

Consideration of Comments

Project 2007-09 Generator Verification PRC-024-1

The Project 2007-09 Generator Verification Standard Drafting Team (GVSDT) thanks all commenters who submitted comments on the proposed revisions to PRC-024-1. The standard was posted for a 30-day public comment period from September 28, 2012 through October 31, 2012. Stakeholders were asked to provide feedback on the standard and associated documents through a special electronic comment form. There were 54 sets of comments, including comments from approximately 149 different people from approximately 78 companies representing 9 of the 10 Industry Segments as shown in the table on the following pages.

All comments submitted may be reviewed in their original format on the standard's [project page](#).

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, Mark Lauby, at 404-446-2560 or at mark.lauby@nerc.net. In addition, there is a NERC Reliability Standards Appeals Process.¹

¹ The appeals process is in the Standard Processes Manual: http://www.nerc.com/files/Appendix_3A_StandardsProcessesManual_20120131.pdf

Summary Consideration

During the last posting period, the GVSDT had revised the VRFs for Requirements R1, R2 and the original R5 to “medium” and asked stakeholders if they agreed with the proposed VRFs. The GVSDT did not receive any comments on this revision and all stakeholders agreed with the revised VRFs.

The GVSDT revised R4 to improve clarity. A majority of the stakeholders agreed that the revision had improved clarity. Some stakeholders were still unclear if the activities described in this requirement were to be performed by request only, so the SDT rearranged the sentences to make that more clear. Some stakeholders pointed out the RCs and TOPs can request such information via requirements in other standards (IRO-010-1a and TOP-003-2), so these two functional entities were removed from this requirement.

Based on comments from a majority of stakeholders, Requirement R5 (along with its associated Measure M5 and VSL’s) was removed from the Standard. The SDT believes that Requirement R4 achieves the reliability objective of Paragraph 1787 of FERC Order 693 that Requirement R5 was written to address. Other changes were made in response to comments from several stakeholders including:

- Additional wording in the Effective Date section for jurisdictions where regulatory approval is required to address the situation in some Canadian provinces.
- A modification to the high frequency allowable trip point in Attachment 1 for the Eastern and ERCOT Interconnections to match IEEE and IEC standards for generator manufacturers.
- A modification to the final voltage value of the low voltage curve and time duration of Attachment 2 to coordinate with the requirements of PRC-025 Generator Relay Loadability.
- Rearrangement of the sentences in Requirement R4 to better clarify that developing the estimate of performance is to be done only on request of certain planning entities.
- Removal of the Reliability Coordinator and Transmission Operator from the list of functional entities who can request a performance estimate in Requirement R4 and protection settings information in Requirement R6 to eliminate duplication with standards IRO-010 and TOP-003.
- Various wording changes made to improve consistent use of terminology and to improve readability.

Several stakeholders pointed out that a portion of the allowable high frequency trip curve for the Eastern, ERCOT, and Quebec Interconnections (Attachment 1) exceeded the off-nominal frequency limits in IEEE C50.13 and IEC 60034 that are used by equipment manufacturers to design generators.

The drafting team revised the high frequency portion of the curve from zero to two seconds for the Eastern and ERCOT Interconnections to meet the IEEE and IEC standards. This leaves no margin between the high frequency allowance for UFLS designers in frequency overshoot for that amount of time, but the drafting team feels this is acceptable.

