984.11
10/12/09 03:01:00	59.976	3704.293	335	218.327255	16	245	10	0	-103	7985.1
10/12/09 03:01:06	59.977	3703.142	335	218.327255	16	245.5	10	0	-103	7986.09
10/12/09 03:01:12	59.974	3705.662	335	218.327255	16	246	10	0	-103	7987.08
10/12/09 03:01:18	59.974	3707.514	335	217.379425	16	246.5	10	0	-103	7988.07
10/12/09 03:01:24	59.979	3706.335	335	217.379425	16	247	10	0	-103	7989.06
10/12/09 03:01:30	59.985	3704.127	335	217.379425	16	247.5	10	0	-103	7990.05
10/12/09 03:01:36	59.979	3705.968	335	217.379425	16	248	10	0	-103	7991.04
10/12/09 03:01:42	59.986	3703.913	335	217.379425	16	248.5	10	0	-103	7992.03
10/12/09 03:01:48	59.982	3705.05	335	214.830353	16	249	10	0	-103	7993.02
10/12/09 03:01:54	59.987	3701.831	335	214.830353	16	249.5	10	0	-103	7994.01
10/12/09 03:02:00	59.996	3701.308	335	214.830353	16	250	10	0	-103	7995

10/12/09 03:02:06	59.997	3700.541	335	214.830353	16	250.5	10	0	-103	7995.99
10/12/09 03:02:12	59.996	3700.549	335	214.830353	16	251	10	0	-103	7996.98
10/12/09 03:02:18	59.998	3699.5	335	227.655914	16	251.5	10	0	-103	7997.97
10/12/09 03:02:24	60.01	3699.409	335	227.655914	16	252	10	0	-103	7998.96
10/12/09 03:02:30	60.004	3701.11	335	227.655914	16	252.5	10	0	-103	7999.95
10/12/09 03:02:36	60.001	3700.22	335	227.655914	16	253	10	0	-103	8000.94
10/12/09 03:02:42	60.007	3702.276	335	227.655914	16	253.5	10	0	-103	8001.93
10/12/09 03:02:48	60.008	3702.943	335	225.018082	16	254	10	0	-103	8002.92
10/12/09 03:02:54	60.006	3703.819	335	225.018082	16	254.5	10	0	-103	8003.91
10/12/09 03:03:00	59.999	3705.329	335	225.018082	16	255	10	0	-103	8004.9
10/12/09 03:03:06	60.004	3703.675	335	225.018082	16	255.5	10	0	-103	8005.89
10/12/09 03:03:12	60.015	3703.017	335	225.018082	16	256	10	0	-103	8006.88
10/12/09 03:03:18	60.009	3705.189	335	228.365158	16	256.5	10	0	-103	8007.87
10/12/09 03:03:24	60.011	3704.051	335	228.365158	16	257	10	0	-103	8008.86
10/12/09 03:03:30	60.016	3703.708	335	228.365158	16	257.5	10	0	-103	8009.85
10/12/09 03:03:36	60.019	3704.139	335	228.365158	16	258	10	0	-103	8010.84
10/12/09 03:03:42	60.011	3705.942	335	228.365158	16	258.5	10	0	-103	8011.83
10/12/09 03:03:48	60.008	3705.749	335	234.075333	16	259	10	0	-103	8012.82
10/12/09 03:03:54	60.015	3706.63	335	234.075333	16	259.5	10	0	-103	8013.81
10/12/09 03:04:00	60.018	3704.224	335	234.075333	16	260	10	0	-103	8014.8
10/12/09 03:04:06	60.019	3704.795	335	234.075333	16	260.5	10	0	-103	8015.79
10/12/09 03:04:12	60.025	3702.008	335	234.075333	16	261	10	0	-103	8016.78
10/12/09 03:04:18	60.027	3700.34	335	228.798157	16	261.5	10	0	-103	8017.77
10/12/09 03:04:24	60.023	3702.959	335	228.798157	16	262	10	0	-103	8018.76
10/12/09 03:04:30	60.024	3703.374	335	228.798157	16	262.5	10	0	-103	8019.75
10/12/09 03:04:36	60.022	3704.947	335	228.798157	16	263	10	0	-103	8020.74
10/12/09 03:04:42	60.023	3703.16	335	228.798157	16	263.5	10	0	-103	8021.73
10/12/09 03:04:48	60.018	3705.441	335	229.466965	16	264	10	0	-103	8022.72
10/12/09 03:04:54	60.012	3707.971	335	229.466965	16	264.5	10	0	-103	8023.71
10/12/09 03:05:00	60.019	3708.831	335	229.466965	16	265	10	0	-103	8024.7
10/12/09 03:05:06	60.015	3709.817	335	229.466965	16	265.5	10	0	-103	8025.69
10/12/09 03:05:12	60.016	3709.642	335	229.466965	16	266	10	0	-103	8026.68
10/12/09 03:05:18	60.016	3710.677	335	228.980164	16	266.5	10	0	-103	8027.67
10/12/09 03:05:24	60.018	3707.696	335	228.980164	16	267	10	0	-103	8028.66
10/12/09 03:05:30	60.024	3706.99	335	228.980164	16	267.5	10	0	-103	8029.65
10/12/09 03:05:36	60.024	3704.406	335	228.980164	16	268	10	0	-103	8030.64
10/12/09 03:05:42	60.019	3705.516	335	228.980164	16	268.5	10	0	-103	8031.63
10/12/09 03:05:48	60.028	3704.773	335	219.975555	16	269	10	0	-103	8032.62
10/12/09 03:05:54	60.029	3702.093	335	219.975555	16	269.5	10	0	-103	8033.61
10/12/09 03:06:00	60.029	3701.52	335	219.975555	16	270	10	0	-103	8034.6
10/12/09 03:06:06	60.03	3698.009	335	219.975555	16	270.5	10	0	-103	8035.59
10/12/09 03:06:12	60.019	3703.815	335	219.975555	16	271	10	0	-103	8036.58
10/12/09 03:06:18	60.021	3700.816	335	229.089249	16	271.5	10	0	-103	8037.57
10/12/09 03:06:24	60.012	3708.527	335	229.089249	16	272	10	0	-103	8038.56
10/12/09 03:06:30	60.013	3706.991	335	229.089249	16	272.5	10	0	-103	8039.55
10/12/09 03:06:36	60.016	3705.398	335	229.089249	16	273	10	0	-103	8040.54

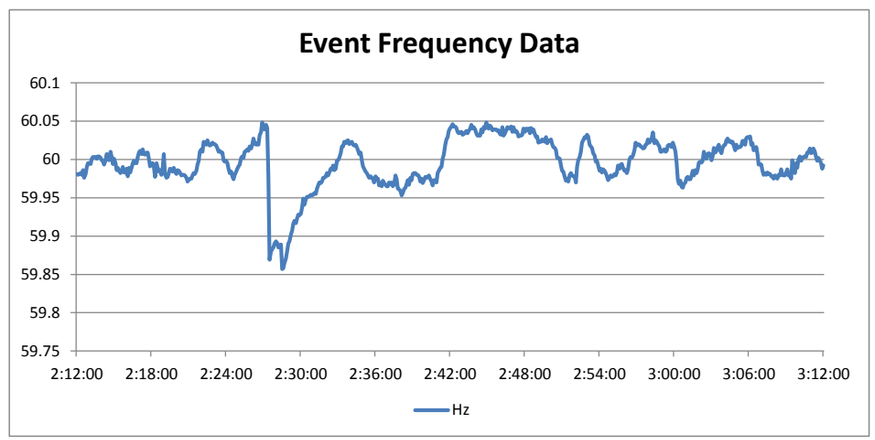
10/12/09 03:06:42	60.007	3708.99	335	229.089249	16	273.5	10	0	-103	8041.53
10/12/09 03:06:48	59.993	3707.304	335	229.663269	16	274	10	0	-103	8042.52
10/12/09 03:06:54	59.994	3706.921	335	229.663269	16	274.5	10	0	-103	8043.51
10/12/09 03:07:00	59.993	3704.934	335	229.663269	16	275	10	0	-103	8044.5
10/12/09 03:07:06	59.985	3707.071	335	229.663269	16	275.5	10	0	-103	8045.49
10/12/09 03:07:12	59.98	3708.246	335	229.663269	16	276	10	0	-103	8046.48
10/12/09 03:07:18	59.982	3710.134	335	229.233856	16	276.5	10	0	-103	8047.47
10/12/09 03:07:24	59.98	3709.192	335	229.233856	16	277	10	0	-103	8048.46
10/12/09 03:07:30	59.983	3707.911	335	229.233856	16	277.5	10	0	-103	8049.45
10/12/09 03:07:36	59.981	3709.689	335	229.233856	16	278	10	0	-103	8050.44
10/12/09 03:07:42	59.981	3711.256	350	229.233856	16	278.5	10	0	-103	8051.43
10/12/09 03:07:48	59.978	3712.012	350	231.409882	16	279	10	0	-103	8052.42
10/12/09 03:07:54	59.978	3713.992	350	231.409882	16	279.5	10	0	-103	8053.41
10/12/09 03:08:00	59.975	3715.323	350	231.409882	16	280	10	0	-103	8054.4
10/12/09 03:08:06	59.979	3715.161	350	231.409882	16	280.5	10	0	-103	8055.39
10/12/09 03:08:12	59.976	3714.063	350	231.409882	16	281	10	0	-103	8056.38
10/12/09 03:08:18	59.975	3715.688	350	218.622284	16	281.5	10	0	-103	8057.37
10/12/09 03:08:24	59.98	3714.848	350	218.622284	16	282	10	0	-103	8058.36
10/12/09 03:08:30	59.979	3712.275	350	218.622284	16	282.5	10	0	-103	8059.35
10/12/09 03:08:36	59.987	3710.05	350	218.622284	16	283	10	0	-103	8060.34
10/12/09 03:08:42	59.98	3710.624	350	218.622284	16	283.5	10	0	-103	8061.33
10/12/09 03:08:48	59.979	3710.475	350	213.535858	16	284	10	0	-103	8062.32
10/12/09 03:08:54	59.979	3709.286	350	213.535858	16	284.5	10	0	-103	8063.31
10/12/09 03:09:00	59.983	3708.371	350	213.535858	16	285	10	0	-103	8064.3
10/12/09 03:09:06	59.987	3707.49	350	213.535858	16	285.5	10	0	-103	8065.29
10/12/09 03:09:12	59.979	3712.303	350	213.535858	16	286	10	0	-103	8066.28
10/12/09 03:09:18	59.979	3712.076	350	225.651855	16	286.5	10	0	-103	8067.27
10/12/09 03:09:24	59.975	3713.51	350	225.651855	16	287	10	0	-103	8068.26
10/12/09 03:09:30	59.999	3712.092	350	225.651855	16	287.5	10	0	-103	8069.25
10/12/09 03:09:36	59.986	3714.953	350	225.651855	16	288	10	0	-103	8070.24
10/12/09 03:09:42	59.982	3715.438	350	225.651855	16	288.5	10	0	-103	8071.23
10/12/09 03:09:48	59.995	3715.068	350	212.573639	16	289	10	0	-103	8072.22
10/12/09 03:09:54	59.989	3716.285	350	212.573639	16	289.5	10	0	-103	8073.21
10/12/09 03:10:00	60	3711.708	350	212.573639	16	290	10	0	-103	8074.2
10/12/09 03:10:06	60.004	3713.362	350	212.573639	16	290.5	10	0	-103	8075.19
10/12/09 03:10:12	59.998	3719.079	350	212.573639	16	291	10	0	-103	8076.18
10/12/09 03:10:18	60.001	3717.889	350	219.897293	16	291.5	10	0	-103	8077.17
10/12/09 03:10:24	60.003	3719.021	350	219.897293	16	292	10	0	-103	8078.16
10/12/09 03:10:30	60.004	3719.299	350	219.897293	16	292.5	10	0	-103	8079.15
10/12/09 03:10:36	60.003	3719.731	350	219.897293	16	293	10	0	-103	8080.14
10/12/09 03:10:42	60.009	3718.976	350	219.897293	16	293.5	10	0	-103	8081.13
10/12/09 03:10:48	60.009	3720.609	350	231.1754	16	294	10	0	-103	8082.12
10/12/09 03:10:54	60.014	3720.38	350	231.1754	16	294.5	10	0	-103	8083.11
10/12/09 03:11:00	60.008	3721.272	350	231.1754	16	295	10	0	-103	8084.1
10/12/09 03:11:06	60.009	3721.594	350	231.1754	16	295.5	10	0	-103	8085.09
10/12/09 03:11:12	60.014	3721.646	350	231.1754	16	296	10	0	-103	8086.08

10/12/09 03:11:18	60.01	3721.645	350	226.634125	16	296.5	10	0	-103	8087.07
10/12/09 03:11:24	60.003	3724.656	350	226.634125	16	297	10	0	-103	8088.06
10/12/09 03:11:30	59.998	3723.696	350	226.634125	16	297.5	10	0	-103	8089.05
10/12/09 03:11:36	60.002	3721.879	350	226.634125	16	298	10	0	-103	8090.04
10/12/09 03:11:42	59.999	3724.142	350	226.634125	16	298.5	10	0	-103	8091.03
10/12/09 03:11:48	59.995	3723.639	350	227.255066	16	299	10	0	-103	8092.02
10/12/09 03:11:54	59.988	3725.361	350	227.255066	16	299.5	10	0	-103	8093.01
10/12/09 03:12:00	59.992	3723.693	350	227.255066	16	300	10	0	-103	8094

Balancing Authority Name:	My BA
Balancing Authority Frequency Response Obligation (FRO from FRS Form 1)	-80

Note: See "Instruction" tab for more detailed instructions.

Step 1.	Copy and Paste Event Data into the appropriate cells of the "Data" worksheet. Maintain date and time format of mm/dd/yy hh:mm:ss.	
Step 2.	Determine Time of T(0) and edit formula in cell "C8" to reference the correct row of the "Data" worksheet. T(0) is the first change in frequency of about 0.010 Hz (10 mHz) which should be the first scan of frequency data of the event.	2:27:24
Step 3.	Time of Frequency Recovery to 60 Hz or Pre-Perturbation Hz	2:33:06
Step 4.	Enter MW output of generator or load that caused event (+ for gen loss, - for load loss) (Value from NERC Event List. If multiple units, enter total MW loss.) If MW loss value is not known, enter a default 1000 MW.	633 MW
Step 5.	Hit the big blue button to copy your data for pasting into FRS Form 1 "BA Event Data" worksheet. Copy Form 2 Data for Pasting into Form 1	
Step 6.	Paste data into "FRS Form 1" in the appropriate row on the "BA Event Data" worksheet.	



Step 7. Save this workbook using the following file name format:MyBA_yymmdd_hhmm_FRS_Form2.xlsm

09/10/12 Date yymmdd

2:27 Time hh:ss of T(0)

Where "MyBA" = your BA mnemonic

scan rate	2 seconds	Date:	Monday, October 12, 2009		Balancing Authority	My BA	
		Time of T(0)	2:27:24		Grid Nominal Frequency	60.000	Hz
		Time of Frequency Recovery to 60 Hz or Pre-Perturbation Hz	2:33:06		Capacity @ Droop for Minimum Performance	2400.0	MW
		Value A Pre-Perturbation Average Frequency [T(-2) to T(-16)]	60.0420	Hz	Droop Setting	5.00%	3.00000 Hz
		Value B Post-Perturbation Average Frequency [T(+20 to T(+52)]	59.8880	Hz	Deadband Setting	0.000	Hz
		Pre to Post Perturbation Delta Frequency Actual	-0.154	Hz	Hz Span	3.00000	Hz
		Value A Pre-Perturbation Average Interchange MW [T(-2) to T(-16)]	3645.04	MW	Frequency Response Obligation (FRO)	-80	MW/0.1 Hz
		Value B Post-Perturbation Average Interchange MW [T(+20 to T(+52)]	3788.79	MW			
		Pre to Post Perturbation Interchange Delta MW Actual	143.75	MW			
		Initial Performance Ramp Magnitude Adjustment	-17.57	MW			
		EPFR Pre-Perturbation Average	-33.60	MW			
		EPFR Post-Perturbation Average	89.60	MW			
		EPFR Delta	123.20	MW	TC (frequency response filter constant)	0.350	Time Constant for delayed delivery of PFR during Sustained Measure
						Low Hz	Delta Hz Event
						3764.66	Actual Interchange MW Average during frequency recovery period
						3778.52	Target Interchange MW Average during frequency recovery period
EPFR = Expected Primary Frequency Response		EPFR(Final)	105.64	MW		3726.23	Interchange Average Ramp MW during frequency recovery period
		MW Response in right direction for frequency delta	Yes			3640.68	Actual MW @ T(-4)
						105.27	Starting and Ending Difference in Interchange MW during frequency recovery pe
						0:05:42	Event Duration (h:mm:ss)
						No	Target MW Average minus MW @ T(-4) less than zero
						137.84	Interchange Target Relative Average Change - MW (Low Frequency Event)
						123.98	Interchange Actual Relative Average Change - MW (Low Frequency Event)
						No	Interchange Actual Average minus MW @ T(-4) less than zero
						Yes	Interchange Average MW minus MW @ T(-4) greater than zero
						Yes	Interchange Target MW Average minus MW @ T(-4) greater than zero
						32.57	Interchange Target Relative Average Change - MW (High Frequency Event)
						18.71	Interchange Actual Relative Average Change - MW (High Frequency Event)
						Up	Ramp Direction during frequency recovery period
		Initial Response P.U. Performance	1.361	P.U.		0.899	P.U. Sustianed Response P.U. Performance

	T	Frequency Hz	Interchange MW	Value B 20 to 52 sec Average Frequency	Average MW	FRO (EPFR) Expected Primary Frequency Response	(TC) Delayed Delivery Frequency Response	Initial Measure Final Expected Primary Frequency Response	Average Ramp MW/scan	Recovery Period Target MW	Average Output During Recovery Period MW	Average Target During Recovery Period MW	Recovery Period Ramp MW	Average Ramp During Recovery Period MW	Generator Trip MW
T-72 sec	2:26:12	60.027	3668.611			-21.600	-7.560								633
T-70 sec	2:26:14	60.027	3668.611			-21.600	-12.474								
T-68 sec	2:26:16	60.027	3668.611			-21.600	-15.668								

T-66 sec	2:26:18	60.022	3666.062			-17.599	-16.344										
T-64 sec	2:26:20	60.022	3666.062			-17.599	-16.784										
T-62 sec	2:26:22	60.022	3666.062			-17.599	-17.069										
T-60 sec	2:26:24	60.019	3670.454			-15.201	-16.415		-0.442	3670.454							
T-58 sec	2:26:26	60.019	3670.454			-15.201	-15.990		-0.442	3670.436							
T-56 sec	2:26:28	60.019	3670.454			-15.201	-15.714		-0.442	3670.271							
T-54 sec	2:26:30	60.021	3672.493			-16.800	-16.094		-0.442	3669.448							
T-52 sec	2:26:32	60.021	3672.493			-16.800	-16.341		-0.442	3668.759							
T-50 sec	2:26:34	60.021	3672.493			-16.800	-16.502		-0.442	3668.156							
T-48 sec	2:26:36	60.019	3672.164			-15.201	-16.046		-0.442	3668.169							
T-46 sec	2:26:38	60.019	3672.164			-15.201	-15.750		-0.442	3668.023							
T-44 sec	2:26:40	60.019	3672.164			-15.201	-15.558		-0.442	3667.773							
T-42 sec	2:26:42	60.031	3666.467			-24.799	-18.792		-0.442	3664.097							
T-40 sec	2:26:44	60.031	3666.467			-24.799	-20.894		-0.442	3661.553							
T-38 sec	2:26:46	60.031	3666.467			-24.799	-22.261		-0.442	3659.744							
T-36 sec	2:26:48	60.036	3660.672			-28.799	-24.549		-0.442	3657.013							
T-34 sec	2:26:50	60.036	3660.672			-28.799	-26.037		-0.442	3655.084							
T-32 sec	2:26:52	60.036	3660.672			-28.799	-27.004		-0.442	3653.675							
T-30 sec	2:26:54	60.048	3650.025			-38.400	-30.993		-0.442	3649.244							
T-28 sec	2:26:56	60.048	3650.025			-38.400	-33.585		-0.442	3646.209							
T-26 sec	2:26:58	60.048	3650.025			-38.400	-35.271		-0.442	3644.082							
T-24 sec	2:27:00	60.041	3654.294			-32.800	-34.406		-0.442	3644.504							
T-22 sec	2:27:02	60.041	3654.294			-32.800	-33.844		-0.442	3644.624							
T-20 sec	2:27:04	60.041	3654.294			-32.800	-33.479		-0.442	3644.547							
T-18 sec	2:27:06	60.039	3651.059			-31.201	-32.682		-0.442	3644.902							
T-16 sec	2:27:08	60.039	3651.059	60.042	3645.041	-31.201	-32.163		-0.442	3644.978							
T-14 sec	2:27:10	60.039	3651.059	60.042	3645.041	-31.201	-31.827		-0.442	3644.872							
T-12 sec	2:27:12	60.045	3645.387	60.042	3645.041	-35.999	-33.287		-0.442	3642.970							
T-10 sec	2:27:14	60.045	3645.387	60.042	3645.041	-35.999	-34.236		-0.442	3641.579							
T-08 sec	2:27:16	60.045	3645.387	60.042	3645.041	-35.999	-34.853		-0.442	3640.520							
T-06 sec	2:27:18	60.041	3640.682	60.042	3645.041	-32.800	-34.134		-0.442	3640.796							
T-04 sec	2:27:20	60.041	3640.682	60.042	3645.041	-32.800	-33.667		-0.442	3640.821							
T-02 sec	2:27:22	60.041	3640.682	60.042	3645.041	-32.800	-33.364		-0.442	3640.682							
T+0 sec	2:27:24	59.978	3696.362			17.599	-15.527		0.000	3658.519							633
T+02 sec	2:27:26	59.978	3696.362			17.599	-3.933		0.616	3670.729	3696.362	3664.624	3673.907	3673.907			633
T+04 sec	2:27:28	59.978	3696.362			17.599	3.604		0.616	3678.881	3696.362	3669.376	3674.523	3674.215			633
T+06 sec	2:27:30	59.978	3696.362			17.599	8.502		0.616	3684.395	3696.362	3673.131	3675.139	3674.523			633
T+08 sec	2:27:32	59.869	3737.157			104.800	42.207		0.616	3718.715	3704.521	3682.248	3675.754	3674.831			633
T+10 sec	2:27:34	59.869	3737.157			104.800	64.114		0.616	3741.239	3709.960	3692.080	3676.370	3675.139			633
T+12 sec	2:27:36	59.869	3737.157			104.800	78.355		0.616	3756.094	3713.846	3701.225	3676.986	3675.446			633
T+14 sec	2:27:38	59.88	3766.194			95.999	84.530		0.616	3762.886	3720.389	3708.932	3677.601	3675.754			633
T+16 sec	2:27:40	59.88	3766.194			95.999	88.544		0.616	3767.515	3725.479	3715.442	3678.217	3676.062			633
T+18 sec	2:27:42	59.88	3766.194			95.999	91.153		0.616	3770.740	3729.550	3720.971	3678.832	3676.370			633
T+20 sec	2:27:44	59.883	3780.621	59.888	3788.789	93.600	92.010	3750.676	0.616	3772.212	3734.193	3725.630	3679.448	3676.678			633
T+22 sec	2:27:46	59.883	3780.621	59.888	3788.789	93.600	92.567	3750.676	0.616	3773.385	3738.062	3729.609	3680.064	3676.986			633
T+24 sec	2:27:48	59.883	3780.621	59.888	3788.789	93.600	92.928	3750.676	0.616	3774.362	3741.336	3733.052	3680.679	3677.293			633