Index to Questions, Comments, and Responses

- 1. The GVSDT revised the VRFs for Requirements R1, R2 and R5 to “medium”. Do you agree with this revision? If not, please explain in the comment area below. 13
- 2. The GVSDT revised R4 to improve clarity. Do you agree with this revision? If not, please explain in the comment area below. 16
- 3. Do you have any other comment, not expressed in questions above, for the GVSDT?..... 28

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.	Alan Adamson	New York State Reliability Council, LLC	NPCC	10									
2.	Carmen Agavrioloi	Independent Electricity System Operator	NPCC	2									
3.	Greg Campoli	New York Independent Electricity System Operator	NPCC	2									
4.	Sylvain Clermont	Hydro-Quebec TransEnergie	NPCC	1									
5.	Chris de Graffenried	Consolidated Edison Co. of New York, Inc.	NPCC	1									
6.	Gerry Dunbar	Northeast Power Coordinating Council	NPCC	10									
7.	Mike Garton	Dominion Resources Services, Inc.	NPCC	5									
8.	Kathleen Goodman	ISO - New England	NPCC	2									
9.	Michael Jones	National Grid	NPCC	1									
10.	David Kiguel	Hydro One Networks Inc.	NPCC	1									
11.	Michael Lombardi	Northeast Utilities	NPCC	1									
12.	Randy MacDonald	New Brunswick Power Transmission	NPCC	9									
13.	Bruce Metruck	New York Power Authority	NPCC	6									
14.	Silvia Parada Mitchell	NextEra Energy, LLC	NPCC	5									
15.	Lee Pedowicz	Northeast Power Coordinating Council	NPCC	10									
16.	Robert Pellegrini	The United Illuminating Company	NPCC	1									
17.	Si-Truc Phan	Hydro-Quebec TransEnergie	NPCC	1									
18.	David Ramkalawan	Ontario Power Generation, Inc.	NPCC	5									
19.	Brian Robinson	Utility Services	NPCC	8									
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									
3.	Group	David Thorne	Pepco Holdings Inc		X		X						
	Additional Member	Additional Organization	Region	Segment Selection									
1.	Carl Kinsley	Delmarva Power & Light	RFC	1, 3									
4.	Group	Chris Higgins	Bonneville Power Administration		X		X		X	X			
	Additional Member	Additional Organization	Region	Segment Selection									
1.	Jim Burns	Technical Operations	WECC	1									

Group/Individual		Commenter	Organization	Registered Ballot Body Segment									
				1	2	3	4	5	6	7	8	9	10
2. Chuck Matthews		Transmission Planning	WECC	1									
3. Erika Doot		Generation Support	WECC	3, 5, 6									
5.	Group	ryan millard	pacificorp	X		X		X	X				
No additional members listed.													
6.	Group	Brandy Spraker	Tennessee Valley Authority	X		X		X	X				
Additional Member				Additional Organization				Region		Segment Selection			
1.	Ian Grant		SERC	3									
2.	Marjorie Parsons		SERC	6									
3.	David Thompson		SERC	5									
4.	Dewayne Scott		SERC	1									
5.	Tom Vandervort		SERC	5									
6.	Annette Dudley		SERC	5									
7.	Paul Palmer		SERC	5									
8.	George Pitts		SERC	1									
9.	Robert Bottoms		SERC	1									
10.	David Marler		SERC	1									
7.	Group	Shammara Hasty	Southern Company	X		X		X	X				
No additional members listed.													
8.	Group	Steve Rueckert	Western Electricity Coordinating Council										
No additional members listed.													
9.	Group	Larry Raczkowski	FirstEnergy	X		X	X	X	X				
Additional Member				Additional Organization				Region		Segment Selection			
1.	William J Smith		FirstEnergy Corp	RFC	1								
2.	Steve Kern		FE Energy Delivery	RFC	3								
3.	Doug Hohlbaugh		Ohio Edison	RFC	4								
4.	Ken Dresner		FirstEnergy Solutions	RFC	5								
5.	Kevin Querry		FirstEnergy Solutions	RFC	6								
10.	Group	Mike Garton	Dominion	X		X		X	X				
Additional Member				Additional Organization				Region		Segment Selection			
1.	Louis Slade		Dominion Resources Services, Inc.	RFC	5, 6								

Group/Individual	Commenter	Organization	Registered Ballot Body Segment											
			1	2	3	4	5	6	7	8	9	10		
2. Randi Heise	Dominion Resources Services, Inc.	NPCC	5, 6											
3. Connie Lowe	Dominion Resources Services, Inc.	MRO	5, 6											
4. Michael Crowley	Virginia Electric and Power Company	SERC	1, 3, 5, 6											
11. Group	paul haase	seattle city light		X		X	X	X	X					
Additional Member	Additional Organization	Region	Segment Selection											
1. pawel	krupa	WECC	1											
2. dana	wheelock	WECC	3											
3. hao	li	WECC	4											
4. mike	haynes	WECC	5											
5. dennis	sismaet	WECC	6											
12. Group	E Scott Miller	MEAG Power		X		X		X						
Additional Member	Additional Organization	Region	Segment Selection											
1. Steve Jackson	MEAG Power	SERC	3											
2. Steve Grego	MEAG Power	SERC	5											
3. Danny Dees	MEAG Power	SERC	1											
13. Group	Thomas McElhinney	JEA		X		X		X						
Additional Member	Additional Organization	Region	Segment Selection											
1. Ted Hobson		FRCC	1											
2. Garry Baker		FRCC	3											
3. John Babik		FRCC	5											
14. Group	Brenda Hampton	Luminant							X					
Additional Member	Additional Organization	Region	Segment Selection											
1. Mike Laney	Luminant Generation Company, LLC	ERCOT	5											
15. Group	Jason Marshall	ACES Power Marketing Standards Collaborators							X					
Additional Member	Additional Organization	Region	Segment Selection											
1. John Shaver	Arizona Electric Power Cooperative	WECC	4, 5											
2. John Shaver	Southwest Transmission Cooperative	WECC	1											
3. Tom Alban	Buckeye Power	RFC	3, 4											
4. Michael Brytowski	Great River Energy	MRO	1, 3, 5, 6											

Group/Individual		Commenter	Organization	Registered Ballot Body Segment									
				1	2	3	4	5	6	7	8	9	10
5. Shari Heino		Brazos Electric Power Cooperative	ERCOT 1, 5										
6. Megan Wagner		Sunflower Electric Power Corporation	SPP 1										
7. David Sofra		North Carolina Electric Membership Corporation	SERC 1, 3, 4, 5										
16.	Group	Stephen J. Berger	PPL Corporation NERC Registered Affiliates			X		X	X				
	Additional Member	Additional Organization	Region	Segment Selection									
	1. Brenda L. Truhe	PPL Electric Utilities Corporation	RFC	1									
	2. Brent Ingebrigtsen	LG&E KU Services Company	SERC	3									
	3. Annette M. Bannon	PPL Generation, LLC on behalf of its Supply NERC Registered Entities	RFC	5									
	4.		WECC	5									
	5. Elizabeth A. Davis	PPL EnergyPlus, LLC	MRO	6									
	6.		NPCC	6									
	7.		SERC	6									
	8.		SPP	6									
	9.		RFC	6									
	10.		WECC	6									
17.	Group	David Dockery, NERC Reliability Compliance Coordinator	Associated Electric Cooperative, Inc. - JRO00088	X		X		X	X				
	Additional Member	Additional Organization	Region	Segment Selection									
	1. Central Electric Power Cooperative		SERC	1, 3									
	2. KAMO Electric Cooperative		SERC	1, 3									
	3. M & A Electric Power Cooperative		SERC	1, 3									
	4. Northeast Missouri Electric Power Cooperative		SERC	1, 3									
	5. N.W. Electric Power Cooperative, Inc.		SERC	1, 3									
	6. Sho-Me Power Electric Cooperative		SERC	1, 3									
18.	Group	Greg Rowland	Duke Energy	X		X		X	X				
	Additional Member	Additional Organization	Region	Segment Selection									
	1. Doug Hils	Duke Energy	RFC	1									
	2. Lee Schuster	Duke Energy	FRCC	3									
	3. Dale Goodwine	Duke Energy	SERC	5									