T+26 sec	2:27:50	59.885	3784.962	59.888	3788.789	92.001	92.604	3750.676	0.616	3774.653	3744.452	3736.023	3681.295	3677.601	633
T+28 sec	2:27:52	59.885	3784.962	59.888	3788.789	92.001	92.393	3750.676	0.616	3775.058	3747.152	3738.626	3681.910	3677.909	633
T+30 sec	2:27:54	59.885	3784.962	59.888	3788.789	92.001	92.256	3750.676	0.616	3775.536	3749.516	3740.932	3682.526	3678.217	633
T+32 sec	2:27:56	59.89	3788.072	59.888	3788.789	88.000	90.767	3750.676	0.616	3774.663	3751.784	3742.917	3683.142	3678.525	633
T+34 sec	2:27:58	59.89	3788.072	59.888	3788.789	88.000	89.798	3750.676	0.616	3774.310	3753.800	3744.661	3683.757	3678.832	633
T+36 sec	2:28:00	59.89	3788.072	59.888	3788.789	88.000	89.169	3750.676	0.616	3774.296	3755.603	3746.220	3684.373	3679.140	633
T+38 sec	2:28:02	59.893	3788.472	59.888	3788.789	85.599	87.920	3750.676	0.616	3773.662	3757.247	3747.593	3684.989	3679.448	633
T+40 sec	2:28:04	59.893	3788.472	59.888	3788.789	85.599	87.107	3750.676	0.616	3773.466	3758.734	3748.825	3685.604	3679.756	633
T+42 sec	2:28:06	59.893	3788.472	59.888	3788.789	85.599	86.579	3750.676	0.616	3773.553	3760.086	3749.949	3686.220	3680.064	633
T+44 sec	2:28:08	59.891	3794.374	59.888	3788.789	87.201	86.797	3750.676	0.616	3774.387	3761.576	3751.011	3686.835	3680.371	633
T+46 sec	2:28:10	59.891	3794.374	59.888	3788.789	87.201	86.938	3750.676	0.616	3775.144	3762.943	3752.017	3687.451	3680.679	633
T+48 sec	2:28:12	59.891	3794.374	59.888	3788.789	87.201	87.030	3750.676	0.616	3775.851	3764.200	3752.970	3688.067	3680.987	633
T+50 sec	2:28:14	59.885	3799.959	59.888	3788.789	92.001	88.770	3750.676	0.616	3778.207	3765.576	3753.941	3688.682	3681.295	633
T+52 sec	2:28:16	59.885	3799.959	59.888	3788.789	92.001	89.901	3750.676	0.616	3779.953	3766.849	3754.904	3689.298	3681.603	633
T+54 sec	2:28:18	59.885	3799.959			92.001	90.636		0.616	3781.304	3768.031	3755.847	3689.914	3681.910	633
T+56 sec	2:28:20	59.888	3802.951			89.600	90.273		0.616	3781.557	3769.236	3756.734	3690.529	3682.218	633
T+58 sec	2:28:22	59.888	3802.951			89.600	90.038		0.616	3781.937	3770.359	3757.574	3691.145	3682.526	633
T+60 sec	2:28:24	59.888	3802.951			89.600	89.884		0.616	3782.399	3771.411	3758.374	3691.760	3682.834	633
T+62 sec	2:28:26	59.889	3805.617			88.800	89.505		0.616	3782.635	3772.480	3759.133	3692.376	3683.142	633
T+64 sec	2:28:28	59.889	3805.617			88.800	89.258		0.616	3783.004	3773.484	3759.856	3692.992	3683.450	633
T+66 sec	2:28:30	59.889	3805.617			88.800	89.098		0.616	3783.459	3774.429	3760.550	3693.607	3683.757	633
T+68 sec	2:28:32	59.857	3814.862			114.401	97.954		0.616	3792.931	3775.584	3761.475	3694.223	3684.065	633
T+70 sec	2:28:34	59.857	3814.862			114.401	103.711		0.616	3799.303	3776.675	3762.526	3694.838	3684.373	633
T+72 sec	2:28:36	59.857	3814.862			114.401	107.452		0.616	3803.661	3777.707	3763.638	3695.454	3684.681	633
T+74 sec	2:28:38	59.858	3826.053			113.599	109.604		0.616	3806.427	3778.980	3764.764	3696.070	3684.989	633
T+76 sec	2:28:40	59.858	3826.053			113.599	111.002		0.616	3808.441	3780.187	3765.884	3696.685	3685.296	633
T+78 sec	2:28:42	59.858	3826.053			113.599	111.911		0.616	3809.966	3781.333	3766.986	3697.301	3685.604	633
T+80 sec	2:28:44	59.865	3826.753			107.999	110.541		0.616	3809.212	3782.441	3768.016	3697.917	3685.912	633
	2:28:46	59.865	3826.753			107.999	109.651		0.616	3808.938	3783.496	3768.990	3698.532	3686.220	633
	2:28:48	59.865	3826.753			107.999	109.073		0.616	3808.975	3784.502	3769.920	3699.148	3686.528	633
	2:28:50	59.871	3825.713			103.201	107.018		0.616	3807.536	3785.439	3770.775	3699.763	3686.835	633
	2:28:52	59.871	3825.713			103.201	105.682		0.616	3806.815	3786.334	3771.576	3700.379	3687.143	633
	2:28:54	59.871	3825.713			103.201	104.814		0.616	3806.563	3787.190	3772.336	3700.995	3687.451	633
	2:28:56	59.88	3819.081			95.999	101.729		0.616	3804.093	3787.868	3773.012	3701.610	3687.759	633
	2:28:58	59.88	3819.081			95.999	99.723		0.616	3802.703	3788.519	3773.631	3702.226	3688.067	633
	2:29:00	59.88	3819.081			95.999	98.420		0.616	3802.016	3789.142	3774.210	3702.841	3688.374	633
	2:29:02	59.89	3815.010			88.000	94.773		0.616	3798.984	3789.660	3774.705	3703.457	3688.682	633
	2:29:04	59.89	3815.010			88.000	92.403		0.616	3797.230	3790.157	3775.147	3704.073	3688.990	633
	2:29:06	59.89	3815.010			88.000	90.862		0.616	3796.305	3790.635	3775.554	3704.688	3689.298	633
	2:29:08	59.893	3809.652			85.599	89.020		0.616	3795.078	3790.993	3775.922	3705.304	3689.606	633
	2:29:10	59.893	3809.652			85.599	87.822		0.616	3794.496	3791.339	3776.266	3705.920	3689.914	633
	2:29:12	59.893	3809.652			85.599	87.044		0.616	3794.334	3791.672	3776.595	3706.535	3690.221	633
	2:29:14	59.902	3804.188			78.400	84.019		0.616	3791.924	3791.895	3776.869	3707.151	3690.529	633
	2:29:16	59.902	3804.188			78.400	82.052		0.616	3790.573	3792.111	3777.109	3707.766	3690.837	633
	2:29:18	59.902	3804.188			78.400	80.774		0.616	3789.910	3792.319	3777.330	3708.382	3691.145	633

2:29:20	59.907	3792.169	74.399	78.542	0.616	3788.294	3792.317	3777.515	3708.998	3691.453	633
2:29:22	59.907	3792.169	74.399	77.092	0.616	3787.460	3792.314	3777.681	3709.613	3691.760	633
2:29:24	59.907	3792.169	74.399	76.149	0.616	3787.133	3792.312	3777.836	3710.229	3692.068	633
2:29:26	59.916	3788.132	67.200	73.017	0.616	3784.616	3792.245	3777.946	3710.845	3692.376	633
2:29:28	59.916	3788.132	67.200	70.981	0.616	3783.195	3792.179	3778.029	3711.460	3692.684	633
2:29:30	59.916	3788.132	67.200	69.658	0.616	3782.488	3792.116	3778.099	3712.076	3692.992	633
2:29:32	59.92	3781.701	64.001	67.678	0.616	3781.124	3791.956	3778.145	3712.691	3693.299	633
2:29:34	59.92	3781.701	64.001	66.391	0.616	3780.452	3791.800	3778.180	3713.307	3693.607	633
2:29:36	59.92	3781.701	64.001	65.555	0.616	3780.232	3791.650	3778.211	3713.923	3693.915	633
2:29:38	59.917	3774.604	66.400	65.851	0.616	3781.143	3791.399	3778.254	3714.538	3694.223	633
2:29:40	59.917	3774.604	66.400	66.043	0.616	3781.951	3791.156	3778.307	3715.154	3694.531	633
2:29:42	59.917	3774.604	66.400	66.168	0.616	3782.692	3790.919	3778.370	3715.769	3694.838	633
2:29:44	59.923	3772.722	61.600	64.569	0.616	3781.708	3790.663	3778.417	3716.385	3695.146	633
2:29:46	59.923	3772.722	61.600	63.530	0.616	3781.285	3790.414	3778.457	3717.001	3695.454	633
2:29:48	59.923	3772.722	61.600	62.854	0.616	3781.225	3790.171	3778.495	3717.616	3695.762	633
2:29:50	59.928	3768.707	57.599	61.015	0.616	3780.001	3789.881	3778.515	3718.232	3696.070	633
2:29:52	59.928	3768.707	57.599	59.819	0.616	3779.421	3789.599	3778.527	3718.848	3696.378	633
2:29:54	59.928	3768.707	57.599	59.042	0.616	3779.260	3789.324	3778.537	3719.463	3696.685	633
2:29:56	59.927	3767.408	58.401	58.818	0.616	3779.651	3789.039	3778.551	3720.079	3696.993	633
2:29:58	59.927	3767.408	58.401	58.672	0.616	3780.121	3788.762	3778.571	3720.694	3697.301	633
2:30:00	59.927	3767.408	58.401	58.577	0.616	3780.642	3788.492	3778.598	3721.310	3697.609	633
2:30:02	59.929	3765.672	56.799	57.955	0.616	3780.635	3788.207	3778.623	3721.926	3697.917	633
2:30:04	59.929	3765.672	56.799	57.551	0.616	3780.846	3787.928	3778.651	3722.541	3698.224	633
2:30:06	59.929	3765.672	56.799	57.288	0.616	3781.199	3787.657	3778.682	3723.157	3698.532	633
2:30:08	59.937	3765.105	50.400	54.877	0.616	3779.404	3787.385	3778.690	3723.773	3698.840	633
2:30:10	59.937	3765.105	50.400	53.310	0.616	3778.452	3787.120	3778.687	3724.388	3699.148	633
2:30:12	59.937	3765.105	50.400	52.291	0.616	3778.049	3786.861	3778.680	3725.004	3699.456	633
2:30:14	59.949	3753.922	40.799	48.269	0.616	3774.643	3786.478	3778.633	3725.619	3699.763	633
2:30:16	59.949	3753.922	40.799	45.654	0.616	3772.644	3786.104	3778.564	3726.235	3700.071	633
2:30:18	59.949	3753.922	40.799	43.955	0.616	3771.560	3785.738	3778.485	3726.851	3700.379	633
2:30:20	59.941	3747.875	47.198	45.090	0.616	3773.311	3785.313	3778.426	3727.466	3700.687	633
2:30:22	59.941	3747.875	47.198	45.828	0.616	3774.664	3784.897	3778.385	3728.082	3700.995	633
2:30:24	59.941	3747.875	47.198	46.308	0.616	3775.759	3784.490	3778.356	3728.697	3701.302	633
2:30:26	59.948	3746.706	41.599	44.660	0.616	3774.727	3784.079	3778.316	3729.313	3701.610	633
2:30:28	59.948	3746.706	41.599	43.588	0.616	3774.271	3783.677	3778.273	3729.929	3701.918	633
2:30:30	59.948	3746.706	41.599	42.892	0.616	3774.190	3783.284	3778.229	3730.544	3702.226	633
2:30:32	59.951	3740.259	39.200	41.600	0.616	3773.514	3782.831	3778.180	3731.160	3702.534	633
2:30:34	59.951	3740.259	39.200	40.760	0.616	3773.289	3782.388	3778.129	3731.776	3702.841	633
2:30:36	59.951	3740.259	39.200	40.214	0.616	3773.359	3781.953	3778.080	3732.391	3703.149	633
2:30:38	59.951	3727.838	39.200	39.859	0.616	3773.620	3781.401	3778.034	3733.007	3703.457	633
2:30:40	59.951	3727.838	39.200	39.628	0.616	3774.005	3780.860	3777.993	3733.622	3703.765	633
2:30:42	59.951	3727.838	39.200	39.478	0.616	3774.471	3780.330	3777.958	3734.238	3704.073	633
2:30:44	59.952	3720.578	38.400	39.101	0.616	3774.709	3779.738	3777.926	3734.854	3704.381	633
2:30:46	59.952	3720.578	38.400	38.856	0.616	3775.079	3779.158	3777.898	3735.469	3704.688	633
2:30:48	59.952	3720.578	38.400	38.696	0.616	3775.535	3778.590	3777.875	3736.085	3704.996	633
2:30:50	59.954	3715.753	36.801	38.033	0.616	3775.488	3777.985	3777.852	3736.700	3705.304	633

2:30:52	59.954	3715.753	36.801	37.602	0.616	3775.672	3777.393	3777.832	3737.316	3705.612	633
2:30:54	59.954	3715.753	36.801	37.322	0.616	3776.008	3776.811	3777.814	3737.932	3705.920	633
2:30:56	59.953	3710.848	37.601	37.419	0.616	3776.721	3776.195	3777.804	3738.547	3706.227	633
2:30:58	59.953	3710.848	37.601	37.483	0.616	3777.400	3775.590	3777.800	3739.163	3706.535	633
2:31:00	59.953	3710.848	37.601	37.524	0.616	3778.057	3774.996	3777.803	3739.779	3706.843	633
2:31:02	59.954	3714.623	36.801	37.271	0.616	3778.419	3774.447	3777.808	3740.394	3707.151	633
2:31:04	59.954	3714.623	36.801	37.107	0.616	3778.871	3773.908	3777.818	3741.010	3707.459	633
2:31:06	59.954	3714.623	36.801	37.000	0.616	3779.379	3773.379	3777.832	3741.625	3707.766	633
2:31:08	59.956	3716.461	35.199	36.369	0.616	3779.365	3772.875	3777.845	3742.241	3708.074	633
2:31:10	59.956	3716.461	35.199	35.960	0.616	3779.571	3772.380	3777.861	3742.857	3708.382	633
2:31:12	59.956	3716.461	35.199	35.693	0.616	3779.920	3771.894	3777.878	3743.472	3708.690	633
2:31:14	59.955	3722.361	35.999	35.800	0.616	3780.642	3771.467	3777.902	3744.088	3708.998	633
2:31:16	59.955	3722.361	35.999	35.870	0.616	3781.327	3771.047	3777.932	3744.704	3709.305	633
2:31:18	59.955	3722.361	35.999	35.915	0.616	3781.988	3770.634	3777.966	3745.319	3709.613	633
2:31:20	59.962	3722.267	30.399	33.984	0.616	3780.673	3770.228	3777.989	3745.935	3709.921	633
2:31:22	59.962	3722.267	30.399	32.729	0.616	3780.034	3769.828	3778.006	3746.550	3710.229	633
2:31:24	59.962	3722.267	30.399	31.913	0.616	3779.834	3769.435	3778.021	3747.166	3710.537	633
2:31:26	59.966	3723.091	27.200	30.264	0.616	3778.800	3769.055	3778.027	3747.782	3710.845	633
2:31:28	59.966	3723.091	27.200	29.192	0.616	3778.343	3768.682	3778.030	3748.397	3711.152	633
2:31:30	59.966	3723.091	27.200	28.495	0.616	3778.262	3768.314	3778.032	3749.013	3711.460	633
2:31:32	59.97	3723.893	23.999	26.921	0.616	3777.304	3767.959	3778.026	3749.628	3711.768	633
2:31:34	59.97	3723.893	23.999	25.898	0.616	3776.897	3767.609	3778.017	3750.244	3712.076	633
2:31:36	59.97	3723.893	23.999	25.234	0.616	3776.848	3767.265	3778.008	3750.860	3712.384	633
2:31:38	59.969	3728.053	24.799	25.081	0.616	3777.311	3766.958	3778.002	3751.475	3712.691	633
2:31:40	59.969	3728.053	24.799	24.982	0.616	3777.828	3766.657	3778.001	3752.091	3712.999	633
2:31:42	59.969	3728.053	24.799	24.918	0.616	3778.379	3766.360	3778.004	3752.707	3713.307	633
2:31:44	59.971	3733.327	23.199	24.317	0.616	3778.393	3766.108	3778.007	3753.322	3713.615	633
2:31:46	59.971	3733.327	23.199	23.926	0.616	3778.618	3765.859	3778.011	3753.938	3713.923	633
2:31:48	59.971	3733.327	23.199	23.671	0.616	3778.979	3765.615	3778.019	3754.553	3714.230	633
2:31:50	59.976	3736.822	19.199	22.106	0.616	3778.029	3765.400	3778.019	3755.169	3714.538	633
2:31:52	59.976	3736.822	19.199	21.088	0.616	3777.627	3765.188	3778.016	3755.785	3714.846	633
2:31:54	59.976	3736.822	19.199	20.427	0.616	3777.581	3764.980	3778.013	3756.400	3715.154	633
2:31:56	59.976	3740.877	19.199	19.997	0.616	3777.767	3764.804	3778.011	3757.016	3715.462	633
2:31:58	59.976	3740.877	19.199	19.718	0.616	3778.103	3764.630	3778.011	3757.631	3715.769	633
2:32:00	59.976	3740.877	19.199	19.536	0.616	3778.537	3764.459	3778.015	3758.247	3716.077	633
2:32:02	59.978	3746.608	17.599	18.858	0.616	3778.475	3764.332	3778.019	3758.863	3716.385	633
2:32:04	59.978	3746.608	17.599	18.418	0.616	3778.650	3764.206	3778.023	3759.478	3716.693	633
2:32:06	59.978	3746.608	17.599	18.131	0.616	3778.980	3764.082	3778.030	3760.094	3717.001	633
2:32:08	59.982	3751.558	14.401	16.826	0.616	3778.290	3763.995	3778.032	3760.710	3717.309	633
2:32:10	59.982	3751.558	14.401	15.977	0.616	3778.057	3763.908	3778.032	3761.325	3717.616	633
2:32:12	59.982	3751.558	14.401	15.426	0.616	3778.121	3763.823	3778.032	3761.941	3717.924	633
2:32:14	59.979	3756.407	16.800	15.907	0.616	3779.217	3763.772	3778.040	3762.556	3718.232	633
2:32:16	59.979	3756.407	16.800	16.219	0.616	3780.146	3763.722	3778.055	3763.172	3718.540	633
2:32:18	59.979	3756.407	16.800	16.423	0.616	3780.964	3763.673	3778.074	3763.788	3718.848	633
2:32:20	59.983	3760.982	13.599	15.434	0.616	3780.592	3763.655	3778.091	3764.403	3719.155	633
2:32:22	59.983	3760.982	13.599	14.792	0.616	3780.565	3763.637	3778.108	3765.019	3719.463	633