Group/Individual		Commenter	Organization	Registered Ballot Body Segment									
				1	2	3	4	5	6	7	8	9	10
4. Greg Cecil		Duke Energy	RFC 6										
19.	Group	Al DiCaprio Chair	ISO RTO Council Standards Review Committee		X								
Additional Member		Additional Organization	Region	Segment Selection									
1.	Greg Campoli	NYISO	NPCC	2									
2.	Ben Li	IESO	NPCC	2									
3.	Bill Phillips	MISO	RFC	2									
4.	Charles Yeung	SPP	SPP	2									
5.	Matthew Goldberg	ISONE	NPCC	2									
6.	Steve Myers	ERCOT	ERCOT	2									
7.	Ali Miremadi	CAISO	WECC	2									
20.	Individual	Brian Bejcek	Wolverine Power Cooperative	X									
21.	Individual	Jim Watson	Dynegy					X					
22.	Individual	Cristina Papuc	TransAlta Centralia Generation LLC					X					
23.	Individual	Nazra Gladu	Manitoba Hydro	X		X		X	X				
24.	Individual	Carter B. Edge	SERC Reliability Corp										X
25.	Individual	Winnie Holden	PSEG	X		X		X	X				
26.	Individual	Alice Ireland	Xcel Energy	X		X		X	X				
27.	Individual	Michelle R. D'Antuono	Ingleside Cogeneration LP (voting under entity name Occidental Chemical Corporation)					X					
28.	Individual	Andrew Z. Pusztai	American Transmission Company	X									
29.	Individual	Anthony Jablonski	ReliabilityFirst										X
30.	Individual	Thad Ness	American Electric Power	X		X		X	X				
31.	Individual	Dale Fredrickson	Wisconsin Electric Power Company			X	X	X					
32.	Individual	Michael Falvo	Independent Electricity System Operator		X								
33.	Individual	Patrick Brown	Essential Power, LLC					X					
34.	Individual	Wryan Feil	Northeast Utilities	X									

Group/Individual		Commenter	Organization	Registered Ballot Body Segment									
				1	2	3	4	5	6	7	8	9	10
35.	Individual	Brian Evans-Mongeon	Utility Services								X		
36.	Individual	Mike Hirst	Cogentrix Energy					X					
37.	Individual	Mahmood Safi	Omaha Public Power District	X		X		X	X				
38.	Individual	Daniel Duff	Liberty Electric Power LLC					X					
39.	Individual	John Yale	Chelan County PUD					X					
40.	Individual	Scott Berry	Indiana Municipal Power Agency				X						
41.	Individual	Eric Salsbury	Consumers Energy			X	X	X					
42.	Individual	RoLynda Shumpert	South Carolina Electric and Gas	X		X		X	X				
43.	Individual	Eric Bakie	Idaho Power Company	X		X							
44.	Individual	Maggy Powell	Exelon Corporation and its affiliates	X		X	X	X	X				
45.	Individual	Daniela Hammons	CenterPoint Energy	X									
46.	Individual	Kirit Shah	Ameren	X		X		X	X				
47.	Individual	Don Jones	Texas Reliability Entity										X
48.	Individual	Marie Knox	MISO		X								
49.	Individual	Mary Downey	City of Redding			X	X	X	X				
50.	Individual	Joe Tarantino	SMUD	X		X	X	X	X				
51.	Individual	Tony Kroskey	Brazos Electric Power Cooperative, Inc.	X									
52.	Individual	Russell Noble	Cowlitz PUD			X	X	X					
53.	Individual	Don Schmit	Nebraska Public Power District	X		X		X					
54.	Individual	Chifong Thomas	BrightSource Energy					X					

If you support the comments submitted by another entity and would like to indicate you agree with their comments, please select "agree" below and enter the entity's name in the comment section (please provide the name of the organization, trade association, group, or committee, rather than the name of the individual submitter).

Summary Consideration:

Organization	Supporting Entity
Brazos Electric Power Cooperative, Inc.	ACES Power Marketing
Indiana Municipal Power Agency	Indiana Municipal Power Agency agrees with the comments submitted by the North American Generator Forum (NAGF) for PRC-024.
Nebraska Public Power District	MRO NSRF [MidwestReliability Organization - NERC Standards Review Forum]
Liberty Electric Power LLC	NAGF
Chelan County PUD	North American Generator Forum
City of Redding	SMUD/BANC
MEAG Power	Southern Company Services, Inc. - GenMEAG Power intended to vote NEGATIVE on this ballot. The Affirmative vote is an error. If the draft standard is not changed based upon the comments, MEAG Power will vote Negative on the Recirculation ballot.
MISO	The ISO/RTO Council's (IRC) Standards Review Committee (SRC)

1. The GVSDT revised the VRFs for Requirements R1, R2 and R5 to “medium”. Do you agree with this revision? If not, please explain in the comment area below.

Summary Consideration: All stakeholders agreed with the revised VRFs.

Organization	Yes or No	Question 1 Comment
Idaho Power Company	Yes	Idaho Power System Planning agrees with the revised VRFs for R1, R2 and R5.
Response: The SDT thanks you for your comment.		
Manitoba Hydro	Yes	None.
Southwest Power Pool Reliability Standards Development Team	Yes	
Pepco Holdings Inc	Yes	
Bonneville Power Administration	Yes	
pacificorp	Yes	
Southern Company	Yes	
FirstEnergy	Yes	
Luminant	Yes	
ACES Power Marketing Standards	Yes	

Organization	Yes or No	Question 1 Comment
Collaborators		
PPL Corporation NERC Registered Affiliates	Yes	
Associated Electric Cooperative, Inc. - JRO00088	Yes	
Duke Energy	Yes	
Wolverine Power Cooperative	Yes	
Dynergy	Yes	
TransAlta Centralia Generation LLC	Yes	
SERC Reliability Corp	Yes	
PSEG	Yes	
Xcel Energy	Yes	
Ingleside Cogeneration LP (voting under entity name Occidental Chemical Corporation)	Yes	
American Transmission Company	Yes	
Wisconsin Electric Power Company	Yes	
Independent Electricity System	Yes	

Organization	Yes or No	Question 1 Comment
Operator		
Northeast Utilities	Yes	
Omaha Public Power District	Yes	
South Carolina Electric and Gas	Yes	
Exelon Corporation and its affiliates	Yes	
Ameren	Yes	
Texas Reliability Entity	Yes	
BrightSource Energy	Yes	

2. The GVSDT revised R4 to improve clarity. Do you agree with this revision? If not, please explain in the comment area below.

Summary Consideration: A majority of the stakeholders agreed that the revision had improved clarity. Some stakeholders were still unclear if the activities described in this requirement were to be performed by request only, so the SDT rearranged the sentences to make that more clear. Some stakeholders pointed out the RCs and TOPs can request such information via requirements in other standards, so these two functional entities were removed from this requirement.

Organization	Yes or No	Question 2 Comment
Tennessee Valley Authority	No	Recommend that the R4 be enhanced to give more detail on how to satisfy this requirement. As significant as R4 is, the Generator Owners need more guidance than what is currently stated.
<p>Response: The SDT thanks you for your comment. The SDT does not believe the requirements should be prescriptive as to how to accomplish the reliability goals. We agree some level of technical guidance can be developed, but that it should not be in the standard.</p>		
seattle city light	No	Seattle City Light votes NO because it is unclear the type of data the Reliability Coordinator, Planning Coordinator, Transmission Planner, and/or Transmission Operator is to provide the Generator Operator. Until Reliability Coordinators, Transmission Planners, Planning Coordinators, and/or Transmission Operators agree to and approve acceptable simulations and dynamic models, it is difficult for Seattle City Light to approve this standard. There are requirements included in R4 and R5 that have not been communicated with Generator Operators in the past, and without agreement about simulations and models, it is simply too unclear.
<p>Response: The SDT thanks you for your comment. Based on comments from you and numerous other stakeholders the SDT has decided to remove Requirement R5 from the next draft of the standard. The SDT believes that Requirement R4 meets the reliability objective of the directive in Paragraph 1787 of FERC Order 693. In addition, the SDT agrees with stakeholders who</p>		