2:32:24	59.983	3760.982	13.599	14.374	0.616	3780.763	3763.619	3778.125	3765.635	3719.771	633
2:32:26	59.988	3763.212	9.601	12.703	0.616	3779.708	3763.617	3778.136	3766.250	3720.079	633
2:32:28	59.988	3763.212	9.601	11.618	0.616	3779.238	3763.614	3778.143	3766.866	3720.387	633
2:32:30	59.988	3763.212	9.601	10.912	0.616	3779.147	3763.611	3778.150	3767.481	3720.694	633
2:32:32	59.987	3766.433	10.400	10.733	0.616	3779.584	3763.630	3778.159	3768.097	3721.002	633
2:32:34	59.987	3766.433	10.400	10.616	0.616	3780.083	3763.648	3778.171	3768.713	3721.310	633
2:32:36	59.987	3766.433	10.400	10.541	0.616	3780.623	3763.665	3778.187	3769.328	3721.618	633
2:32:38	59.992	3768.634	6.400	9.091	0.616	3779.789	3763.697	3778.197	3769.944	3721.926	633
2:32:40	59.992	3768.634	6.400	8.149	0.616	3779.463	3763.728	3778.205	3770.559	3722.233	633
2:32:42	59.992	3768.634	6.400	7.537	0.616	3779.466	3763.758	3778.213	3771.175	3722.541	633
2:32:44	59.986	3773.695	11.200	8.819	0.616	3781.364	3763.820	3778.232	3771.791	3722.849	633
2:32:46	59.986	3773.695	11.200	9.652	0.616	3782.813	3763.881	3778.261	3772.406	3723.157	633
2:32:48	59.986	3773.695	11.200	10.194	0.616	3783.970	3763.941	3778.296	3773.022	3723.465	633
2:32:50	59.988	3775.363	9.601	9.986	0.616	3784.378	3764.011	3778.333	3773.638	3723.773	633
2:32:52	59.988	3775.363	9.601	9.851	0.616	3784.859	3764.080	3778.372	3774.253	3724.080	633
2:32:54	59.988	3775.363	9.601	9.764	0.616	3785.387	3764.148	3778.415	3774.869	3724.388	633
2:32:56	59.998	3776.420	1.599	6.906	0.616	3783.145	3764.221	3778.443	3775.484	3724.696	633
2:32:58	59.998	3776.420	1.599	5.049	0.616	3781.903	3764.294	3778.463	3776.100	3725.004	633
2:33:00	59.998	3776.420	1.599	3.841	0.616	3781.311	3764.366	3778.480	3776.716	3725.312	633
2:33:02	59.999	3781.256	0.800	2.777	0.616	3780.862	3764.465	3778.494	3777.331	3725.619	633
2:33:04	59.999	3781.256	0.800	2.085	0.616	3780.786	3764.563	3778.508	3777.947	3725.927	633
2:33:06	59.999	3781.256	0.800	1.635	0.616	3780.952	3764.660	3778.522	3778.562	3726.235	633
2:33:08	60.002	3783.896	-1.599	0.503	0.000	3779.820	3764.771	3778.529	3778.562	3726.539	633
2:33:10	60.002	3783.896	-1.599	-0.233	0.000	3779.084	3764.881	3778.533	3778.562	3726.840	633
2:33:12	60.002	3783.896	-1.599	-0.711	0.000	3778.606	3764.990	3778.533	3778.562	3727.137	633
2:33:14	60.008	3785.463	-6.400	-2.702	0.000	3776.615	3765.106	3778.522	3778.562	3727.431	633
2:33:16	60.008	3785.463	-6.400	-3.996	0.000	3775.321	3765.221	3778.504	3778.562	3727.722	633
2:33:18	60.008	3785.463	-6.400	-4.837	0.000	3774.479	3765.335	3778.481	3778.562	3728.009	633
2:33:20	60.017	3787.259	-13.599	-7.904	0.000	3771.413	3765.457	3778.442	3778.562	3728.293	633
2:33:22	60.017	3787.259	-13.599	-9.897	0.000	3769.420	3765.579	3778.392	3778.562	3728.574	633
2:33:24	60.017	3787.259	-13.599	-11.193	0.000	3768.124	3765.698	3778.335	3778.562	3728.851	633
2:33:26	60.017	3788.030	-13.599	-12.035	0.000	3767.282	3765.821	3778.274	3778.562	3729.126	633
2:33:28	60.017	3788.030	-13.599	-12.582	0.000	3766.735	3765.942	3778.211	3778.562	3729.398	633
2:33:30	60.017	3788.030	-13.599	-12.938	0.000	3766.379	3766.062	3778.147	3778.562	3729.666	633
2:33:32	60.023	3787.537	-18.399	-14.849	0.000	3764.467	3766.179	3778.073	3778.562	3729.932	633
2:33:34	60.023	3787.537	-18.399	-16.092	0.000	3763.225	3766.293	3777.993	3778.562	3730.195	633
2:33:36	60.023	3787.537	-18.399	-16.899	0.000	3762.417	3766.407	3777.910	3778.562	3730.455	633
2:33:38	60.021	3787.930	-16.800	-16.865	0.000	3762.452	3766.521	3777.828	3778.562	3730.712	633
2:33:40	60.021	3787.930	-16.800	-16.842	0.000	3762.475	3766.635	3777.746	3778.562	3730.967	633
2:33:42	60.021	3787.930	-16.800	-16.827	0.000	3762.490	3766.747	3777.666	3778.562	3731.219	633
2:33:44	60.024	3786.550	-19.199	-17.657	0.000	3761.660	3766.851	3777.582	3778.562	3731.468	633
2:33:46	60.024	3786.550	-19.199	-18.197	0.000	3761.120	3766.953	3777.497	3778.562	3731.714	633
2:33:48	60.024	3786.550	-19.199	-18.547	0.000	3760.769	3767.055	3777.410	3778.562	3731.958	633
2:33:50	60.025	3785.614	-20.001	-19.056	0.000	3760.261	3767.150	3777.322	3778.562	3732.200	633
2:33:52	60.025	3785.614	-20.001	-19.387	0.000	3759.930	3767.245	3777.232	3778.562	3732.439	633
2:33:54	60.025	3785.614	-20.001	-19.602	0.000	3759.715	3767.339	3777.143	3778.562	3732.675	633

2:33:56	60.02	3786.864	-16.000	-18.341	0.000	3760.975	3767.438	3777.061	3778.562	3732.909	633
2:33:58	60.02	3786.864	-16.000	-17.522	0.000	3761.795	3767.536	3776.984	3778.562	3733.141	633
2:34:00	60.02	3786.864	-16.000	-16.989	0.000	3762.327	3767.633	3776.910	3778.562	3733.371	633
2:34:02	60.022	3785.726	-17.599	-17.203	0.000	3762.114	3767.724	3776.836	3778.562	3733.598	633
2:34:04	60.022	3785.726	-17.599	-17.342	0.000	3761.975	3767.813	3776.762	3778.562	3733.822	633
2:34:06	60.022	3785.726	-17.599	-17.432	0.000	3761.885	3767.902	3776.689	3778.562	3734.045	633
2:34:08	60.023	3785.798	-18.399	-17.770	0.000	3761.546	3767.990	3776.614	3778.562	3734.265	633
2:34:10	60.023	3785.798	-18.399	-17.990	0.000	3761.326	3768.077	3776.539	3778.562	3734.484	633
2:34:12	60.023	3785.798	-18.399	-18.133	0.000	3761.183	3768.164	3776.464	3778.562	3734.700	633
2:34:14	60.019	3787.627	-15.201	-17.107	0.000	3762.210	3768.258	3776.395	3778.562	3734.914	633
2:34:16	60.019	3787.627	-15.201	-16.440	0.000	3762.877	3768.352	3776.330	3778.562	3735.126	633
2:34:18	60.019	3787.627	-15.201	-16.006	0.000	3763.311	3768.444	3776.267	3778.562	3735.335	633
2:34:20	60.018	3789.404	-14.401	-15.444	0.000	3763.872	3768.545	3776.208	3778.562	3735.543	633
2:34:22	60.018	3789.404	-14.401	-15.079	0.000	3764.237	3768.644	3776.151	3778.562	3735.749	633
2:34:24	60.018	3789.404	-14.401	-14.842	0.000	3764.475	3768.742	3776.095	3778.562	3735.953	633
2:34:26	60.019	3789.369	-15.201	-14.968	0.000	3764.349	3768.840	3776.040	3778.562	3736.155	633
2:34:28	60.019	3789.369	-15.201	-15.049	0.000	3764.268	3768.936	3775.985	3778.562	3736.355	633
2:34:30	60.019	3789.369	-15.201	-15.102	0.000	3764.214	3769.032	3775.930	3778.562	3736.553	633
2:34:32	60.016	3788.933	-12.799	-14.296	0.000	3765.021	3769.124	3775.879	3778.562	3736.749	633
2:34:34	60.016	3788.933	-12.799	-13.772	0.000	3765.545	3769.216	3775.831	3778.562	3736.944	633
2:34:36	60.016	3788.933	-12.799	-13.432	0.000	3765.885	3769.307	3775.785	3778.562	3737.137	633
2:34:38	60.012	3790.411	-9.601	-12.091	0.000	3767.226	3769.404	3775.746	3778.562	3737.327	633
2:34:40	60.012	3790.411	-9.601	-11.219	0.000	3768.097	3769.499	3775.711	3778.562	3737.517	633
2:34:42	60.012	3790.411	-9.601	-10.653	0.000	3768.664	3769.595	3775.679	3778.562	3737.704	633
2:34:44	60.007	3792.945	-5.600	-8.884	0.000	3770.432	3769.700	3775.655	3778.562	3737.890	633
2:34:46	60.007	3792.945	-5.600	-7.735	0.000	3771.582	3769.805	3775.637	3778.562	3738.074	633
2:34:48	60.007	3792.945	-5.600	-6.988	0.000	3772.329	3769.909	3775.622	3778.562	3738.256	633
2:34:50	60.009	3791.426	-7.199	-7.062	0.000	3772.255	3770.005	3775.607	3778.562	3738.437	633
2:34:52	60.009	3791.426	-7.199	-7.110	0.000	3772.207	3770.100	3775.592	3778.562	3738.616	633
2:34:54	60.009	3791.426	-7.199	-7.141	0.000	3772.176	3770.194	3775.577	3778.562	3738.794	633
2:34:56	59.999	3790.216	0.800	-4.362	0.000	3774.955	3770.282	3775.574	3778.562	3738.970	633
2:34:58	59.999	3790.216	0.800	-2.555	0.000	3776.761	3770.370	3775.579	3778.562	3739.144	633
2:35:00	59.999	3790.216	0.800	-1.381	0.000	3777.936	3770.457	3775.590	3778.562	3739.317	633
2:35:02	59.991	3788.105	7.199	1.622	0.000	3780.939	3770.533	3775.613	3778.562	3739.488	633
2:35:04	59.991	3788.105	7.199	3.574	0.000	3782.891	3770.609	3775.644	3778.562	3739.658	633
2:35:06	59.991	3788.105	7.199	4.843	0.000	3784.160	3770.685	3775.681	3778.562	3739.827	633
2:35:08	59.988	3788.497	9.601	6.508	0.000	3785.825	3770.761	3775.725	3778.562	3739.994	633
2:35:10	59.988	3788.497	9.601	7.591	0.000	3786.907	3770.837	3775.772	3778.562	3740.159	633
2:35:12	59.988	3788.497	9.601	8.294	0.000	3787.611	3770.912	3775.823	3778.562	3740.323	633
2:35:14	59.984	3788.101	12.799	9.871	0.000	3789.188	3770.985	3775.879	3778.562	3740.486	633
2:35:16	59.984	3788.101	12.799	10.896	0.000	3790.213	3771.057	3775.940	3778.562	3740.647	633
2:35:18	59.984	3788.101	12.799	11.562	0.000	3790.879	3771.129	3776.003	3778.562	3740.807	633
2:35:20	59.982	3787.732	14.401	12.556	0.000	3791.872	3771.198	3776.069	3778.562	3740.966	633
2:35:22	59.982	3787.732	14.401	13.202	0.000	3792.518	3771.267	3776.138	3778.562	3741.123	633
2:35:24	59.982	3787.732	14.401	13.621	0.000	3792.938	3771.336	3776.207	3778.562	3741.279	633
2:35:26	59.979	3788.256	16.800	14.734	0.000	3794.051	3771.405	3776.281	3778.562	3741.434	633

2:35:28	59.979	3788.256	16.800	15.457	0.000	3794.774	3771.475	3776.357	3778.562	3741.587	633
2:35:30	59.979	3788.256	16.800	15.927	0.000	3795.244	3771.544	3776.435	3778.562	3741.739	633
2:35:32	59.976	3790.665	19.199	17.072	0.000	3796.389	3771.622	3776.516	3778.562	3741.890	633
2:35:34	59.976	3790.665	19.199	17.816	0.000	3797.133	3771.699	3776.600	3778.562	3742.040	633
2:35:36	59.976	3790.665	19.199	18.300	0.000	3797.617	3771.776	3776.685	3778.562	3742.188	633
2:35:38	59.978	3789.267	17.599	18.055	0.000	3797.372	3771.846	3776.768	3778.562	3742.336	633
2:35:40	59.978	3789.267	17.599	17.896	0.000	3797.212	3771.916	3776.850	3778.562	3742.482	633
2:35:42	59.978	3789.267	17.599	17.792	0.000	3797.109	3771.986	3776.932	3778.562	3742.627	633
2:35:44	59.976	3789.914	19.199	18.284	0.000	3797.601	3772.057	3777.014	3778.562	3742.770	633
2:35:46	59.976	3789.914	19.199	18.604	0.000	3797.921	3772.128	3777.097	3778.562	3742.913	633
2:35:48	59.976	3789.914	19.199	18.812	0.000	3798.129	3772.198	3777.180	3778.562	3743.055	633
2:35:50	59.975	3788.963	20.001	19.228	0.000	3798.545	3772.264	3777.264	3778.562	3743.195	633
2:35:52	59.975	3788.963	20.001	19.499	0.000	3798.816	3772.330	3777.349	3778.562	3743.334	633
2:35:54	59.975	3788.963	20.001	19.675	0.000	3798.991	3772.395	3777.433	3778.562	3743.472	633
2:35:56	59.97	3792.911	23.999	21.188	0.000	3800.505	3772.475	3777.523	3778.562	3743.609	633
2:35:58	59.97	3792.911	23.999	22.172	0.000	3801.489	3772.554	3777.616	3778.562	3743.745	633
2:36:00	59.97	3792.911	23.999	22.811	0.000	3802.128	3772.632	3777.710	3778.562	3743.880	633
2:36:02	59.978	3788.080	17.599	20.987	0.000	3800.304	3772.692	3777.797	3778.562	3744.014	633
2:36:04	59.978	3788.080	17.599	19.802	0.000	3799.118	3772.751	3777.879	3778.562	3744.147	633
2:36:06	59.978	3788.080	17.599	19.031	0.000	3798.348	3772.809	3777.957	3778.562	3744.279	633
2:36:08	59.975	3787.164	20.001	19.370	0.000	3798.687	3772.864	3778.036	3778.562	3744.410	633
2:36:10	59.975	3787.164	20.001	19.591	0.000	3798.908	3772.918	3778.115	3778.562	3744.540	633
2:36:12	59.975	3787.164	20.001	19.735	0.000	3799.051	3772.972	3778.194	3778.562	3744.669	633
2:36:14	59.975	3786.487	20.001	19.828	0.000	3799.145	3773.023	3778.273	3778.562	3744.796	633
2:36:16	59.975	3786.487	20.001	19.889	0.000	3799.205	3773.073	3778.351	3778.562	3744.923	633
2:36:18	59.975	3786.487	20.001	19.928	0.000	3799.245	3773.123	3778.429	3778.562	3745.049	633
2:36:20	59.966	3790.512	27.200	22.473	0.000	3801.790	3773.188	3778.516	3778.562	3745.174	633
2:36:22	59.966	3790.512	27.200	24.128	0.000	3803.445	3773.252	3778.608	3778.562	3745.299	633
2:36:24	59.966	3790.512	27.200	25.203	0.000	3804.520	3773.316	3778.704	3778.562	3745.422	633
2:36:26	59.969	3790.959	24.799	25.062	0.000	3804.378	3773.380	3778.798	3778.562	3745.544	633
2:36:28	59.969	3790.959	24.799	24.970	0.000	3804.286	3773.445	3778.892	3778.562	3745.665	633
2:36:30	59.969	3790.959	24.799	24.910	0.000	3804.226	3773.509	3778.984	3778.562	3745.786	633
2:36:32	59.965	3789.167	28.000	25.991	0.000	3805.308	3773.566	3779.080	3778.562	3745.906	633
2:36:34	59.965	3789.167	28.000	26.694	0.000	3806.011	3773.622	3779.177	3778.562	3746.024	633
2:36:36	59.965	3789.167	28.000	27.151	0.000	3806.468	3773.678	3779.276	3778.562	3746.142	633
2:36:38	59.972	3784.831	22.400	25.488	0.000	3804.805	3773.718	3779.368	3778.562	3746.259	633
2:36:40	59.972	3784.831	22.400	24.407	0.000	3803.724	3773.758	3779.455	3778.562	3746.375	633
2:36:42	59.972	3784.831	22.400	23.705	0.000	3803.021	3773.798	3779.539	3778.562	3746.491	633
2:36:44	59.969	3782.809	24.799	24.088	0.000	3803.404	3773.830	3779.624	3778.562	3746.605	633
2:36:46	59.969	3782.809	24.799	24.336	0.000	3803.653	3773.862	3779.709	3778.562	3746.719	633
2:36:48	59.969	3782.809	24.799	24.498	0.000	3803.815	3773.893	3779.795	3778.562	3746.832	633
2:36:50	59.967	3779.056	26.401	25.164	0.000	3804.481	3773.912	3779.882	3778.562	3746.944	633
2:36:52	59.967	3779.056	26.401	25.597	0.000	3804.914	3773.930	3779.969	3778.562	3747.055	633
2:36:54	59.967	3779.056	26.401	25.878	0.000	3805.195	3773.947	3780.058	3778.562	3747.166	633
2:36:56	59.965	3779.335	28.000	26.621	0.000	3805.938	3773.966	3780.148	3778.562	3747.276	633
2:36:58	59.965	3779.335	28.000	27.103	0.000	3806.420	3773.985	3780.239	3778.562	3747.385	633

2:37:00	59.965	3779.335	28.000	27.417	0.000	3806.734	3774.003	3780.331	3778.562	3747.493	633
2:37:02	59.965	3776.597	28.000	27.621	0.000	3806.938	3774.012	3780.422	3778.562	3747.601	633
2:37:04	59.965	3776.597	28.000	27.754	0.000	3807.070	3774.021	3780.514	3778.562	3747.707	633
2:37:06	59.965	3776.597	28.000	27.840	0.000	3807.157	3774.030	3780.605	3778.562	3747.813	633
2:37:08	59.97	3773.170	23.999	26.496	0.000	3805.812	3774.027	3780.691	3778.562	3747.919	633
2:37:10	59.97	3773.170	23.999	25.622	0.000	3804.939	3774.024	3780.774	3778.562	3748.023	633
2:37:12	59.97	3773.170	23.999	25.054	0.000	3804.371	3774.021	3780.854	3778.562	3748.127	633
2:37:14	59.968	3768.503	25.601	25.245	0.000	3804.562	3774.003	3780.934	3778.562	3748.230	633
2:37:16	59.968	3768.503	25.601	25.370	0.000	3804.687	3773.984	3781.014	3778.562	3748.333	633
2:37:18	59.968	3768.503	25.601	25.451	0.000	3804.768	3773.966	3781.093	3778.562	3748.435	633
2:37:20	59.97	3764.786	23.999	24.943	0.000	3804.259	3773.935	3781.171	3778.562	3748.536	633
2:37:22	59.97	3764.786	23.999	24.612	0.000	3803.929	3773.905	3781.247	3778.562	3748.636	633
2:37:24	59.97	3764.786	23.999	24.398	0.000	3803.714	3773.874	3781.321	3778.562	3748.736	633
2:37:26	59.965	3761.894	28.000	25.658	0.000	3804.975	3773.835	3781.400	3778.562	3748.835	633
2:37:28	59.965	3761.894	28.000	26.478	0.000	3805.795	3773.795	3781.480	3778.562	3748.933	633
2:37:30	59.965	3761.894	28.000	27.011	0.000	3806.327	3773.756	3781.562	3778.562	3749.031	633
2:37:32	59.967	3760.157	26.401	26.797	0.000	3806.114	3773.711	3781.643	3778.562	3749.128	633
2:37:34	59.967	3760.157	26.401	26.658	0.000	3805.975	3773.667	3781.722	3778.562	3749.225	633
2:37:36	59.967	3760.157	26.401	26.568	0.000	3805.885	3773.623	3781.801	3778.562	3749.321	633
2:37:38	59.979	3757.773	16.800	23.149	0.000	3802.466	3773.572	3781.868	3778.562	3749.416	633
2:37:40	59.979	3757.773	16.800	20.927	0.000	3800.244	3773.521	3781.927	3778.562	3749.511	633
2:37:42	59.979	3757.773	16.800	19.483	0.000	3798.799	3773.470	3781.982	3778.562	3749.605	633
2:37:44	59.974	3751.637	20.801	19.944	0.000	3799.261	3773.400	3782.037	3778.562	3749.698	633
2:37:46	59.974	3751.637	20.801	20.244	0.000	3799.561	3773.330	3782.093	3778.562	3749.791	633
2:37:48	59.974	3751.637	20.801	20.439	0.000	3799.756	3773.261	3782.150	3778.562	3749.883	633
2:37:50	59.962	3759.250	30.399	23.925	0.000	3803.241	3773.216	3782.217	3778.562	3749.975	633
2:37:52	59.962	3759.250	30.399	26.191	0.000	3805.507	3773.172	3782.291	3778.562	3750.066	633
2:37:54	59.962	3759.250	30.399	27.663	0.000	3806.980	3773.127	3782.369	3778.562	3750.156	633
2:37:56	59.961	3762.022	31.201	28.902	0.000	3808.218	3773.092	3782.451	3778.562	3750.246	633
2:37:58	59.961	3762.022	31.201	29.706	0.000	3809.023	3773.058	3782.534	3778.562	3750.335	633
2:38:00	59.961	3762.022	31.201	30.230	0.000	3809.546	3773.023	3782.619	3778.562	3750.424	633
2:38:02	59.959	3763.858	32.800	31.129	0.000	3810.446	3772.994	3782.706	3778.562	3750.512	633
2:38:04	59.959	3763.858	32.800	31.714	0.000	3811.031	3772.966	3782.794	3778.562	3750.600	633
2:38:06	59.959	3763.858	32.800	32.094	0.000	3811.411	3772.938	3782.883	3778.562	3750.687	633
2:38:08	59.953	3768.339	37.601	34.022	0.000	3813.338	3772.923	3782.977	3778.562	3750.774	633
2:38:10	59.953	3768.339	37.601	35.274	0.000	3814.591	3772.909	3783.075	3778.562	3750.860	633
2:38:12	59.953	3768.339	37.601	36.089	0.000	3815.405	3772.895	3783.174	3778.562	3750.945	633
2:38:14	59.956	3765.606	35.199	35.777	0.000	3815.094	3772.873	3783.272	3778.562	3751.030	633
2:38:16	59.956	3765.606	35.199	35.575	0.000	3814.892	3772.851	3783.369	3778.562	3751.115	633
2:38:18	59.956	3765.606	35.199	35.443	0.000	3814.760	3772.829	3783.465	3778.562	3751.199	633
2:38:20	59.961	3761.920	31.201	33.959	0.000	3813.275	3772.795	3783.555	3778.562	3751.282	633
2:38:22	59.961	3761.920	31.201	32.993	0.000	3812.310	3772.762	3783.642	3778.562	3751.365	633
2:38:24	59.961	3761.920	31.201	32.366	0.000	3811.683	3772.730	3783.727	3778.562	3751.447	633
2:38:26	59.963	3752.429	29.599	31.398	0.000	3810.714	3772.669	3783.808	3778.562	3751.529	633
2:38:28	59.963	3752.429	29.599	30.768	0.000	3810.085	3772.608	3783.887	3778.562	3751.611	633
2:38:30	59.963	3752.429	29.599	30.359	0.000	3809.676	3772.547	3783.965	3778.562	3751.692	633

2:38:32	59.968	3753.510	25.601	28.694	0.000	3808.010	3772.491	3784.036	3778.562	3751.772	633
2:38:34	59.968	3753.510	25.601	27.611	0.000	3806.928	3772.434	3784.104	3778.562	3751.852	633
2:38:36	59.968	3753.510	25.601	26.908	0.000	3806.225	3772.378	3784.170	3778.562	3751.932	633
2:38:38	59.973	3753.178	21.600	25.050	0.000	3804.367	3772.321	3784.230	3778.562	3752.011	633
2:38:40	59.973	3753.178	21.600	23.843	0.000	3803.160	3772.265	3784.286	3778.562	3752.089	633
2:38:42	59.973	3753.178	21.600	23.058	0.000	3802.375	3772.208	3784.339	3778.562	3752.167	633
2:38:44	59.967	3752.872	26.401	24.228	0.000	3803.545	3772.152	3784.395	3778.562	3752.245	633
2:38:46	59.967	3752.872	26.401	24.988	0.000	3804.305	3772.095	3784.453	3778.562	3752.322	633
2:38:48	59.967	3752.872	26.401	25.483	0.000	3804.799	3772.039	3784.513	3778.562	3752.399	633
2:38:50	59.976	3747.476	19.199	23.283	0.000	3802.600	3771.968	3784.565	3778.562	3752.475	633
2:38:52	59.976	3747.476	19.199	21.854	0.000	3801.170	3771.897	3784.613	3778.562	3752.551	633
2:38:54	59.976	3747.476	19.199	20.924	0.000	3800.241	3771.826	3784.659	3778.562	3752.626	633
2:38:56	59.973	3746.651	21.600	21.161	0.000	3800.478	3771.754	3784.704	3778.562	3752.701	633
2:38:58	59.973	3746.651	21.600	21.315	0.000	3800.632	3771.682	3784.750	3778.562	3752.776	633
2:39:00	59.973	3746.651	21.600	21.415	0.000	3800.731	3771.610	3784.796	3778.562	3752.850	633
2:39:02	59.981	3741.618	15.201	19.240	0.000	3798.557	3771.524	3784.835	3778.562	3752.924	633
2:39:04	59.981	3741.618	15.201	17.826	0.000	3797.143	3771.439	3784.870	3778.562	3752.997	633
2:39:06	59.981	3741.618	15.201	16.907	0.000	3796.224	3771.354	3784.902	3778.562	3753.070	633
2:39:08	59.982	3738.901	14.401	16.030	0.000	3795.347	3771.262	3784.932	3778.562	3753.142	633
2:39:10	59.982	3738.901	14.401	15.460	0.000	3794.777	3771.171	3784.960	3778.562	3753.214	633
2:39:12	59.982	3738.901	14.401	15.089	0.000	3794.406	3771.080	3784.986	3778.562	3753.286	633
2:39:14	59.982	3736.308	14.401	14.849	0.000	3794.165	3770.982	3785.012	3778.562	3753.357	633
2:39:16	59.982	3736.308	14.401	14.692	0.000	3794.009	3770.885	3785.037	3778.562	3753.428	633
2:39:18	59.982	3736.308	14.401	14.590	0.000	3793.907	3770.789	3785.062	3778.562	3753.498	633
2:39:20	59.98	3735.650	16.000	15.084	0.000	3794.401	3770.691	3785.088	3778.562	3753.568	633
2:39:22	59.98	3735.650	16.000	15.405	0.000	3794.721	3770.593	3785.115	3778.562	3753.638	633
2:39:24	59.98	3735.650	16.000	15.613	0.000	3794.930	3770.497	3785.142	3778.562	3753.707	633
2:39:26	59.98	3736.748	16.000	15.749	0.000	3795.065	3770.403	3785.170	3778.562	3753.776	633
2:39:28	59.98	3736.748	16.000	15.837	0.000	3795.154	3770.311	3785.197	3778.562	3753.844	633
2:39:30	59.98	3736.748	16.000	15.894	0.000	3795.211	3770.219	3785.225	3778.562	3753.912	633
2:39:32	59.978	3736.094	17.599	16.491	0.000	3795.808	3770.125	3785.254	3778.562	3753.980	633
2:39:34	59.978	3736.094	17.599	16.879	0.000	3796.196	3770.032	3785.283	3778.562	3754.047	633
2:39:36	59.978	3736.094	17.599	17.131	0.000	3796.448	3769.940	3785.314	3778.562	3754.114	633
2:39:38	59.971	3738.875	23.199	19.255	0.000	3798.572	3769.855	3785.350	3778.562	3754.181	633
2:39:40	59.971	3738.875	23.199	20.636	0.000	3799.952	3769.771	3785.389	3778.562	3754.247	633
2:39:42	59.971	3738.875	23.199	21.533	0.000	3800.850	3769.688	3785.431	3778.562	3754.313	633
2:39:44	59.975	3737.684	20.001	20.997	0.000	3800.314	3769.601	3785.471	3778.562	3754.379	633
2:39:46	59.975	3737.684	20.001	20.648	0.000	3799.965	3769.516	3785.510	3778.562	3754.444	633
2:39:48	59.975	3737.684	20.001	20.422	0.000	3799.739	3769.430	3785.548	3778.562	3754.509	633
2:39:50	59.969	3740.017	24.799	21.954	0.000	3801.270	3769.352	3785.590	3778.562	3754.573	633
2:39:52	59.969	3740.017	24.799	22.949	0.000	3802.266	3769.273	3785.635	3778.562	3754.637	633
2:39:54	59.969	3740.017	24.799	23.597	0.000	3802.913	3769.196	3785.681	3778.562	3754.701	633
2:39:56	59.972	3742.424	22.400	23.178	0.000	3802.495	3769.125	3785.726	3778.562	3754.765	633
2:39:58	59.972	3742.424	22.400	22.906	0.000	3802.222	3769.054	3785.769	3778.562	3754.828	633
2:40:00	59.972	3742.424	22.400	22.729	0.000	3802.045	3768.984	3785.812	3778.562	3754.891	633
2:40:02	59.977	3741.723	18.399	21.213	0.000	3800.530	3768.912	3785.851	3778.562	3754.953	633

2:40:04	59.977	3741.723	18.399	20.228	0.000	3799.545	3768.841	3785.887	3778.562	3755.015	633
2:40:06	59.977	3741.723	18.399	19.588	0.000	3798.905	3768.770	3785.921	3778.562	3755.077	633
2:40:08	59.976	3739.964	19.199	19.452	0.000	3798.769	3768.694	3785.954	3778.562	3755.138	633
2:40:10	59.976	3739.964	19.199	19.363	0.000	3798.680	3768.620	3785.988	3778.562	3755.200	633
2:40:12	59.976	3739.964	19.199	19.306	0.000	3798.622	3768.545	3786.020	3778.562	3755.260	633
2:40:14	59.977	3741.268	18.399	18.988	0.000	3798.305	3768.474	3786.052	3778.562	3755.321	633
2:40:16	59.977	3741.268	18.399	18.782	0.000	3798.099	3768.404	3786.083	3778.562	3755.381	633
2:40:18	59.977	3741.268	18.399	18.648	0.000	3797.965	3768.334	3786.114	3778.562	3755.441	633
2:40:20	59.979	3738.706	16.800	18.001	0.000	3797.318	3768.258	3786.143	3778.562	3755.501	633
2:40:22	59.979	3738.706	16.800	17.581	0.000	3796.897	3768.182	3786.170	3778.562	3755.560	633
2:40:24	59.979	3738.706	16.800	17.307	0.000	3796.624	3768.107	3786.197	3778.562	3755.619	633
2:40:26	59.974	3738.102	20.801	18.530	0.000	3797.847	3768.030	3786.227	3778.562	3755.678	633
2:40:28	59.974	3738.102	20.801	19.325	0.000	3798.642	3767.954	3786.258	3778.562	3755.736	633
2:40:30	59.974	3738.102	20.801	19.841	0.000	3799.158	3767.878	3786.291	3778.562	3755.794	633
2:40:32	59.971	3743.419	23.199	21.017	0.000	3800.334	3767.817	3786.327	3778.562	3755.852	633
2:40:34	59.971	3743.419	23.199	21.781	0.000	3801.097	3767.755	3786.364	3778.562	3755.909	633
2:40:36	59.971	3743.419	23.199	22.277	0.000	3801.594	3767.694	3786.402	3778.562	3755.967	633
2:40:38	59.966	3747.340	27.200	24.000	0.000	3803.317	3767.642	3786.445	3778.562	3756.023	633
2:40:40	59.966	3747.340	27.200	25.120	0.000	3804.437	3767.592	3786.490	3778.562	3756.080	633
2:40:42	59.966	3747.340	27.200	25.848	0.000	3805.165	3767.541	3786.537	3778.562	3756.136	633
2:40:44	59.973	3746.217	21.600	24.362	0.000	3803.678	3767.488	3786.579	3778.562	3756.192	633
2:40:46	59.973	3746.217	21.600	23.395	0.000	3802.712	3767.435	3786.619	3778.562	3756.248	633
2:40:48	59.973	3746.217	21.600	22.767	0.000	3802.084	3767.382	3786.658	3778.562	3756.304	633
2:40:50	59.972	3743.149	22.400	22.638	0.000	3801.955	3767.322	3786.696	3778.562	3756.359	633
2:40:52	59.972	3743.149	22.400	22.555	0.000	3801.872	3767.263	3786.733	3778.562	3756.414	633
2:40:54	59.972	3743.149	22.400	22.501	0.000	3801.817	3767.203	3786.770	3778.562	3756.469	633
2:40:56	59.97	3733.376	23.999	23.025	0.000	3802.342	3767.120	3786.809	3778.562	3756.523	633
2:40:58	59.97	3733.376	23.999	23.366	0.000	3802.683	3767.037	3786.847	3778.562	3756.577	633
2:41:00	59.97	3733.376	23.999	23.588	0.000	3802.904	3766.955	3786.887	3778.562	3756.631	633
2:41:02	59.982	3736.229	14.401	20.372	0.000	3799.689	3766.880	3786.918	3778.562	3756.685	633
2:41:04	59.982	3736.229	14.401	18.282	0.000	3797.599	3766.806	3786.944	3778.562	3756.738	633
2:41:06	59.982	3736.229	14.401	16.924	0.000	3796.241	3766.731	3786.967	3778.562	3756.791	633
2:41:08	59.985	3733.115	12.000	15.200	0.000	3794.517	3766.650	3786.985	3778.562	3756.844	633
2:41:10	59.985	3733.115	12.000	14.080	0.000	3793.397	3766.569	3787.000	3778.562	3756.897	633
2:41:12	59.985	3733.115	12.000	13.352	0.000	3792.669	3766.488	3787.014	3778.562	3756.949	633
2:41:14	59.989	3725.459	8.801	11.759	0.000	3791.076	3766.390	3787.024	3778.562	3757.001	633
2:41:16	59.989	3725.459	8.801	10.724	0.000	3790.041	3766.292	3787.031	3778.562	3757.053	633
2:41:18	59.989	3725.459	8.801	10.051	0.000	3789.368	3766.194	3787.037	3778.562	3757.104	633
2:41:20	59.99	3720.938	7.999	9.333	0.000	3788.649	3766.086	3787.040	3778.562	3757.156	633
2:41:22	59.99	3720.938	7.999	8.866	0.000	3788.183	3765.978	3787.043	3778.562	3757.207	633
2:41:24	59.99	3720.938	7.999	8.562	0.000	3787.879	3765.871	3787.045	3778.562	3757.258	633
2:41:26	60.001	3727.754	-0.800	5.286	0.000	3784.602	3765.781	3787.039	3778.562	3757.308	633
2:41:28	60.001	3727.754	-0.800	3.156	0.000	3782.473	3765.691	3787.029	3778.562	3757.359	633
2:41:30	60.001	3727.754	-0.800	1.771	0.000	3781.088	3765.602	3787.015	3778.562	3757.409	633
2:41:32	60.006	3727.231	-4.800	-0.529	0.000	3778.788	3765.511	3786.995	3778.562	3757.459	633
2:41:34	60.006	3727.231	-4.800	-2.024	0.000	3777.293	3765.422	3786.972	3778.562	3757.508	633

2:41:36	60.006	3727.231	-4.800	-2.996	0.000	3776.321	3765.332	3786.947	3778.562	3757.558	633
2:41:38	60.019	3726.016	-15.201	-7.267	0.000	3772.049	3765.240	3786.913	3778.562	3757.607	633
2:41:40	60.019	3726.016	-15.201	-10.044	0.000	3769.273	3765.149	3786.872	3778.562	3757.656	633
2:41:42	60.019	3726.016	-15.201	-11.849	0.000	3767.468	3765.058	3786.826	3778.562	3757.705	633
2:41:44	60.026	3717.333	-20.801	-14.982	0.000	3764.335	3764.947	3786.774	3778.562	3757.753	633
2:41:46	60.026	3717.333	-20.801	-17.019	0.000	3762.298	3764.837	3786.718	3778.562	3757.801	633
2:41:48	60.026	3717.333	-20.801	-18.342	0.000	3760.974	3764.727	3786.658	3778.562	3757.850	633
2:41:50	60.029	3715.166	-23.199	-20.042	0.000	3759.274	3764.613	3786.595	3778.562	3757.897	633
2:41:52	60.029	3715.166	-23.199	-21.147	0.000	3758.169	3764.499	3786.530	3778.562	3757.945	633
2:41:54	60.029	3715.166	-23.199	-21.866	0.000	3757.451	3764.386	3786.463	3778.562	3757.992	633
2:41:56	60.037	3710.158	-29.599	-24.572	0.000	3754.744	3764.262	3786.390	3778.562	3758.040	633
2:41:58	60.037	3710.158	-29.599	-26.332	0.000	3752.985	3764.138	3786.314	3778.562	3758.087	633
2:42:00	60.037	3710.158	-29.599	-27.475	0.000	3751.842	3764.016	3786.236	3778.562	3758.133	633
2:42:02	60.041	3704.591	-32.800	-29.339	0.000	3749.978	3763.880	3786.153	3778.562	3758.180	633
2:42:04	60.041	3704.591	-32.800	-30.550	0.000	3748.766	3763.746	3786.068	3778.562	3758.226	633
2:42:06	60.041	3704.591	-32.800	-31.338	0.000	3747.979	3763.612	3785.982	3778.562	3758.272	633
2:42:08	60.043	3701.316	-34.399	-32.409	0.000	3746.907	3763.472	3785.894	3778.562	3758.318	633
2:42:10	60.043	3701.316	-34.399	-33.106	0.000	3746.211	3763.332	3785.805	3778.562	3758.364	633
2:42:12	60.043	3701.316	-34.399	-33.559	0.000	3745.758	3763.192	3785.715	3778.562	3758.409	633
2:42:14	60.046	3699.726	-36.801	-34.694	0.000	3744.623	3763.050	3785.623	3778.562	3758.455	633
2:42:16	60.046	3699.726	-36.801	-35.431	0.000	3743.886	3762.908	3785.529	3778.562	3758.500	633
2:42:18	60.046	3699.726	-36.801	-35.911	0.000	3743.406	3762.767	3785.435	3778.562	3758.545	633
2:42:20	60.043	3696.865	-34.399	-35.382	0.000	3743.935	3762.620	3785.343	3778.562	3758.589	633
2:42:22	60.043	3696.865	-34.399	-35.038	0.000	3744.279	3762.474	3785.251	3778.562	3758.634	633
2:42:24	60.043	3696.865	-34.399	-34.814	0.000	3744.502	3762.329	3785.161	3778.562	3758.678	633

A Point	2:27:22		
FPointA	60.0410	2:27:22 AM	
A Value	60.0420		
C Value	59.8690	2:27:36 AM	
Delta FCA	-0.173000336		
FR C	-365.9	MW/0.1 Hz	
Slope A-C dF/dT	-0.012286	Hz/second	
C Value Maximum Resource Loss	633		
Secondary C Value	59.8569984	2:28:36 AM	Time

A Point	2:27:22		
FPointA	60.04100037	2:27:22	
A Value	60.04199982		
C Value	59.86899948	#N/A	
Delta FC			

	Value B 12 to 24 sec	FR B 12 to 24 sec	Value B 18 to 30 sec	FR B 18 to 30 sec	Value B 20 to 40 sec	FR B 20 to 40 sec	Value B 18 to 52 sec	FR B 18 to 52 sec	Value B 20 to 52 sec
B Frequency Value	59.8797		59.8834		59.8880		59.8876		59.8880
Delta FB	-0.1623	-390.352	-0.1586	-399.232	-0.1540	-409.354	-0.1544	-410.136	-0.1540
Slope B dF/dT	-0.00811427		-0.0079286		-0.0077		-0.0077222		-0.0077
RatioB-C	93.8064		91.6600		89.0174		89.2743		89.0174
Sustainability Index	-0.0120		-0.0157		-0.0203		-0.0199		-0.0203

Tzero	2:27:22		
FT+4	59.97800064		
FT+10	59.86899948		
FT+20	59.88299942		
FT+60	59.88800049		

Interconnection Evaluation

riod (indicates ramp direction during recovery period)

B Value Average Resource Loss	633	
B Value Average LaaR Loss	0	
B Value Average Net Loss	633	
		Interconnection Bias Total
		EI ERCOT WECC
Interconnection Bias Setting	-660	-6349 -660 -2024
IPFR as a % of Bias Setting	0.00%	
Interconnection Total Energy	37446	60.07%
Interconnection Peak Energy	62339	

Frequency and Interconnection Frequency Response @ different Average periods of B

Generator Trip MW	Generator Trip MW	Generator Trip MW	Generator Trip MW	Generator Trip MW	Generator Trip MW	LaaR Trip MW	Total Generation Trip MW	Interconne Primary Frequency Response	FR B 20 to 52 sec Average MW
								MW/0.1 Hz	
							0		
							0		
							0		
							0		