Organization	Yes or No	Question 2 Comment
<p>indicated that the additional resources that would be required to design, build, operate and maintain synchronous generating facilities that could ride through any of the defined excursions without fail would not justify the resulting incremental gain in grid reliability. From a low voltage ride-through perspective, the occurrence of severe transmission system faults in the immediate vicinity of a generation facility is rare and the history of transmission faults causing trips of generating facilities is similarly rare. From a frequency excursion perspective, turbines and generators currently on the market easily meet the requirements for coordinating with UFLS programs when challenged with typical frequency excursions. While there have been issues with frequency oscillations in some cases (e.g., lean fuel blowout), the SDT believes that these types of issues can be resolved by market forces without the need for a requirement in a reliability standard. As noted, the SDT feels Requirement R4 must remain in the standard in order to satisfy the requirements of the SAR to meet the directives of FERC Order 693 – in this case Paragraph 1787 of the Order.</p>		
Luminant	No	<p>Because R4 is only requiring an estimate of a unit’s ability to ride through an excursion developed by a planner, the generator owner should only state if the unit is or is not capable of staying on-line. R4 should be written to follow the FERC order. It is recommended that R4 be written as such. R4) Each Generator Owner of a generating unit shall respond within 60 days of receipt of a written request by the requesting entity (Reliability Coordinator, Planning Coordinator, Transmission Operator, or Transmission Planner that monitors or models the associated generating unit) stating if generating unit(s) or plant is or is not expected to ride through a frequency or voltage excursion based on a dynamic simulation provided by the requestor.</p>
<p>Response: The SDT thanks you for your comment. The SDT believes there is merit in the estimate of the amount of time following an event that the unit would remain connected and has elected to leave the wording as is.</p>		
ACES Power Marketing Standards Collaborators	No	<p>(1) We question the value of this requirement and suggest it should be struck. While knowing how long a generator will remain connected following a voltage or frequency excursion might be useful to a planning engineer conducting dynamic simulations, we do not see how it helps the RC, BA or TOP. The RC, BA or TOP’s System Operator will not likely take any action as a result of such information. Rather, they will wait to see if the unit trips before taking additional action because</p>

Organization	Yes or No	Question 2 Comment
		<p>there is no guarantee the unit will trip. Then, they will already be taking actions to minimize the stress regardless of whether they suspect that a unit may trip due to a voltage or frequency excursion. System Operators always have to be prepared to respond to events but simply cannot be expected to respond to every possible event because most simply don't happen and it would be an unreasonable expectation of System Operator. Even if the System Operator knew that a unit might trip in a short time frame due to a voltage or frequency excursion, they simply do not know when such an excursion might or even will occur and likely would not take preemptive action. Because System Operators are responsible for monitoring many aspects of the BES, it would be a waste of time to have them speculating whether or not a unit is going to trip. The system operator only needs to know how to react and mitigate the event if a unit does in fact trip. Furthermore, the RC, BA, and TOP already operate the system to withstand the loss of a unit so any unit that would trip due to such an excursion would not cause a problem. Upon the actual unit trip, then the RC, BA and TOP can reposition the system if necessary to prepare for the next contingency. When information is supplied to a System Operator that does not require them to do something it becomes "noise" which provides no value. Please note that the BA function is not listed within this standard. The RC and TOP have been removed from this requirement per your comment below to eliminate redundancy with the other standards you cited. As you note in this comment, the time duration between initiation of an event and a unit trip is of value to a PC or TP doing stability studies and has been retained in Requirement R4.</p> <p>(2) IRO-010-1a and TOP-003-2 already allow the RC and TOP to request necessary data from the Generator Owner through their data specification and have the authority to compel the Generator Owner to provide the data. Thus, if this data is needed the RC and TOP will include it in their data specifications. As a result, supplying the portion of R4 that requires data to be supplied to the RC and TOP is redundant and unnecessary. The SDT agrees with your comment and has removed the RC and TOP from Requirement R4. As you note, these entities still may obtain the information via the requirements in the other cited standards.</p>