	Value B 12 to 24 sec Average Frequency	FR B 12 to 24 sec Average MW	Value B 18 to 30 sec Average Frequency	FR B 18 to 30 sec Average MW	Value B 20 to 40 sec Average Frequency	FR B 20 to 40 sec Average MW	Value B 18 to 52 sec Average Frequency	FR B 18 to 52 sec Average MW	Value B 20 to 52 sec Average Frequency
T-72 sec									
T-70 sec									
T-68 sec									

	0			T-66 sec										
	0			T-64 sec										
	0			T-62 sec										
	0			T-60 sec										
	0			T-58 sec										
	0			T-56 sec										
	0			T-54 sec										
	0			T-52 sec										
	0			T-50 sec										
	0			T-48 sec										
	0			T-46 sec										
	0			T-44 sec										
	0			T-42 sec										
	0			T-40 sec										
	0			T-38 sec										
	0			T-36 sec										
	0			T-34 sec										
	0			T-32 sec										
	0			T-30 sec										
	0			T-28 sec										
	0			T-26 sec										
	0			T-24 sec										
	0			T-22 sec										
	0			T-20 sec										
	0			T-18 sec										
	0			T-16 sec	60.042									
	0			T-14 sec	60.042									
	0			T-12 sec	60.042									
	0			T-10 sec	60.042									
	0			T-08 sec	60.042									
	0			T-06 sec	60.042									
	0			T-04 sec	60.042									
	0			T-02 sec	60.042									
	633	-989.075		T+0 sec										
	633	-989.075		T+02 sec										
	633	-989.075		T+04 sec										
0	633	-989.075		T+06 sec										
0	633	-365.895		T+08 sec										
0	633	-365.895		T+10 sec										
0	633	-365.895		T+12 sec	59.8797	-390.352								
0	633	-390.744		T+14 sec	59.8797	-390.352								
0	633	-390.744		T+16 sec	59.8797	-390.352								
0	633	-390.744		T+18 sec	59.8797	-390.352	59.8834	-399.232			59.8876	-410.136		
0	633	-398.112	-411.2764051	T+20 sec	59.8797	-390.352	59.8834	-399.232	59.8880	-409.354	59.8876	-410.136	59.8880	
0	633	-398.112	-411.2764051	T+22 sec	59.8797	-390.352	59.8834	-399.232	59.8880	-409.354	59.8876	-410.136	59.8880	
0	633	-398.112	-411.2764051	T+24 sec	59.8797	-390.352	59.8834	-399.232	59.8880	-409.354	59.8876	-410.136	59.8880	

0	633	-403.181	-411.2764051	T+26 sec			59.8834	-399.232	59.8880	-409.354	59.8876	-410.136	59.8880
0	633	-403.181	-411.2764051	T+28 sec			59.8834	-399.232	59.8880	-409.354	59.8876	-410.136	59.8880
0	633	-403.181	-411.2764051	T+30 sec			59.8834	-399.232	59.8880	-409.354	59.8876	-410.136	59.8880
0	633	-416.446	-411.2764051	T+32 sec					59.8880	-409.354	59.8876	-410.136	59.8880
0	633	-416.446	-411.2764051	T+34 sec					59.8880	-409.354	59.8876	-410.136	59.8880
0	633	-416.446	-411.2764051	T+36 sec					59.8880	-409.354	59.8876	-410.136	59.8880
0	633	-424.837	-411.2764051	T+38 sec					59.8880	-409.354	59.8876	-410.136	59.8880
0	633	-424.837	-411.2764051	T+40 sec					59.8880	-409.354	59.8876	-410.136	59.8880
0	633	-424.837	-411.2764051	T+42 sec							59.8876	-410.136	59.8880
0	633	-419.203	-411.2764051	T+44 sec							59.8876	-410.136	59.8880
0	633	-419.203	-411.2764051	T+46 sec							59.8876	-410.136	59.8880
0	633	-419.203	-411.2764051	T+48 sec							59.8876	-410.136	59.8880
0	633	-403.181	-411.2764051	T+50 sec							59.8876	-410.136	59.8880
0	633	-403.181	-411.2764051	T+52 sec							59.8876	-410.136	59.8880
0	633	-403.181		T+54 sec									
0	633	-411.041		T+56 sec									
0	633	-411.041		T+58 sec									
0	633	-411.041		T+60 sec									
0	633	-413.726		T+62 sec									
0	633	-413.726		T+64 sec									
0	633	-413.726		T+66 sec									
0	633	-342.16		T+68 sec									
0	633	-342.16		T+70 sec									
0	633	-342.16		T+72 sec									
0	633	-344.025		T+74 sec									
0	633	-344.025		T+76 sec									
0	633	-344.025		T+78 sec									
0	633	-357.631		T+80 sec									
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0	633	-879.184
0	633	-879.184
0	633	-1054.98
0	633	-1054.98
0	633	-1054.98
0	633	-1110.54
0	633	-1110.54
0	633	-1110.54
0	633	-1194.31
0	633	-1194.31
0	633	-1194.31
0	633	-1217.35
0	633	-1217.35
0	633	-1217.35
0	633	-1543.89
0	633	-1543.89
0	633	-1543.89
0	633	-1758.37
0	633	-1758.37

0	633	-1758.37
0	633	-2752.32
0	633	-2752.32
0	633	-2752.32
0	633	-3956.54
0	633	-3956.54
0	633	-3956.54
0	633	-4869.05
0	633	-4869.05
0	633	-4869.05
0	633	-12657.3
0	633	-12657.3
0	633	-12657.3
0	633	-63334.8
0	633	-63334.8
0	633	-63334.8
0	633	63334.79
0	633	63334.79
0	633	63334.79
0	633	15818.6
0	633	15818.6
0	633	15818.6
0	633	63334.79
0	633	63334.79
0	633	63334.79

Non-Conforming Load sign convention + (Data is positive for Load then enter "+" else "-"

FR B
20 to 52 sec

-411.276

Time of Freque
Value A Pre-Pert
Value B Post-Pertu
Pre
Value A Pre-Perturbati
Value B Post-Perturbatio
Pre to Pos

Frequency, Actual Interchange, Adjustment Data, Bias and Load used in the evaluation

12 to 24 second

FR B
20 to 52 sec
Average
MW

	T	Frequency Hz	Net Actual Interchange MW	JOU Dynamic Schedules Imp(-) Exp (+) MW	Non-Conforming Load Load (-) MW	Pumped Hydro Load (-) Gen (+) MW	Ramping Units Gen (+) MW	Transferred Frequency Response Rec (-) Del (+) MW/0.1 Hz	Contingent BA Lost Generation Load (-) Gen (+) MW	BA Bias Setting MW/0.1 Hz	BA Load MW	Expected Primary Freq Response MW	T	Frequency Hz
T-72 sec	2:26:12	60.0270	3668.61	350.00	-165.48	0.00	71.00	10.00	15.00	-103.00	7640.58	-21.600	T-72 sec	2:26:12
T-70 sec	2:26:14	60.0270	3668.61	350.00	-165.48	0.00	71.00	10.00	15.00	-103.00	7640.58	-21.600	T-70 sec	2:26:14
T-68 sec	2:26:16	60.0270	3668.61	350.00	-165.48	0.00	71.00	10.00	15.00	-103.00	7640.58	-21.600	T-68 sec	2:26:16

	T-66 sec	2:26:18	60.0220	3666.06	350.00	-165.48	0.00	71.50	10.00	15.00	-103.00	7641.57	-17.599	T-66 sec	2:26:18	
	T-64 sec	2:26:20	60.0220	3666.06	350.00	-165.48	0.00	71.50	10.00	15.00	-103.00	7641.57	-17.599	T-64 sec	2:26:20	
	T-62 sec	2:26:22	60.0220	3666.06	350.00	-165.48	0.00	71.50	10.00	15.00	-103.00	7641.57	-17.599	T-62 sec	2:26:22	
	T-60 sec	2:26:24	60.0190	3670.45	350.00	-165.48	0.00	72.00	10.00	15.00	-103.00	7642.56	-15.201	T-60 sec	2:26:24	
	T-58 sec	2:26:26	60.0190	3670.45	350.00	-165.48	0.00	72.00	10.00	15.00	-103.00	7642.56	-15.201	T-58 sec	2:26:26	
	T-56 sec	2:26:28	60.0190	3670.45	350.00	-165.48	0.00	72.00	10.00	15.00	-103.00	7642.56	-15.201	T-56 sec	2:26:28	
	T-54 sec	2:26:30	60.0210	3672.49	350.00	-165.48	0.00	72.50	10.00	15.00	-103.00	7643.55	-16.800	T-54 sec	2:26:30	
	T-52 sec	2:26:32	60.0210	3672.49	350.00	-165.48	0.00	72.50	10.00	15.00	-103.00	7643.55	-16.800	T-52 sec	2:26:32	
	T-50 sec	2:26:34	60.0210	3672.49	350.00	-165.48	0.00	72.50	10.00	15.00	-103.00	7643.55	-16.800	T-50 sec	2:26:34	
	T-48 sec	2:26:36	60.0190	3672.16	350.00	-165.48	0.00	73.00	10.00	15.00	-103.00	7644.54	-15.201	T-48 sec	2:26:36	
	T-46 sec	2:26:38	60.0190	3672.16	350.00	-165.48	0.00	73.00	10.00	15.00	-103.00	7644.54	-15.201	T-46 sec	2:26:38	
	T-44 sec	2:26:40	60.0190	3672.16	350.00	-165.48	0.00	73.00	10.00	15.00	-103.00	7644.54	-15.201	T-44 sec	2:26:40	
	T-42 sec	2:26:42	60.0310	3666.47	350.00	-165.48	0.00	73.50	10.00	15.00	-103.00	7645.53	-24.799	T-42 sec	2:26:42	
	T-40 sec	2:26:44	60.0310	3666.47	350.00	-165.48	0.00	73.50	10.00	15.00	-103.00	7645.53	-24.799	T-40 sec	2:26:44	
	T-38 sec	2:26:46	60.0310	3666.47	350.00	-165.48	0.00	73.50	10.00	15.00	-103.00	7645.53	-24.799	T-38 sec	2:26:46	
	T-36 sec	2:26:48	60.0360	3660.67	350.00	-165.48	0.00	74.00	10.00	15.00	-103.00	7646.52	-28.799	T-36 sec	2:26:48	
	T-34 sec	2:26:50	60.0360	3660.67	350.00	-165.48	0.00	74.00	10.00	15.00	-103.00	7646.52	-28.799	T-34 sec	2:26:50	
	T-32 sec	2:26:52	60.0360	3660.67	350.00	-165.48	0.00	74.00	10.00	15.00	-103.00	7646.52	-28.799	T-32 sec	2:26:52	
	T-30 sec	2:26:54	60.0480	3650.03	350.00	-165.48	0.00	74.50	10.00	15.00	-103.00	7647.51	-38.400	T-30 sec	2:26:54	
	T-28 sec	2:26:56	60.0480	3650.03	350.00	-165.48	0.00	74.50	10.00	15.00	-103.00	7647.51	-38.400	T-28 sec	2:26:56	
	T-26 sec	2:26:58	60.0480	3650.03	350.00	-165.48	0.00	74.50	10.00	15.00	-103.00	7647.51	-38.400	T-26 sec	2:26:58	
	T-24 sec	2:27:00	60.0410	3654.29	350.00	-165.48	0.00	75.00	10.00	15.00	-103.00	7648.50	-32.800	T-24 sec	2:27:00	
	T-22 sec	2:27:02	60.0410	3654.29	350.00	-165.48	0.00	75.00	10.00	15.00	-103.00	7648.50	-32.800	T-22 sec	2:27:02	
	T-20 sec	2:27:04	60.0410	3654.29	350.00	-165.48	0.00	75.00	10.00	15.00	-103.00	7648.50	-32.800	T-20 sec	2:27:04	
	T-18 sec	2:27:06	60.0390	3651.06	350.00	-165.48	0.00	75.50	10.00	15.00	-103.00	7649.49	-31.201	T-18 sec	2:27:06	
	T-16 sec	2:27:08	60.0390	3651.06	350.00	-165.48	0.00	75.50	10.00	15.00	-103.00	7649.49	-31.201	T-16 sec	2:27:08	60.042
	T-14 sec	2:27:10	60.0390	3651.06	350.00	-165.48	0.00	75.50	10.00	15.00	-103.00	7649.49	-31.201	T-14 sec	2:27:10	60.042
	T-12 sec	2:27:12	60.0450	3645.39	350.00	-165.48	0.00	76.00	10.00	15.00	-103.00	7650.48	-35.999	T-12 sec	2:27:12	60.042
	T-10 sec	2:27:14	60.0450	3645.39	350.00	-165.48	0.00	76.00	10.00	15.00	-103.00	7650.48	-35.999	T-10 sec	2:27:14	60.042
	T-08 sec	2:27:16	60.0450	3645.39	350.00	-165.48	0.00	76.00	10.00	15.00	-103.00	7650.48	-35.999	T-08 sec	2:27:16	60.042
	T-06 sec	2:27:18	60.0410	3640.68	350.00	-165.48	0.00	76.50	10.00	15.00	-103.00	7651.47	-32.800	T-06 sec	2:27:18	60.042
	T-04 sec	2:27:20	60.0410	3640.68	350.00	-165.48	0.00	76.50	10.00	15.00	-103.00	7651.47	-32.800	T-04 sec	2:27:20	60.042
	T-02 sec	2:27:22	60.0410	3640.68	350.00	-165.48	0.00	76.50	10.00	15.00	-103.00	7651.47	-32.800	T-02 sec	2:27:22	60.042
	T+0 sec	2:27:24	59.9780	3696.36	350.00	-206.46	0.00	77.00	10.00	15.00	-103.00	7645.00	17.599	T+0 sec	2:27:24	
	T+02 sec	2:27:26	59.9780	3696.36	350.00	-206.46	0.00	77.00	10.00	15.00	-103.00	7645.00	17.599	T+02 sec	2:27:26	
	T+04 sec	2:27:28	59.9780	3696.36	350.00	-206.46	0.00	77.00	10.00	15.00	-103.00	7645.00	17.599	T+04 sec	2:27:28	
	T+06 sec	2:27:30	59.9780	3696.36	350.00	-206.46	0.00	77.00	10.00	15.00	-103.00	7645.00	17.599	T+06 sec	2:27:30	
	T+08 sec	2:27:32	59.8690	3737.16	335.00	-206.46	0.00	77.50	10.00	0.00	-103.00	7639.00	104.800	T+08 sec	2:27:32	
	T+10 sec	2:27:34	59.8690	3737.16	335.00	-206.46	0.00	77.50	10.00	0.00	-103.00	7639.00	104.800	T+10 sec	2:27:34	
	T+12 sec	2:27:36	59.8690	3737.16	335.00	-206.46	0.00	77.50	10.00	0.00	-103.00	7639.00	104.800	T+12 sec	2:27:36	59.880
	T+14 sec	2:27:38	59.8800	3766.19	335.00	-206.46	0.00	78.00	10.00	0.00	-103.00	7631.00	95.999	T+14 sec	2:27:38	59.880
	T+16 sec	2:27:40	59.8800	3766.19	335.00	-206.46	0.00	78.00	10.00	0.00	-103.00	7631.00	95.999	T+16 sec	2:27:40	59.880
	T+18 sec	2:27:42	59.8800	3766.19	335.00	-206.46	0.00	78.00	10.00	0.00	-103.00	7631.00	95.999	T+18 sec	2:27:42	59.880
-411.276	T+20 sec	2:27:44	59.8830	3780.62	335.00	-206.46	0.00	78.50	10.00	0.00	-103.00	7630.00	93.600	T+20 sec	2:27:44	59.880
-411.276	T+22 sec	2:27:46	59.8830	3780.62	335.00	-206.46	0.00	78.50	10.00	0.00	-103.00	7630.00	93.600	T+22 sec	2:27:46	59.880
-411.276	T+24 sec	2:27:48	59.8830	3780.62	335.00	-206.46	0.00	78.50	10.00	0.00	-103.00	7630.00	93.600	T+24 sec	2:27:48	59.880

-411.276	T+26 sec	2:27:50	59.8850	3784.96	335.00	-206.46	0.00	79.00	10.00	0.00	-103.00	7631.00	92.001	T+26 sec	2:27:50
-411.276	T+28 sec	2:27:52	59.8850	3784.96	335.00	-206.46	0.00	79.00	10.00	0.00	-103.00	7631.00	92.001	T+28 sec	2:27:52
-411.276	T+30 sec	2:27:54	59.8850	3784.96	335.00	-206.46	0.00	79.00	10.00	0.00	-103.00	7631.00	92.001	T+30 sec	2:27:54
-411.276	T+32 sec	2:27:56	59.8900	3788.07	335.00	-211.26	0.00	79.50	10.00	0.00	-103.00	7630.00	88.000	T+32 sec	2:27:56
-411.276	T+34 sec	2:27:58	59.8900	3788.07	335.00	-211.26	0.00	79.50	10.00	0.00	-103.00	7630.00	88.000	T+34 sec	2:27:58
-411.276	T+36 sec	2:28:00	59.8900	3788.07	335.00	-211.26	0.00	79.50	10.00	0.00	-103.00	7630.00	88.000	T+36 sec	2:28:00
-411.276	T+38 sec	2:28:02	59.8930	3788.47	335.00	-211.26	0.00	80.00	10.00	0.00	-103.00	7632.00	85.599	T+38 sec	2:28:02
-411.276	T+40 sec	2:28:04	59.8930	3788.47	335.00	-211.26	0.00	80.00	10.00	0.00	-103.00	7632.00	85.599	T+40 sec	2:28:04
-411.276	T+42 sec	2:28:06	59.8930	3788.47	335.00	-211.26	0.00	80.00	10.00	0.00	-103.00	7632.00	85.599	T+42 sec	2:28:06
-411.276	T+44 sec	2:28:08	59.8910	3794.37	335.00	-211.26	0.00	80.50	10.00	0.00	-103.00	7633.00	87.201	T+44 sec	2:28:08
-411.276	T+46 sec	2:28:10	59.8910	3794.37	335.00	-211.26	0.00	80.50	10.00	0.00	-103.00	7633.00	87.201	T+46 sec	2:28:10
-411.276	T+48 sec	2:28:12	59.8910	3794.37	335.00	-211.26	0.00	80.50	10.00	0.00	-103.00	7633.00	87.201	T+48 sec	2:28:12
-411.276	T+50 sec	2:28:14	59.8850	3799.96	335.00	-211.26	0.00	81.00	10.00	0.00	-103.00	7634.00	92.001	T+50 sec	2:28:14
-411.276	T+52 sec	2:28:16	59.8850	3799.96	335.00	-211.26	0.00	81.00	10.00	0.00	-103.00	7634.00	92.001	T+52 sec	2:28:16
	T+54 sec	2:28:18	59.8850	3799.96	335.00	-211.26	0.00	81.00	10.00	0.00	-103.00	7634.00	92.001	T+54 sec	2:28:18
	T+56 sec	2:28:20	59.8880	3802.95	335.00	-211.26	0.00	81.50	10.00	0.00	-103.00	7635.00	89.600	T+56 sec	2:28:20
	T+58 sec	2:28:22	59.8880	3802.95	335.00	-211.26	0.00	81.50	10.00	0.00	-103.00	7635.00	89.600	T+58 sec	2:28:22
	T+60 sec	2:28:24	59.8880	3802.95	335.00	-211.26	0.00	81.50	10.00	0.00	-103.00	7635.00	89.600	T+60 sec	2:28:24
	T+62 sec	2:28:26	59.8890	3805.62	335.00	-214.35	0.00	82.00	10.00	0.00	-103.00	7636.00	88.800	T+62 sec	2:28:26
	T+64 sec	2:28:28	59.8890	3805.62	335.00	-214.35	0.00	82.00	10.00	0.00	-103.00	7636.00	88.800	T+64 sec	2:28:28
	T+66 sec	2:28:30	59.8890	3805.62	335.00	-214.35	0.00	82.00	10.00	0.00	-103.00	7636.00	88.800	T+66 sec	2:28:30
	T+68 sec	2:28:32	59.8570	3814.86	335.00	-214.35	0.00	82.50	10.00	0.00	-103.00	7637.00	114.401	T+68 sec	2:28:32
	T+70 sec	2:28:34	59.8570	3814.86	335.00	-214.35	0.00	82.50	10.00	0.00	-103.00	7637.00	114.401	T+70 sec	2:28:34
	T+72 sec	2:28:36	59.8570	3814.86	335.00	-214.35	0.00	82.50	10.00	0.00	-103.00	7637.00	114.401	T+72 sec	2:28:36
	T+74 sec	2:28:38	59.8580	3826.05	335.00	-214.35	0.00	83.00	10.00	0.00	-103.00	7638.00	113.599	T+74 sec	2:28:38
	T+76 sec	2:28:40	59.8580	3826.05	335.00	-214.35	0.00	83.00	10.00	0.00	-103.00	7638.00	113.599	T+76 sec	2:28:40
	T+78 sec	2:28:42	59.8580	3826.05	335.00	-214.35	0.00	83.00	10.00	0.00	-103.00	7638.00	113.599	T+78 sec	2:28:42
	T+80 sec	2:28:44	59.8650	3826.75	335.00	-214.35	0.00	83.50	10.00	0.00	-103.00	7641.00	107.999	T+80 sec	2:28:44
		2:28:46	59.8650	3826.75	335.00	-214.35	0.00	83.50	10.00	0.00	-103.00	7641.00	107.999		
		2:28:48	59.8650	3826.75	335.00	-214.35	0.00	83.50	10.00	0.00	-103.00	7641.00	107.999		
		2:28:50	59.8710	3825.71	335.00	-214.35	0.00	84.00	10.00	0.00	-103.00	7642.00	103.201		
		2:28:52	59.8710	3825.71	335.00	-214.35	0.00	84.00	10.00	0.00	-103.00	7642.00	103.201		
		2:28:54	59.8710	3825.71	335.00	-214.35	0.00	84.00	10.00	0.00	-103.00	7642.00	103.201		
		2:28:56	59.8800	3819.08	335.00	-212.17	0.00	84.50	10.00	0.00	-103.00	7629.00	95.999		
		2:28:58	59.8800	3819.08	335.00	-212.17	0.00	84.50	10.00	0.00	-103.00	7629.00	95.999		
		2:29:00	59.8800	3819.08	335.00	-212.17	0.00	84.50	10.00	0.00	-103.00	7629.00	95.999		
		2:29:02	59.8900	3815.01	335.00	-212.17	0.00	85.00	10.00	0.00	-103.00	7630.00	88.000		
		2:29:04	59.8900	3815.01	335.00	-212.17	0.00	85.00	10.00	0.00	-103.00	7630.00	88.000		
		2:29:06	59.8900	3815.01	335.00	-212.17	0.00	85.00	10.00	0.00	-103.00	7630.00	88.000		
		2:29:08	59.8930	3809.65	335.00	-212.17	0.00	85.50	10.00	0.00	-103.00	7630.00	85.599		
		2:29:10	59.8930	3809.65	335.00	-212.17	0.00	85.50	10.00	0.00	-103.00	7630.00	85.599		
		2:29:12	59.8930	3809.65	335.00	-212.17	0.00	85.50	10.00	0.00	-103.00	7630.00	85.599		
		2:29:14	59.9020	3804.19	335.00	-329.99	0.00	86.00	10.00	0.00	-103.00	7631.00	78.400		
		2:29:16	59.9020	3804.19	335.00	-329.99	0.00	86.00	10.00	0.00	-103.00	7631.00	78.400		
		2:29:18	59.9020	3804.19	335.00	-329.99	0.00	86.00	10.00	0.00	-103.00	7631.00	78.400		

2:29:20	59.9070	3792.17	335.00	-255.44	0.00	86.50	10.00	0.00	-103.00	7633.00	74.399
2:29:22	59.9070	3792.17	335.00	-255.44	0.00	86.50	10.00	0.00	-103.00	7633.00	74.399
2:29:24	59.9070	3792.17	335.00	-255.44	0.00	86.50	10.00	0.00	-103.00	7633.00	74.399
2:29:26	59.9160	3788.13	335.00	-255.44	0.00	87.00	10.00	0.00	-103.00	7636.00	67.200
2:29:28	59.9160	3788.13	335.00	-255.44	0.00	87.00	10.00	0.00	-103.00	7636.00	67.200
2:29:30	59.9160	3788.13	335.00	-255.44	0.00	87.00	10.00	0.00	-103.00	7636.00	67.200
2:29:32	59.9200	3781.70	335.00	-255.44	0.00	87.50	10.00	0.00	-103.00	7640.00	64.001
2:29:34	59.9200	3781.70	335.00	-255.44	0.00	87.50	10.00	0.00	-103.00	7640.00	64.001
2:29:36	59.9200	3781.70	335.00	-255.44	0.00	87.50	10.00	0.00	-103.00	7640.00	64.001
2:29:38	59.9170	3774.60	335.00	-255.44	0.00	88.00	10.00	0.00	-103.00	7644.00	66.400
2:29:40	59.9170	3774.60	335.00	-255.44	0.00	88.00	10.00	0.00	-103.00	7644.00	66.400
2:29:42	59.9170	3774.60	335.00	-255.44	0.00	88.00	10.00	0.00	-103.00	7644.00	66.400
2:29:44	59.9230	3772.72	335.00	-255.44	0.00	88.50	10.00	0.00	-103.00	7648.00	61.600
2:29:46	59.9230	3772.72	335.00	-255.44	0.00	88.50	10.00	0.00	-103.00	7648.00	61.600
2:29:48	59.9230	3772.72	335.00	-255.44	0.00	88.50	10.00	0.00	-103.00	7648.00	61.600
2:29:50	59.9280	3768.71	335.00	-254.84	0.00	89.00	10.00	0.00	-103.00	7652.00	57.599
2:29:52	59.9280	3768.71	335.00	-254.84	0.00	89.00	10.00	0.00	-103.00	7652.00	57.599
2:29:54	59.9280	3768.71	335.00	-254.84	0.00	89.00	10.00	0.00	-103.00	7652.00	57.599
2:29:56	59.9270	3767.41	335.00	-254.84	0.00	89.50	10.00	0.00	-103.00	7656.00	58.401
2:29:58	59.9270	3767.41	335.00	-254.84	0.00	89.50	10.00	0.00	-103.00	7656.00	58.401
2:30:00	59.9270	3767.41	335.00	-254.84	0.00	89.50	10.00	0.00	-103.00	7656.00	58.401
2:30:02	59.9290	3765.67	350.00	-254.84	0.00	90.00	10.00	0.00	-103.00	7662.00	56.799
2:30:04	59.9290	3765.67	350.00	-254.84	0.00	90.00	10.00	0.00	-103.00	7662.00	56.799
2:30:06	59.9290	3765.67	350.00	-254.84	0.00	90.00	10.00	0.00	-103.00	7662.00	56.799
2:30:08	59.9370	3765.10	350.00	-254.84	0.00	90.50	10.00	0.00	-103.00	7665.00	50.400
2:30:10	59.9370	3765.10	350.00	-254.84	0.00	90.50	10.00	0.00	-103.00	7665.00	50.400
2:30:12	59.9370	3765.10	350.00	-254.84	0.00	90.50	10.00	0.00	-103.00	7665.00	50.400
2:30:14	59.9490	3753.92	350.00	-254.84	0.00	91.00	10.00	0.00	-103.00	7670.00	40.799
2:30:16	59.9490	3753.92	350.00	-254.84	0.00	91.00	10.00	0.00	-103.00	7670.00	40.799
2:30:18	59.9490	3753.92	350.00	-254.84	0.00	91.00	10.00	0.00	-103.00	7670.00	40.799
2:30:20	59.9410	3747.88	350.00	-257.15	0.00	91.50	10.00	0.00	-103.00	7674.00	47.198
2:30:22	59.9410	3747.88	350.00	-257.15	0.00	91.50	10.00	0.00	-103.00	7674.00	47.198
2:30:24	59.9410	3747.88	350.00	-257.15	0.00	91.50	10.00	0.00	-103.00	7674.00	47.198
2:30:26	59.9480	3746.71	350.00	-257.15	0.00	92.00	10.00	0.00	-103.00	7679.00	41.599
2:30:28	59.9480	3746.71	350.00	-257.15	0.00	92.00	10.00	0.00	-103.00	7679.00	41.599
2:30:30	59.9480	3746.71	350.00	-257.15	0.00	92.00	10.00	0.00	-103.00	7679.00	41.599
2:30:32	59.9510	3740.26	350.00	-257.15	0.00	92.50	10.00	0.00	-103.00	7682.00	39.200
2:30:34	59.9510	3740.26	350.00	-257.15	0.00	92.50	10.00	0.00	-103.00	7682.00	39.200
2:30:36	59.9510	3740.26	350.00	-257.15	0.00	92.50	10.00	0.00	-103.00	7682.00	39.200
2:30:38	59.9510	3727.84	350.00	-257.15	0.00	93.00	10.00	0.00	-103.00	7684.00	39.200
2:30:40	59.9510	3727.84	350.00	-257.15	0.00	93.00	10.00	0.00	-103.00	7684.00	39.200
2:30:42	59.9510	3727.84	350.00	-257.15	0.00	93.00	10.00	0.00	-103.00	7684.00	39.200
2:30:44	59.9520	3720.58	350.00	-257.15	0.00	93.50	10.00	0.00	-103.00	7686.00	38.400
2:30:46	59.9520	3720.58	350.00	-257.15	0.00	93.50	10.00	0.00	-103.00	7686.00	38.400
2:30:48	59.9520	3720.58	350.00	-257.15	0.00	93.50	10.00	0.00	-103.00	7686.00	38.400
2:30:50	59.9540	3715.75	350.00	-262.29	0.00	94.00	10.00	0.00	-103.00	7688.00	36.801

2:30:52	59.9540	3715.75	350.00	-262.29	0.00	94.00	10.00	0.00	-103.00	7688.00	36.801
2:30:54	59.9540	3715.75	350.00	-262.29	0.00	94.00	10.00	0.00	-103.00	7688.00	36.801
2:30:56	59.9530	3710.85	350.00	-262.29	0.00	94.50	10.00	0.00	-103.00	7689.00	37.601
2:30:58	59.9530	3710.85	350.00	-262.29	0.00	94.50	10.00	0.00	-103.00	7689.00	37.601
2:31:00	59.9530	3710.85	350.00	-262.29	0.00	94.50	10.00	0.00	-103.00	7689.00	37.601
2:31:02	59.9540	3714.62	350.00	-262.29	0.00	95.00	10.00	0.00	-103.00	7689.00	36.801
2:31:04	59.9540	3714.62	350.00	-262.29	0.00	95.00	10.00	0.00	-103.00	7689.00	36.801
2:31:06	59.9540	3714.62	350.00	-262.29	0.00	95.00	10.00	0.00	-103.00	7689.00	36.801
2:31:08	59.9560	3716.46	350.00	-262.29	0.00	95.50	10.00	0.00	-103.00	7690.00	35.199
2:31:10	59.9560	3716.46	350.00	-262.29	0.00	95.50	10.00	0.00	-103.00	7690.00	35.199
2:31:12	59.9560	3716.46	350.00	-262.29	0.00	95.50	10.00	0.00	-103.00	7690.00	35.199
2:31:14	59.9550	3722.36	350.00	-262.29	0.00	96.00	10.00	0.00	-103.00	7690.08	35.999
2:31:16	59.9550	3722.36	350.00	-262.29	0.00	96.00	10.00	0.00	-103.00	7690.08	35.999
2:31:18	59.9550	3722.36	350.00	-262.29	0.00	96.00	10.00	0.00	-103.00	7690.08	35.999
2:31:20	59.9620	3722.27	350.00	-256.65	0.00	96.50	10.00	0.00	-103.00	7690.00	30.399
2:31:22	59.9620	3722.27	350.00	-256.65	0.00	96.50	10.00	0.00	-103.00	7690.00	30.399
2:31:24	59.9620	3722.27	350.00	-256.65	0.00	96.50	10.00	0.00	-103.00	7690.00	30.399
2:31:26	59.9660	3723.09	350.00	-256.65	0.00	97.00	10.00	0.00	-103.00	7692.06	27.200
2:31:28	59.9660	3723.09	350.00	-256.65	0.00	97.00	10.00	0.00	-103.00	7692.06	27.200
2:31:30	59.9660	3723.09	350.00	-256.65	0.00	97.00	10.00	0.00	-103.00	7692.06	27.200
2:31:32	59.9700	3723.89	350.00	-256.65	0.00	97.50	10.00	0.00	-103.00	7693.05	23.999
2:31:34	59.9700	3723.89	350.00	-256.65	0.00	97.50	10.00	0.00	-103.00	7693.05	23.999
2:31:36	59.9700	3723.89	350.00	-256.65	0.00	97.50	10.00	0.00	-103.00	7693.05	23.999
2:31:38	59.9690	3728.05	350.00	-256.65	0.00	98.00	10.00	0.00	-103.00	7694.04	24.799
2:31:40	59.9690	3728.05	350.00	-256.65	0.00	98.00	10.00	0.00	-103.00	7694.04	24.799
2:31:42	59.9690	3728.05	350.00	-256.65	0.00	98.00	10.00	0.00	-103.00	7694.04	24.799
2:31:44	59.9710	3733.33	350.00	-256.65	0.00	98.50	10.00	0.00	-103.00	7695.03	23.199
2:31:46	59.9710	3733.33	350.00	-256.65	0.00	98.50	10.00	0.00	-103.00	7695.03	23.199
2:31:48	59.9710	3733.33	350.00	-256.65	0.00	98.50	10.00	0.00	-103.00	7695.03	23.199
2:31:50	59.9760	3736.82	350.00	-256.31	0.00	99.00	10.00	0.00	-103.00	7696.02	19.199
2:31:52	59.9760	3736.82	350.00	-256.31	0.00	99.00	10.00	0.00	-103.00	7696.02	19.199
2:31:54	59.9760	3736.82	350.00	-256.31	0.00	99.00	10.00	0.00	-103.00	7696.02	19.199
2:31:56	59.9760	3740.88	350.00	-256.31	0.00	99.50	10.00	0.00	-103.00	7697.01	19.199
2:31:58	59.9760	3740.88	350.00	-256.31	0.00	99.50	10.00	0.00	-103.00	7697.01	19.199
2:32:00	59.9760	3740.88	350.00	-256.31	0.00	99.50	10.00	0.00	-103.00	7697.01	19.199
2:32:02	59.9780	3746.61	350.00	-256.31	0.00	100.00	10.00	0.00	-103.00	7698.00	17.599
2:32:04	59.9780	3746.61	350.00	-256.31	0.00	100.00	10.00	0.00	-103.00	7698.00	17.599
2:32:06	59.9780	3746.61	350.00	-256.31	0.00	100.00	10.00	0.00	-103.00	7698.00	17.599
2:32:08	59.9820	3751.56	350.00	-256.31	0.00	100.50	10.00	0.00	-103.00	7699.00	14.401
2:32:10	59.9820	3751.56	350.00	-256.31	0.00	100.50	10.00	0.00	-103.00	7699.00	14.401
2:32:12	59.9820	3751.56	350.00	-256.31	0.00	100.50	10.00	0.00	-103.00	7699.00	14.401
2:32:14	59.9790	3756.41	350.00	-256.31	0.00	101.00	10.00	0.00	-103.00	7699.98	16.800
2:32:16	59.9790	3756.41	350.00	-256.31	0.00	101.00	10.00	0.00	-103.00	7699.98	16.800
2:32:18	59.9790	3756.41	350.00	-256.31	0.00	101.00	10.00	0.00	-103.00	7699.98	16.800
2:32:20	59.9830	3760.98	350.00	-249.09	0.00	101.50	10.00	0.00	-103.00	7700.97	13.599
2:32:22	59.9830	3760.98	350.00	-249.09	0.00	101.50	10.00	0.00	-103.00	7700.97	13.599

2:32:24	59.9830	3760.98	350.00	-249.09	0.00	101.50	10.00	0.00	-103.00	7700.97	13.599
2:32:26	59.9880	3763.21	350.00	-249.09	0.00	102.00	10.00	0.00	-103.00	7701.96	9.601
2:32:28	59.9880	3763.21	350.00	-249.09	0.00	102.00	10.00	0.00	-103.00	7701.96	9.601
2:32:30	59.9880	3763.21	350.00	-249.09	0.00	102.00	10.00	0.00	-103.00	7701.96	9.601
2:32:32	59.9870	3766.43	350.00	-249.09	0.00	102.50	10.00	0.00	-103.00	7702.95	10.400
2:32:34	59.9870	3766.43	350.00	-249.09	0.00	102.50	10.00	0.00	-103.00	7702.95	10.400
2:32:36	59.9870	3766.43	350.00	-249.09	0.00	102.50	10.00	0.00	-103.00	7702.95	10.400
2:32:38	59.9920	3768.63	350.00	-249.09	0.00	103.00	10.00	0.00	-103.00	7703.94	6.400
2:32:40	59.9920	3768.63	350.00	-249.09	0.00	103.00	10.00	0.00	-103.00	7703.94	6.400
2:32:42	59.9920	3768.63	350.00	-249.09	0.00	103.00	10.00	0.00	-103.00	7703.94	6.400
2:32:44	59.9860	3773.69	350.00	-249.09	0.00	103.50	10.00	0.00	-103.00	7704.93	11.200
2:32:46	59.9860	3773.69	350.00	-249.09	0.00	103.50	10.00	0.00	-103.00	7704.93	11.200
2:32:48	59.9860	3773.69	350.00	-249.09	0.00	103.50	10.00	0.00	-103.00	7704.93	11.200
2:32:50	59.9880	3775.36	350.00	-253.74	0.00	104.00	10.00	0.00	-103.00	7705.92	9.601
2:32:52	59.9880	3775.36	350.00	-253.74	0.00	104.00	10.00	0.00	-103.00	7705.92	9.601
2:32:54	59.9880	3775.36	350.00	-253.74	0.00	104.00	10.00	0.00	-103.00	7705.92	9.601
2:32:56	59.9980	3776.42	350.00	-253.74	0.00	104.50	10.00	0.00	-103.00	7706.91	1.599
2:32:58	59.9980	3776.42	350.00	-253.74	0.00	104.50	10.00	0.00	-103.00	7706.91	1.599
2:33:00	59.9980	3776.42	350.00	-253.74	0.00	104.50	10.00	0.00	-103.00	7706.91	1.599
2:33:02	59.9990	3781.26	350.00	-253.74	0.00	105.00	10.00	0.00	-103.00	7707.90	0.800
2:33:04	59.9990	3781.26	350.00	-253.74	0.00	105.00	10.00	0.00	-103.00	7707.90	0.800
2:33:06	59.9990	3781.26	350.00	-253.74	0.00	105.00	10.00	0.00	-103.00	7707.90	0.800
2:33:08	60.0020	3783.90	350.00	-253.74	0.00	105.50	10.00	0.00	-103.00	7708.89	-1.599
2:33:10	60.0020	3783.90	350.00	-253.74	0.00	105.50	10.00	0.00	-103.00	7708.89	-1.599
2:33:12	60.0020	3783.90	350.00	-253.74	0.00	105.50	10.00	0.00	-103.00	7708.89	-1.599
2:33:14	60.0080	3785.46	350.00	-253.74	0.00	106.00	10.00	0.00	-103.00	7709.88	-6.400
2:33:16	60.0080	3785.46	350.00	-253.74	0.00	106.00	10.00	0.00	-103.00	7709.88	-6.400
2:33:18	60.0080	3785.46	350.00	-253.74	0.00	106.00	10.00	0.00	-103.00	7709.88	-6.400
2:33:20	60.0170	3787.26	350.00	-257.42	0.00	106.50	10.00	0.00	-103.00	7710.87	-13.599
2:33:22	60.0170	3787.26	350.00	-257.42	0.00	106.50	10.00	0.00	-103.00	7710.87	-13.599
2:33:24	60.0170	3787.26	350.00	-257.42	0.00	106.50	10.00	0.00	-103.00	7710.87	-13.599
2:33:26	60.0170	3788.03	350.00	-257.42	0.00	107.00	10.00	0.00	-103.00	7711.86	-13.599
2:33:28	60.0170	3788.03	350.00	-257.42	0.00	107.00	10.00	0.00	-103.00	7711.86	-13.599
2:33:30	60.0170	3788.03	350.00	-257.42	0.00	107.00	10.00	0.00	-103.00	7711.86	-13.599
2:33:32	60.0230	3787.54	350.00	-257.42	0.00	107.50	10.00	0.00	-103.00	7712.85	-18.399
2:33:34	60.0230	3787.54	350.00	-257.42	0.00	107.50	10.00	0.00	-103.00	7712.85	-18.399
2:33:36	60.0230	3787.54	350.00	-257.42	0.00	107.50	10.00	0.00	-103.00	7712.85	-18.399
2:33:38	60.0210	3787.93	350.00	-257.42	0.00	108.00	10.00	0.00	-103.00	7713.84	-16.800
2:33:40	60.0210	3787.93	350.00	-257.42	0.00	108.00	10.00	0.00	-103.00	7713.84	-16.800
2:33:42	60.0210	3787.93	350.00	-257.42	0.00	108.00	10.00	0.00	-103.00	7713.84	-16.800
2:33:44	60.0240	3786.55	350.00	-257.42	0.00	108.50	10.00	0.00	-103.00	7714.83	-19.199
2:33:46	60.0240	3786.55	350.00	-257.42	0.00	108.50	10.00	0.00	-103.00	7714.83	-19.199
2:33:48	60.0240	3786.55	350.00	-257.42	0.00	108.50	10.00	0.00	-103.00	7714.83	-19.199
2:33:50	60.0250	3785.61	350.00	-261.74	0.00	109.00	10.00	0.00	-103.00	7715.82	-20.001
2:33:52	60.0250	3785.61	350.00	-261.74	0.00	109.00	10.00	0.00	-103.00	7715.82	-20.001
2:33:54	60.0250	3785.61	350.00	-261.74	0.00	109.00	10.00	0.00	-103.00	7715.82	-20.001