Organization	Yes or No	Question 2 Comment
		<p>(3) What level of voltage or frequency excursion is intended to be covered by this requirement? It does not appear to be specified. The requirement specifies that the requesting entity is to provide the Generator Owner with the voltage or frequency excursion profile to be evaluated.</p>
<p>Response: The SDT thanks you for your comment. See responses to your specific comments above.</p>		
<p>PPL Corporation NERC Registered Affiliates</p>	<p>No</p>	<p>The Protective Relay coordination portions of this standard are not being contested. It is not clear how the evaluations should be performed to determine the ability to ride through grid transients. A standard should NOT be written to require this until research has been done to document an appropriate approach to doing these evaluations. It is suggested that plant performance requirements be removed from this Protection System (PRC) standard. If this is required to support grid reliability, then a new SAR should be written to develop those plant performance requirements.</p>
<p>Response: The SDT thanks you for your comment. Based on comments from you and numerous other stakeholders the SDT has decided to remove Requirement R5 from the next draft of the standard. The SDT believes that Requirement R4 meets the reliability objective of the directive in Paragraph 1787 of FERC Order 693. In addition, the SDT agrees with stakeholders who indicated that the additional resources that would be required to design, build, operate and maintain synchronous generating facilities that could ride through any of the defined excursions without fail would not justify the resulting incremental gain in grid reliability. From a low voltage ride-through perspective, the occurrence of severe transmission system faults in the immediate vicinity of a generation facility is rare and the history of transmission faults causing trips of generating facilities is similarly rare. From a frequency excursion perspective, turbines and generators currently on the market easily meet the requirements for coordinating with UFLS programs when challenged with typical frequency excursions. While there have been issues with frequency oscillations in some cases (e.g., lean fuel blowout), the SDT believes that these types of issues can be resolved by market forces without the need for a requirement in a reliability standard. As noted, the SDT feels Requirement R4 must remain in the standard in order to satisfy the requirements of the SAR to meet the directives of FERC Order 693 – in this case Paragraph 1787 of the Order.</p>		
<p>Associated Electric Cooperative, Inc. - JRO00088</p>	<p>No</p>	<p>As currently drafted, Requirement R4 appears to dictate an analysis for all inflection-points in unit performance, for a continuum of frequency and voltage excursions, and</p>

Organization	Yes or No	Question 2 Comment
		<p>taking into account all of the underlying auxiliary equipment’s control systems and settings. We see this current draft’s Requirement R4 wording as a creating a much greater expectation, than estimating the duration-times for the curves at the specific inflection-points given in Attachments 1 & 2 of this Standard.</p>
<p>Response: The SDT thanks you for your comment. The requirement specifies that the requesting entity is to provide the Generator Owner with the voltage or frequency excursion profile to be evaluated. The Generator Owner is not expected to arbitrarily evaluate all possible voltage and frequency excursion profiles.</p>		
<p>Duke Energy</p>	<p>No</p>	<p>1) It is unclear if this requirement is to be only upon request, and if requests will be related to the same ride through criteria or a different set specified by the TP. Need to clarify how this aspect will be executed. The wording of the Requirement has been rearranged to help clarify that the estimate is to be provided only upon request.</p> <p>2) Refer to discussion in our response to Question 3 below about industry concerns with the technical viability of plant performance standards.</p>
<p>Response: The SDT thanks you for your comment. See responses to your specific comments above and at Question 3.</p>		
<p>ISO RTO Council Standards Review Committee</p>	<p>No</p>	<p>The proposed language lacks clarity in what data is needed in order for a TOP to comply with the requirement to provide trip settings to the RRO/RC/Transmission Planners. We recommend that regions develop further specific “no-trip” regions specific to their area of the Interconnection.</p>
<p>Response: The SDT thanks you for your comment. There is no language in Requirement R4 for the TOP to provide any information to the RRO, RC, or Transmission Planner. If the TOP requests a Generator Owner to evaluate the ride-through performance of a particular generating facility, then that TOP must provide the GO with the specific transmission system voltage excursion profile or frequency excursion profile to be evaluated as stated in this requirement.</p>		
<p>Dynegy</p>	<p>No</p>	<p>R4 requires the GO to provide the Transmission Planner an estimate of the time duration a generator will stay on during a frequency or voltage excursion. It appears</p>