2:33:56	60.0200	3786.86	350.00	-261.74	0.00	109.50	10.00	0.00	-103.00	7716.81	-16.000
2:33:58	60.0200	3786.86	350.00	-261.74	0.00	109.50	10.00	0.00	-103.00	7716.81	-16.000
2:34:00	60.0200	3786.86	350.00	-261.74	0.00	109.50	10.00	0.00	-103.00	7716.81	-16.000
2:34:02	60.0220	3785.73	350.00	-261.74	0.00	110.00	10.00	0.00	-103.00	7717.80	-17.599
2:34:04	60.0220	3785.73	350.00	-261.74	0.00	110.00	10.00	0.00	-103.00	7717.80	-17.599
2:34:06	60.0220	3785.73	350.00	-261.74	0.00	110.00	10.00	0.00	-103.00	7717.80	-17.599
2:34:08	60.0230	3785.80	350.00	-261.74	0.00	110.50	10.00	0.00	-103.00	7718.79	-18.399
2:34:10	60.0230	3785.80	350.00	-261.74	0.00	110.50	10.00	0.00	-103.00	7718.79	-18.399
2:34:12	60.0230	3785.80	350.00	-261.74	0.00	110.50	10.00	0.00	-103.00	7718.79	-18.399
2:34:14	60.0190	3787.63	350.00	-261.74	0.00	111.00	10.00	0.00	-103.00	7719.78	-15.201
2:34:16	60.0190	3787.63	350.00	-261.74	0.00	111.00	10.00	0.00	-103.00	7719.78	-15.201
2:34:18	60.0190	3787.63	350.00	-261.74	0.00	111.00	10.00	0.00	-103.00	7719.78	-15.201
2:34:20	60.0180	3789.40	350.00	-271.88	0.00	111.50	10.00	0.00	-103.00	7720.77	-14.401
2:34:22	60.0180	3789.40	350.00	-271.88	0.00	111.50	10.00	0.00	-103.00	7720.77	-14.401
2:34:24	60.0180	3789.40	350.00	-271.88	0.00	111.50	10.00	0.00	-103.00	7720.77	-14.401
2:34:26	60.0190	3789.37	350.00	-271.88	0.00	112.00	10.00	0.00	-103.00	7721.76	-15.201
2:34:28	60.0190	3789.37	350.00	-271.88	0.00	112.00	10.00	0.00	-103.00	7721.76	-15.201
2:34:30	60.0190	3789.37	350.00	-271.88	0.00	112.00	10.00	0.00	-103.00	7721.76	-15.201
2:34:32	60.0160	3788.93	350.00	-271.88	0.00	112.50	10.00	0.00	-103.00	7722.75	-12.799
2:34:34	60.0160	3788.93	350.00	-271.88	0.00	112.50	10.00	0.00	-103.00	7722.75	-12.799
2:34:36	60.0160	3788.93	350.00	-271.88	0.00	112.50	10.00	0.00	-103.00	7722.75	-12.799
2:34:38	60.0120	3790.41	350.00	-271.88	0.00	113.00	10.00	0.00	-103.00	7723.74	-9.601
2:34:40	60.0120	3790.41	350.00	-271.88	0.00	113.00	10.00	0.00	-103.00	7723.74	-9.601
2:34:42	60.0120	3790.41	350.00	-271.88	0.00	113.00	10.00	0.00	-103.00	7723.74	-9.601
2:34:44	60.0070	3792.95	350.00	-271.88	0.00	113.50	10.00	0.00	-103.00	7724.73	-5.600
2:34:46	60.0070	3792.95	350.00	-271.88	0.00	113.50	10.00	0.00	-103.00	7724.73	-5.600
2:34:48	60.0070	3792.95	350.00	-271.88	0.00	113.50	10.00	0.00	-103.00	7724.73	-5.600
2:34:50	60.0090	3791.43	350.00	-262.07	0.00	114.00	10.00	0.00	-103.00	7725.72	-7.199
2:34:52	60.0090	3791.43	350.00	-262.07	0.00	114.00	10.00	0.00	-103.00	7725.72	-7.199
2:34:54	60.0090	3791.43	350.00	-262.07	0.00	114.00	10.00	0.00	-103.00	7725.72	-7.199
2:34:56	59.9990	3790.22	350.00	-262.07	0.00	114.50	10.00	0.00	-103.00	7726.71	0.800
2:34:58	59.9990	3790.22	350.00	-262.07	0.00	114.50	10.00	0.00	-103.00	7726.71	0.800
2:35:00	59.9990	3790.22	350.00	-262.07	0.00	114.50	10.00	0.00	-103.00	7726.71	0.800
2:35:02	59.9910	3788.10	350.00	-262.07	0.00	115.00	10.00	0.00	-103.00	7727.70	7.199
2:35:04	59.9910	3788.10	350.00	-262.07	0.00	115.00	10.00	0.00	-103.00	7727.70	7.199
2:35:06	59.9910	3788.10	350.00	-262.07	0.00	115.00	10.00	0.00	-103.00	7727.70	7.199
2:35:08	59.9880	3788.50	350.00	-262.07	0.00	115.50	10.00	0.00	-103.00	7728.69	9.601
2:35:10	59.9880	3788.50	350.00	-262.07	0.00	115.50	10.00	0.00	-103.00	7728.69	9.601
2:35:12	59.9880	3788.50	350.00	-262.07	0.00	115.50	10.00	0.00	-103.00	7728.69	9.601
2:35:14	59.9840	3788.10	350.00	-262.07	0.00	116.00	10.00	0.00	-103.00	7729.68	12.799
2:35:16	59.9840	3788.10	350.00	-262.07	0.00	116.00	10.00	0.00	-103.00	7729.68	12.799
2:35:18	59.9840	3788.10	350.00	-262.07	0.00	116.00	10.00	0.00	-103.00	7729.68	12.799
2:35:20	59.9820	3787.73	350.00	-260.36	0.00	116.50	10.00	0.00	-103.00	7730.67	14.401
2:35:22	59.9820	3787.73	350.00	-260.36	0.00	116.50	10.00	0.00	-103.00	7730.67	14.401
2:35:24	59.9820	3787.73	350.00	-260.36	0.00	116.50	10.00	0.00	-103.00	7730.67	14.401
2:35:26	59.9790	3788.26	350.00	-260.36	0.00	117.00	10.00	0.00	-103.00	7731.66	16.800

2:35:28	59.9790	3788.26	350.00	-260.36	0.00	117.00	10.00	0.00	-103.00	7731.66	16.800
2:35:30	59.9790	3788.26	350.00	-260.36	0.00	117.00	10.00	0.00	-103.00	7731.66	16.800
2:35:32	59.9760	3790.66	350.00	-260.36	0.00	117.50	10.00	0.00	-103.00	7732.65	19.199
2:35:34	59.9760	3790.66	350.00	-260.36	0.00	117.50	10.00	0.00	-103.00	7732.65	19.199
2:35:36	59.9760	3790.66	350.00	-260.36	0.00	117.50	10.00	0.00	-103.00	7732.65	19.199
2:35:38	59.9780	3789.27	350.00	-260.36	0.00	118.00	10.00	0.00	-103.00	7733.64	17.599
2:35:40	59.9780	3789.27	350.00	-260.36	0.00	118.00	10.00	0.00	-103.00	7733.64	17.599
2:35:42	59.9780	3789.27	350.00	-260.36	0.00	118.00	10.00	0.00	-103.00	7733.64	17.599
2:35:44	59.9760	3789.91	350.00	-260.36	0.00	118.50	10.00	0.00	-103.00	7734.63	19.199
2:35:46	59.9760	3789.91	350.00	-260.36	0.00	118.50	10.00	0.00	-103.00	7734.63	19.199
2:35:48	59.9760	3789.91	350.00	-260.36	0.00	118.50	10.00	0.00	-103.00	7734.63	19.199
2:35:50	59.9750	3788.96	350.00	-352.64	0.00	119.00	10.00	0.00	-103.00	7735.62	20.001
2:35:52	59.9750	3788.96	350.00	-352.64	0.00	119.00	10.00	0.00	-103.00	7735.62	20.001
2:35:54	59.9750	3788.96	350.00	-352.64	0.00	119.00	10.00	0.00	-103.00	7735.62	20.001
2:35:56	59.9700	3792.91	350.00	-352.64	0.00	119.50	10.00	0.00	-103.00	7736.61	23.999
2:35:58	59.9700	3792.91	350.00	-352.64	0.00	119.50	10.00	0.00	-103.00	7736.61	23.999
2:36:00	59.9700	3792.91	350.00	-352.64	0.00	119.50	10.00	0.00	-103.00	7736.61	23.999
2:36:02	59.9780	3788.08	350.00	-352.64	0.00	120.00	10.00	0.00	-103.00	7737.60	17.599
2:36:04	59.9780	3788.08	350.00	-352.64	0.00	120.00	10.00	0.00	-103.00	7737.60	17.599
2:36:06	59.9780	3788.08	350.00	-352.64	0.00	120.00	10.00	0.00	-103.00	7737.60	17.599
2:36:08	59.9750	3787.16	350.00	-352.64	0.00	120.50	10.00	0.00	-103.00	7738.59	20.001
2:36:10	59.9750	3787.16	350.00	-352.64	0.00	120.50	10.00	0.00	-103.00	7738.59	20.001
2:36:12	59.9750	3787.16	350.00	-352.64	0.00	120.50	10.00	0.00	-103.00	7738.59	20.001
2:36:14	59.9750	3786.49	350.00	-352.64	0.00	121.00	10.00	0.00	-103.00	7739.58	20.001
2:36:16	59.9750	3786.49	350.00	-352.64	0.00	121.00	10.00	0.00	-103.00	7739.58	20.001
2:36:18	59.9750	3786.49	350.00	-352.64	0.00	121.00	10.00	0.00	-103.00	7739.58	20.001
2:36:20	59.9660	3790.51	350.00	-354.90	0.00	121.50	10.00	0.00	-103.00	7740.57	27.200
2:36:22	59.9660	3790.51	350.00	-354.90	0.00	121.50	10.00	0.00	-103.00	7740.57	27.200
2:36:24	59.9660	3790.51	350.00	-354.90	0.00	121.50	10.00	0.00	-103.00	7740.57	27.200
2:36:26	59.9690	3790.96	350.00	-354.90	0.00	122.00	10.00	0.00	-103.00	7741.56	24.799
2:36:28	59.9690	3790.96	350.00	-354.90	0.00	122.00	10.00	0.00	-103.00	7741.56	24.799
2:36:30	59.9690	3790.96	350.00	-354.90	0.00	122.00	10.00	0.00	-103.00	7741.56	24.799
2:36:32	59.9650	3789.17	350.00	-354.90	0.00	122.50	10.00	0.00	-103.00	7742.55	28.000
2:36:34	59.9650	3789.17	350.00	-354.90	0.00	122.50	10.00	0.00	-103.00	7742.55	28.000
2:36:36	59.9650	3789.17	350.00	-354.90	0.00	122.50	10.00	0.00	-103.00	7742.55	28.000
2:36:38	59.9720	3784.83	350.00	-354.90	0.00	123.00	10.00	0.00	-103.00	7743.54	22.400
2:36:40	59.9720	3784.83	350.00	-354.90	0.00	123.00	10.00	0.00	-103.00	7743.54	22.400
2:36:42	59.9720	3784.83	350.00	-354.90	0.00	123.00	10.00	0.00	-103.00	7743.54	22.400
2:36:44	59.9690	3782.81	350.00	-354.90	0.00	123.50	10.00	0.00	-103.00	7744.53	24.799
2:36:46	59.9690	3782.81	350.00	-354.90	0.00	123.50	10.00	0.00	-103.00	7744.53	24.799
2:36:48	59.9690	3782.81	350.00	-354.90	0.00	123.50	10.00	0.00	-103.00	7744.53	24.799
2:36:50	59.9670	3779.06	350.00	-340.47	0.00	124.00	10.00	0.00	-103.00	7745.52	26.401
2:36:52	59.9670	3779.06	350.00	-340.47	0.00	124.00	10.00	0.00	-103.00	7745.52	26.401
2:36:54	59.9670	3779.06	350.00	-340.47	0.00	124.00	10.00	0.00	-103.00	7745.52	26.401
2:36:56	59.9650	3779.33	350.00	-340.47	0.00	124.50	10.00	0.00	-103.00	7746.51	28.000
2:36:58	59.9650	3779.33	350.00	-340.47	0.00	124.50	10.00	0.00	-103.00	7746.51	28.000

2:37:00	59.9650	3779.33	350.00	-340.47	0.00	124.50	10.00	0.00	-103.00	7746.51	28.000
2:37:02	59.9650	3776.60	350.00	-340.47	0.00	125.00	10.00	0.00	-103.00	7747.50	28.000
2:37:04	59.9650	3776.60	350.00	-340.47	0.00	125.00	10.00	0.00	-103.00	7747.50	28.000
2:37:06	59.9650	3776.60	350.00	-340.47	0.00	125.00	10.00	0.00	-103.00	7747.50	28.000
2:37:08	59.9700	3773.17	350.00	-340.47	0.00	125.50	10.00	0.00	-103.00	7748.49	23.999
2:37:10	59.9700	3773.17	350.00	-340.47	0.00	125.50	10.00	0.00	-103.00	7748.49	23.999
2:37:12	59.9700	3773.17	350.00	-340.47	0.00	125.50	10.00	0.00	-103.00	7748.49	23.999
2:37:14	59.9680	3768.50	350.00	-340.47	0.00	126.00	10.00	0.00	-103.00	7749.48	25.601
2:37:16	59.9680	3768.50	350.00	-340.47	0.00	126.00	10.00	0.00	-103.00	7749.48	25.601
2:37:18	59.9680	3768.50	350.00	-340.47	0.00	126.00	10.00	0.00	-103.00	7749.48	25.601
2:37:20	59.9700	3764.79	350.00	-337.64	0.00	126.50	10.00	0.00	-103.00	7750.47	23.999
2:37:22	59.9700	3764.79	350.00	-337.64	0.00	126.50	10.00	0.00	-103.00	7750.47	23.999
2:37:24	59.9700	3764.79	350.00	-337.64	0.00	126.50	10.00	0.00	-103.00	7750.47	23.999
2:37:26	59.9650	3761.89	350.00	-337.64	0.00	127.00	10.00	0.00	-103.00	7751.46	28.000
2:37:28	59.9650	3761.89	350.00	-337.64	0.00	127.00	10.00	0.00	-103.00	7751.46	28.000
2:37:30	59.9650	3761.89	350.00	-337.64	0.00	127.00	10.00	0.00	-103.00	7751.46	28.000
2:37:32	59.9670	3760.16	350.00	-337.64	0.00	127.50	10.00	0.00	-103.00	7752.45	26.401
2:37:34	59.9670	3760.16	350.00	-337.64	0.00	127.50	10.00	0.00	-103.00	7752.45	26.401
2:37:36	59.9670	3760.16	350.00	-337.64	0.00	127.50	10.00	0.00	-103.00	7752.45	26.401
2:37:38	59.9790	3757.77	350.00	-337.64	0.00	128.00	10.00	0.00	-103.00	7753.44	16.800
2:37:40	59.9790	3757.77	350.00	-337.64	0.00	128.00	10.00	0.00	-103.00	7753.44	16.800
2:37:42	59.9790	3757.77	350.00	-337.64	0.00	128.00	10.00	0.00	-103.00	7753.44	16.800
2:37:44	59.9740	3751.64	350.00	-337.64	0.00	128.50	10.00	0.00	-103.00	7754.43	20.801
2:37:46	59.9740	3751.64	350.00	-337.64	0.00	128.50	10.00	0.00	-103.00	7754.43	20.801
2:37:48	59.9740	3751.64	350.00	-337.64	0.00	128.50	10.00	0.00	-103.00	7754.43	20.801
2:37:50	59.9620	3759.25	350.00	-284.36	0.00	129.00	10.00	0.00	-103.00	7755.42	30.399
2:37:52	59.9620	3759.25	350.00	-284.36	0.00	129.00	10.00	0.00	-103.00	7755.42	30.399
2:37:54	59.9620	3759.25	350.00	-284.36	0.00	129.00	10.00	0.00	-103.00	7755.42	30.399
2:37:56	59.9610	3762.02	350.00	-284.36	0.00	129.50	10.00	0.00	-103.00	7756.41	31.201
2:37:58	59.9610	3762.02	350.00	-284.36	0.00	129.50	10.00	0.00	-103.00	7756.41	31.201
2:38:00	59.9610	3762.02	350.00	-284.36	0.00	129.50	10.00	0.00	-103.00	7756.41	31.201
2:38:02	59.9590	3763.86	350.00	-284.36	0.00	130.00	10.00	0.00	-103.00	7757.40	32.800
2:38:04	59.9590	3763.86	350.00	-284.36	0.00	130.00	10.00	0.00	-103.00	7757.40	32.800
2:38:06	59.9590	3763.86	350.00	-284.36	0.00	130.00	10.00	0.00	-103.00	7757.40	32.800
2:38:08	59.9530	3768.34	350.00	-284.36	0.00	130.50	10.00	0.00	-103.00	7758.39	37.601
2:38:10	59.9530	3768.34	350.00	-284.36	0.00	130.50	10.00	0.00	-103.00	7758.39	37.601
2:38:12	59.9530	3768.34	350.00	-284.36	0.00	130.50	10.00	0.00	-103.00	7758.39	37.601
2:38:14	59.9560	3765.61	350.00	-284.36	0.00	131.00	10.00	0.00	-103.00	7759.38	35.199
2:38:16	59.9560	3765.61	350.00	-284.36	0.00	131.00	10.00	0.00	-103.00	7759.38	35.199
2:38:18	59.9560	3765.61	350.00	-284.36	0.00	131.00	10.00	0.00	-103.00	7759.38	35.199
2:38:20	59.9610	3761.92	350.00	-260.47	0.00	131.50	10.00	0.00	-103.00	7760.37	31.201
2:38:22	59.9610	3761.92	350.00	-260.47	0.00	131.50	10.00	0.00	-103.00	7760.37	31.201
2:38:24	59.9610	3761.92	350.00	-260.47	0.00	131.50	10.00	0.00	-103.00	7760.37	31.201
2:38:26	59.9630	3752.43	350.00	-260.47	0.00	132.00	10.00	0.00	-103.00	7761.36	29.599
2:38:28	59.9630	3752.43	350.00	-260.47	0.00	132.00	10.00	0.00	-103.00	7761.36	29.599
2:38:30	59.9630	3752.43	350.00	-260.47	0.00	132.00	10.00	0.00	-103.00	7761.36	29.599

2:38:32	59.9680	3753.51	350.00	-260.47	0.00	132.50	10.00	0.00	-103.00	7762.35	25.601
2:38:34	59.9680	3753.51	350.00	-260.47	0.00	132.50	10.00	0.00	-103.00	7762.35	25.601
2:38:36	59.9680	3753.51	350.00	-260.47	0.00	132.50	10.00	0.00	-103.00	7762.35	25.601
2:38:38	59.9730	3753.18	350.00	-260.47	0.00	133.00	10.00	0.00	-103.00	7763.34	21.600
2:38:40	59.9730	3753.18	350.00	-260.47	0.00	133.00	10.00	0.00	-103.00	7763.34	21.600
2:38:42	59.9730	3753.18	350.00	-260.47	0.00	133.00	10.00	0.00	-103.00	7763.34	21.600
2:38:44	59.9670	3752.87	350.00	-260.47	0.00	133.50	10.00	0.00	-103.00	7764.33	26.401
2:38:46	59.9670	3752.87	350.00	-260.47	0.00	133.50	10.00	0.00	-103.00	7764.33	26.401
2:38:48	59.9670	3752.87	350.00	-260.47	0.00	133.50	10.00	0.00	-103.00	7764.33	26.401
2:38:50	59.9760	3747.48	350.00	-253.14	0.00	134.00	10.00	0.00	-103.00	7765.32	19.199
2:38:52	59.9760	3747.48	350.00	-253.14	0.00	134.00	10.00	0.00	-103.00	7765.32	19.199
2:38:54	59.9760	3747.48	350.00	-253.14	0.00	134.00	10.00	0.00	-103.00	7765.32	19.199
2:38:56	59.9730	3746.65	350.00	-253.14	0.00	134.50	10.00	0.00	-103.00	7766.31	21.600
2:38:58	59.9730	3746.65	350.00	-253.14	0.00	134.50	10.00	0.00	-103.00	7766.31	21.600
2:39:00	59.9730	3746.65	350.00	-253.14	0.00	134.50	10.00	0.00	-103.00	7766.31	21.600
2:39:02	59.9810	3741.62	350.00	-253.14	0.00	135.00	10.00	0.00	-103.00	7767.30	15.201
2:39:04	59.9810	3741.62	350.00	-253.14	0.00	135.00	10.00	0.00	-103.00	7767.30	15.201
2:39:06	59.9810	3741.62	350.00	-253.14	0.00	135.00	10.00	0.00	-103.00	7767.30	15.201
2:39:08	59.9820	3738.90	350.00	-253.14	0.00	135.50	10.00	0.00	-103.00	7768.29	14.401
2:39:10	59.9820	3738.90	350.00	-253.14	0.00	135.50	10.00	0.00	-103.00	7768.29	14.401
2:39:12	59.9820	3738.90	350.00	-253.14	0.00	135.50	10.00	0.00	-103.00	7768.29	14.401
2:39:14	59.9820	3736.31	350.00	-253.14	0.00	136.00	10.00	0.00	-103.00	7769.28	14.401
2:39:16	59.9820	3736.31	350.00	-253.14	0.00	136.00	10.00	0.00	-103.00	7769.28	14.401
2:39:18	59.9820	3736.31	350.00	-253.14	0.00	136.00	10.00	0.00	-103.00	7769.28	14.401
2:39:20	59.9800	3735.65	350.00	-251.93	0.00	136.50	10.00	0.00	-103.00	7770.27	16.000
2:39:22	59.9800	3735.65	350.00	-251.93	0.00	136.50	10.00	0.00	-103.00	7770.27	16.000
2:39:24	59.9800	3735.65	350.00	-251.93	0.00	136.50	10.00	0.00	-103.00	7770.27	16.000
2:39:26	59.9800	3736.75	350.00	-251.93	0.00	137.00	10.00	0.00	-103.00	7771.26	16.000
2:39:28	59.9800	3736.75	350.00	-251.93	0.00	137.00	10.00	0.00	-103.00	7771.26	16.000
2:39:30	59.9800	3736.75	350.00	-251.93	0.00	137.00	10.00	0.00	-103.00	7771.26	16.000
2:39:32	59.9780	3736.09	350.00	-251.93	0.00	137.50	10.00	0.00	-103.00	7772.25	17.599
2:39:34	59.9780	3736.09	350.00	-251.93	0.00	137.50	10.00	0.00	-103.00	7772.25	17.599
2:39:36	59.9780	3736.09	350.00	-251.93	0.00	137.50	10.00	0.00	-103.00	7772.25	17.599
2:39:38	59.9710	3738.87	350.00	-251.93	0.00	138.00	10.00	0.00	-103.00	7773.24	23.199
2:39:40	59.9710	3738.87	350.00	-251.93	0.00	138.00	10.00	0.00	-103.00	7773.24	23.199
2:39:42	59.9710	3738.87	350.00	-251.93	0.00	138.00	10.00	0.00	-103.00	7773.24	23.199
2:39:44	59.9750	3737.68	350.00	-251.93	0.00	138.50	10.00	0.00	-103.00	7774.23	20.001
2:39:46	59.9750	3737.68	350.00	-251.93	0.00	138.50	10.00	0.00	-103.00	7774.23	20.001
2:39:48	59.9750	3737.68	350.00	-251.93	0.00	138.50	10.00	0.00	-103.00	7774.23	20.001
2:39:50	59.9690	3740.02	350.00	-250.67	0.00	139.00	10.00	0.00	-103.00	7775.22	24.799
2:39:52	59.9690	3740.02	350.00	-250.67	0.00	139.00	10.00	0.00	-103.00	7775.22	24.799
2:39:54	59.9690	3740.02	350.00	-250.67	0.00	139.00	10.00	0.00	-103.00	7775.22	24.799
2:39:56	59.9720	3742.42	350.00	-250.67	0.00	139.50	10.00	0.00	-103.00	7776.21	22.400
2:39:58	59.9720	3742.42	350.00	-250.67	0.00	139.50	10.00	0.00	-103.00	7776.21	22.400
2:40:00	59.9720	3742.42	350.00	-250.67	0.00	139.50	10.00	0.00	-103.00	7776.21	22.400
2:40:02	59.9770	3741.72	350.00	-250.67	0.00	140.00	10.00	0.00	-103.00	7777.20	18.399

2:40:04	59.9770	3741.72	350.00	-250.67	0.00	140.00	10.00	0.00	-103.00	7777.20	18.399
2:40:06	59.9770	3741.72	350.00	-250.67	0.00	140.00	10.00	0.00	-103.00	7777.20	18.399
2:40:08	59.9760	3739.96	350.00	-250.67	0.00	140.50	10.00	0.00	-103.00	7778.19	19.199
2:40:10	59.9760	3739.96	350.00	-250.67	0.00	140.50	10.00	0.00	-103.00	7778.19	19.199
2:40:12	59.9760	3739.96	350.00	-250.67	0.00	140.50	10.00	0.00	-103.00	7778.19	19.199
2:40:14	59.9770	3741.27	350.00	-250.67	0.00	141.00	10.00	0.00	-103.00	7779.18	18.399
2:40:16	59.9770	3741.27	350.00	-250.67	0.00	141.00	10.00	0.00	-103.00	7779.18	18.399
2:40:18	59.9770	3741.27	350.00	-250.67	0.00	141.00	10.00	0.00	-103.00	7779.18	18.399
2:40:20	59.9790	3738.71	350.00	-253.63	0.00	141.50	10.00	0.00	-103.00	7780.17	16.800
2:40:22	59.9790	3738.71	350.00	-253.63	0.00	141.50	10.00	0.00	-103.00	7780.17	16.800
2:40:24	59.9790	3738.71	350.00	-253.63	0.00	141.50	10.00	0.00	-103.00	7780.17	16.800
2:40:26	59.9740	3738.10	350.00	-253.63	0.00	142.00	10.00	0.00	-103.00	7781.16	20.801
2:40:28	59.9740	3738.10	350.00	-253.63	0.00	142.00	10.00	0.00	-103.00	7781.16	20.801
2:40:30	59.9740	3738.10	350.00	-253.63	0.00	142.00	10.00	0.00	-103.00	7781.16	20.801
2:40:32	59.9710	3743.42	350.00	-253.63	0.00	142.50	10.00	0.00	-103.00	7782.15	23.199
2:40:34	59.9710	3743.42	350.00	-253.63	0.00	142.50	10.00	0.00	-103.00	7782.15	23.199
2:40:36	59.9710	3743.42	350.00	-253.63	0.00	142.50	10.00	0.00	-103.00	7782.15	23.199
2:40:38	59.9660	3747.34	350.00	-253.63	0.00	143.00	10.00	0.00	-103.00	7783.14	27.200
2:40:40	59.9660	3747.34	350.00	-253.63	0.00	143.00	10.00	0.00	-103.00	7783.14	27.200
2:40:42	59.9660	3747.34	350.00	-253.63	0.00	143.00	10.00	0.00	-103.00	7783.14	27.200
2:40:44	59.9730	3746.22	350.00	-253.63	0.00	143.50	10.00	0.00	-103.00	7784.13	21.600
2:40:46	59.9730	3746.22	350.00	-253.63	0.00	143.50	10.00	0.00	-103.00	7784.13	21.600
2:40:48	59.9730	3746.22	350.00	-253.63	0.00	143.50	10.00	0.00	-103.00	7784.13	21.600
2:40:50	59.9720	3743.15	350.00	-246.96	0.00	144.00	10.00	0.00	-103.00	7785.12	22.400
2:40:52	59.9720	3743.15	350.00	-246.96	0.00	144.00	10.00	0.00	-103.00	7785.12	22.400
2:40:54	59.9720	3743.15	350.00	-246.96	0.00	144.00	10.00	0.00	-103.00	7785.12	22.400
2:40:56	59.9700	3733.38	350.00	-246.96	0.00	144.50	10.00	0.00	-103.00	7786.11	23.999
2:40:58	59.9700	3733.38	350.00	-246.96	0.00	144.50	10.00	0.00	-103.00	7786.11	23.999
2:41:00	59.9700	3733.38	350.00	-246.96	0.00	144.50	10.00	0.00	-103.00	7786.11	23.999
2:41:02	59.9820	3736.23	350.00	-246.96	0.00	145.00	10.00	0.00	-103.00	7787.10	14.401
2:41:04	59.9820	3736.23	350.00	-246.96	0.00	145.00	10.00	0.00	-103.00	7787.10	14.401
2:41:06	59.9820	3736.23	350.00	-246.96	0.00	145.00	10.00	0.00	-103.00	7787.10	14.401
2:41:08	59.9850	3733.12	350.00	-246.96	0.00	145.50	10.00	0.00	-103.00	7788.09	12.000
2:41:10	59.9850	3733.12	350.00	-246.96	0.00	145.50	10.00	0.00	-103.00	7788.09	12.000
2:41:12	59.9850	3733.12	350.00	-246.96	0.00	145.50	10.00	0.00	-103.00	7788.09	12.000
2:41:14	59.9890	3725.46	350.00	-246.96	0.00	146.00	10.00	0.00	-103.00	7789.08	8.801
2:41:16	59.9890	3725.46	350.00	-246.96	0.00	146.00	10.00	0.00	-103.00	7789.08	8.801
2:41:18	59.9890	3725.46	350.00	-246.96	0.00	146.00	10.00	0.00	-103.00	7789.08	8.801
2:41:20	59.9900	3720.94	350.00	-254.54	0.00	146.50	10.00	0.00	-103.00	7790.07	7.999
2:41:22	59.9900	3720.94	350.00	-254.54	0.00	146.50	10.00	0.00	-103.00	7790.07	7.999
2:41:24	59.9900	3720.94	350.00	-254.54	0.00	146.50	10.00	0.00	-103.00	7790.07	7.999
2:41:26	60.0010	3727.75	350.00	-254.54	0.00	147.00	10.00	0.00	-103.00	7791.06	-0.800
2:41:28	60.0010	3727.75	350.00	-254.54	0.00	147.00	10.00	0.00	-103.00	7791.06	-0.800
2:41:30	60.0010	3727.75	350.00	-254.54	0.00	147.00	10.00	0.00	-103.00	7791.06	-0.800
2:41:32	60.0060	3727.23	350.00	-254.54	0.00	147.50	10.00	0.00	-103.00	7792.05	-4.800
2:41:34	60.0060	3727.23	350.00	-254.54	0.00	147.50	10.00	0.00	-103.00	7792.05	-4.800

2:41:36	60.0060	3727.23	350.00	-254.54	0.00	147.50	10.00	0.00	-103.00	7792.05	-4.800
2:41:38	60.0190	3726.02	350.00	-254.54	0.00	148.00	10.00	0.00	-103.00	7793.04	-15.201
2:41:40	60.0190	3726.02	350.00	-254.54	0.00	148.00	10.00	0.00	-103.00	7793.04	-15.201
2:41:42	60.0190	3726.02	350.00	-254.54	0.00	148.00	10.00	0.00	-103.00	7793.04	-15.201
2:41:44	60.0260	3717.33	350.00	-254.54	0.00	148.50	10.00	0.00	-103.00	7794.03	-20.801
2:41:46	60.0260	3717.33	350.00	-254.54	0.00	148.50	10.00	0.00	-103.00	7794.03	-20.801
2:41:48	60.0260	3717.33	350.00	-254.54	0.00	148.50	10.00	0.00	-103.00	7794.03	-20.801
2:41:50	60.0290	3715.17	350.00	-256.57	0.00	149.00	10.00	0.00	-103.00	7795.02	-23.199
2:41:52	60.0290	3715.17	350.00	-256.57	0.00	149.00	10.00	0.00	-103.00	7795.02	-23.199
2:41:54	60.0290	3715.17	350.00	-256.57	0.00	149.00	10.00	0.00	-103.00	7795.02	-23.199
2:41:56	60.0370	3710.16	350.00	-256.57	0.00	149.50	10.00	0.00	-103.00	7796.01	-29.599
2:41:58	60.0370	3710.16	350.00	-256.57	0.00	149.50	10.00	0.00	-103.00	7796.01	-29.599
2:42:00	60.0370	3710.16	350.00	-256.57	0.00	149.50	10.00	0.00	-103.00	7796.01	-29.599
2:42:02	60.0410	3704.59	350.00	-256.57	0.00	150.00	10.00	0.00	-103.00	7797.00	-32.800
2:42:04	60.0410	3704.59	350.00	-256.57	0.00	150.00	10.00	0.00	-103.00	7797.00	-32.800
2:42:06	60.0410	3704.59	350.00	-256.57	0.00	150.00	10.00	0.00	-103.00	7797.00	-32.800
2:42:08	60.0430	3701.32	350.00	-256.57	0.00	150.50	10.00	0.00	-103.00	7797.99	-34.399
2:42:10	60.0430	3701.32	350.00	-256.57	0.00	150.50	10.00	0.00	-103.00	7797.99	-34.399
2:42:12	60.0430	3701.32	350.00	-256.57	0.00	150.50	10.00	0.00	-103.00	7797.99	-34.399
2:42:14	60.0460	3699.73	350.00	-256.57	0.00	151.00	10.00	0.00	-103.00	7798.98	-36.801
2:42:16	60.0460	3699.73	350.00	-256.57	0.00	151.00	10.00	0.00	-103.00	7798.98	-36.801
2:42:18	60.0460	3699.73	350.00	-256.57	0.00	151.00	10.00	0.00	-103.00	7798.98	-36.801
2:42:20	60.0430	3696.86	350.00	-258.37	0.00	151.50	10.00	0.00	-103.00	7799.97	-34.399
2:42:22	60.0430	3696.86	350.00	-258.37	0.00	151.50	10.00	0.00	-103.00	7799.97	-34.399
2:42:24	60.0430	3696.86	350.00	-258.37	0.00	151.50	10.00	0.00	-103.00	7799.97	-34.399

Date:	Monday, October 12, 2009				
Time of T(0)	2:27:24				
ncy Recovery to 60 Hz or Pre-Perturbation Hz	2:33:06				Time of Frequency Recovery to 60 Hz or Pre-P
urbation Average Frequency [T(-2) to T(-16)]	60.0420	Hz			Value A Pre-Perturbation Average Frequency [T
rbation Average Frequency [T(+12 to T(+24)]	59.8797	Hz			Value B Post-Perturbation Average Frequency [T
to Post Perturbation Delta Frequency Actual	-0.162	Hz			Pre to Post Perturbation Delta Fre
on Average Interchange MW [T(-2) to T(-16)]	3645.04	MW			Value A Pre-Perturbation Average Interchange MW [T
n Average Interchange MW [T(+12 to T(+24)]	3768.23	MW			Value B Post-Perturbation Average Interchange MW [T
st Perturbation Interchange Delta MW Actual	123.19	MW			Pre to Post Perturbation Interchange De
Net Total Adjustments	-52.67	MW			Net Tot
EPFR for FRO Pre-Perturbation Average	-33.60	MW			EPFR for FRO Pre-Perturl
EPFR for FRO Post-Perturbation Average	96.23	MW			EPFR for FRO Post-Perturl
EPFR for FRO Delta	129.83	MW			EPFI
EPFR for FRO Adjusted	77.15	MW			EPFR fo
Pre JOU Dynamic Schedules MW	350.00		Pre-Perturbation Bias Setting	-103.000 MW/0.1 Hz	Pre JOU Dynamic
Pre Non-Conforming Load MW	-165.48		Post-Perturbation Bias Setting	-103.000 MW/0.1 Hz	Pre Non-Confor
Pre Pumped Hydro MW	0.00		EPFR for Bias Setting Pre-Perturbation Average	-43.2598 MW	Pre Pump
Pre Ramping Units MW	76.06		EPFR for Bias Setting Post-Perturbation Average	123.8941 MW	Pre Ram
Pre Transferred Frequency Response MW	-4.20		EPFR for Bias Setting Delta	167.1540 MW	Pre Transferred Frequency
Pre Contingent BA Lost Generation MW	15.00		Primary Frequency Response Delivery of Bias	73.70%	Pre Contingent BA Lost G
Sum of Pre Perturbation Adjustments	271.39				Sum of Pre Perturbatio
Post JOU Dynamic Schedules MW	335.00		Pre-Perturbation BA Load	7650.604 MW	Post JOU Dynamic
Post Non-Conforming Load MW	-206.46		Post-Perturbation BA Load	7631.714 MW	Post Non-Confor
Post Pumped Hydro MW	0.00		Pre to Post Perturbation BA Load Change	-18.889 MW	Post Pump
Post Ramping Units MW	78.14		Load Dampening Frequency Response	-11.640 MW/0.1 Hz	Post Ram
Post Transferred Frequency Response MW	12.03		Load Dampening % of Total BA Frequency Response	15.33%	Post Transferred Frequency
Post Contingent BA Lost Generation MW	0.00				Post Contingent BA Lost G
Sum of Post Perturbation Adjustments	218.71				Sum of Post Perturbatio
Net Total Adjustments MW	-52.67				Net Total Ad

Average Period Evaluation

Initial P.U. Performance for FRO	0.949	P.U.
Initial P.U. Performance Adjusted for FRO	1.355	P.U.

Net Actual Interchange MW	JOU Dynamic Schedules Imp(-) Exp (+) MW	Non-Conforming Load Load (-) MW	Pumped Hydro Load (-) Gen (+) MW	Ramping Units Gen (+) MW	Transferred Frequency Response Rec (-) Del (+) MW/0.1 Hz	Contingent BA Lost Generation Load (-) Gen (+) MW	BA Bias Setting MW/0.1 Hz	BA Load MW	EPFR MW	Expected Net Actual Interchange MW

18 to 30 second Average Period Evalu

Initial P.U. Perfor		
Initial P.U. Performance Ac		

T	Frequency Hz	Net Actual Interchange MW	JOU Dynamic Schedules Imp(-) Exp (+) MW
T-72 sec	2:26:12		
T-70 sec	2:26:14		
T-68 sec	2:26:16		

										T-66 sec	2:26:18				
										T-64 sec	2:26:20				
										T-62 sec	2:26:22				
										T-60 sec	2:26:24				
										T-58 sec	2:26:26				
										T-56 sec	2:26:28				
										T-54 sec	2:26:30				
										T-52 sec	2:26:32				
										T-50 sec	2:26:34				
										T-48 sec	2:26:36				
										T-46 sec	2:26:38				
										T-44 sec	2:26:40				
										T-42 sec	2:26:42				
										T-40 sec	2:26:44				
										T-38 sec	2:26:46				
										T-36 sec	2:26:48				
										T-34 sec	2:26:50				
										T-32 sec	2:26:52				
										T-30 sec	2:26:54				
										T-28 sec	2:26:56				
										T-26 sec	2:26:58				
										T-24 sec	2:27:00				
										T-22 sec	2:27:02				
										T-20 sec	2:27:04				
										T-18 sec	2:27:06				
3645.041	350.000	-165.476	0.000	76.063	10.000	15.000	-103.000	7650.604	-33.600		T-16 sec	2:27:08	60.042	3645.041	350.000
3645.041	350.000	-165.476	0.000	76.063	10.000	15.000	-103.000	7650.604	-33.600		T-14 sec	2:27:10	60.042	3645.041	350.000
3645.041	350.000	-165.476	0.000	76.063	10.000	15.000	-103.000	7650.604	-33.600		T-12 sec	2:27:12	60.042	3645.041	350.000
3645.041	350.000	-165.476	0.000	76.063	10.000	15.000	-103.000	7650.604	-33.600		T-10 sec	2:27:14	60.042	3645.041	350.000
3645.041	350.000	-165.476	0.000	76.063	10.000	15.000	-103.000	7650.604	-33.600		T-08 sec	2:27:16	60.042	3645.041	350.000
3645.041	350.000	-165.476	0.000	76.063	10.000	15.000	-103.000	7650.604	-33.600		T-06 sec	2:27:18	60.042	3645.041	350.000
3645.041	350.000	-165.476	0.000	76.063	10.000	15.000	-103.000	7650.604	-33.600		T-04 sec	2:27:20	60.042	3645.041	350.000
3645.041	350.000	-165.476	0.000	76.063	10.000	15.000	-103.000	7650.604	-33.600		T-02 sec	2:27:22	60.042	3645.041	350.000
											T+0 sec	2:27:24			
											T+02 sec	2:27:26			
											T+04 sec	2:27:28			
											T+06 sec	2:27:30			
											T+08 sec	2:27:32			
											T+10 sec	2:27:34			
3768.229	335.000	-206.459	0.000	78.143	10.000	0.000	-103.000	7631.714	96.228	3722.195	T+12 sec	2:27:36			
3768.229	335.000	-206.459	0.000	78.143	10.000	0.000	-103.000	7631.714	96.228	3722.195	T+14 sec	2:27:38			
3768.229	335.000	-206.459	0.000	78.143	10.000	0.000	-103.000	7631.714	96.228	3722.195	T+16 sec	2:27:40			
3768.229	335.000	-206.459	0.000	78.143	10.000	0.000	-103.000	7631.714	96.228	3722.195	T+18 sec	2:27:42	59.883	3780.420	335.000
3768.229	335.000	-206.459	0.000	78.143	10.000	0.000	-103.000	7631.714	96.228	3722.195	T+20 sec	2:27:44	59.883	3780.420	335.000
3768.229	335.000	-206.459	0.000	78.143	10.000	0.000	-103.000	7631.714	96.228	3722.195	T+22 sec	2:27:46	59.883	3780.420	335.000
3768.229	335.000	-206.459	0.000	78.143	10.000	0.000	-103.000	7631.714	96.228	3722.195	T+24 sec	2:27:48	59.883	3780.420	335.000

T+26 sec	2:27:50	59.883	3780.420	335.000
T+28 sec	2:27:52	59.883	3780.420	335.000
T+30 sec	2:27:54	59.883	3780.420	335.000
T+32 sec	2:27:56			
T+34 sec	2:27:58			
T+36 sec	2:28:00			
T+38 sec	2:28:02			
T+40 sec	2:28:04			
T+42 sec	2:28:06			
T+44 sec	2:28:08			
T+46 sec	2:28:10			
T+48 sec	2:28:12			
T+50 sec	2:28:14			
T+52 sec	2:28:16			
T+54 sec	2:28:18			
T+56 sec	2:28:20			
T+58 sec	2:28:22			
T+60 sec	2:28:24			
T+62 sec	2:28:26			
T+64 sec	2:28:28			
T+66 sec	2:28:30			
T+68 sec	2:28:32			
T+70 sec	2:28:34			
T+72 sec	2:28:36			
T+74 sec	2:28:38			
T+76 sec	2:28:40			
T+78 sec	2:28:42			
T+80 sec	2:28:44			