Organization	Yes or No	Question 2 Comment
		<p>this question would already be answered in complying with R2 when the GO verifies the relay settings against the graphs in Attachment 2. It's also not clear whether R4 is to be accomplished before or after a request from the Transmission Planner. It is recommended R4 be removed. If it is not removed, add "...if requested." at the end of the first sentence.</p>
<p>Response: The SDT thanks you for your comment. The requesting entity (Transmission Planner or Planning Coordinator) might be aware of the trip set points for the Generator Protection System as specified in Requirements R1 and R2, but Requirement R4 specifically states that the Generator Owner must consider the performance of the auxiliary systems when providing the estimate to the requesting planner. The expectation is that the protection will not operate during an excursion but the plant may still trip due to process upsets caused by auxiliary systems reaction to the excursion. The wording in Requirement R4 has been rearranged to clarify that the estimate is to be provided only upon request.</p>		
<p>Ingleside Cogeneration LP (voting under entity name Occidental Chemical Corporation)</p>	<p>No</p>	<p>Unlike MOD-026-1, which requires some amount of justification from the requesting entity before action must be taken, PRC-024-1 R4 requires compliance without any regard to the Generator Owner's resource availability. In general, Ingleside Cogeneration LP believes that a good working relationship between the Generator Owner and Transmission Planner includes a reasonable justification for any request that requires time and expense on the part of the other.</p>
<p>Response: The SDT thanks you for your comment. The Generator Owner must perform the verification activities described in MOD-026-1 on a 10-year basis, absent any justification from any entity. The SDT congratulates Ingleside for maintaining a good relationship with your Transmission Planner. The Transmission Planners on the SDT indicate that a request for an estimate would likely only be for facilities that appear to be critical to stability immediately following an excursion.</p>		
<p>American Electric Power</p>	<p>No</p>	<p>R4 should be removed entirely from this standard. R4 appears to add no reliability benefit beyond what is already prescribed in R3. Documentation of equipment limitations as possible causes for tripping within the no-trip zones of Attachments 1 and 2 will allow PCs and other entities to check for instances where UFLS effectiveness or system voltage recovery might be compromised by possible early tripping of generators due to factors other than relay settings. As these benefits</p>

Organization	Yes or No	Question 2 Comment
		<p>seem to be the intent of R3, R4 does not appear to add any useful information beyond what would already be supplied under R3. We further expect that GOs will be unable to devise the required estimates of time duration without detailed simulations of generating unit and auxiliary system performance (the explicit statement that detailed studies are not required notwithstanding) during the specified frequency or voltage excursion profiles to be supplied to them. Were these intended to be trajectories rather than profiles?</p>
<p>Response: The SDT thanks you for your comment. The SDT feels Requirement R4 is needed to comply with the SAR for this project that mandates the SDT consider directives in FERC Order 693 – in this case Paragraph 1787. The intent of Requirement R3 is to allow owners of generating facilities to set protection to operate inside the “No Trip Zone” of Attachments 1 or 2 if there is a known limitation that prevents operation in a portion of the “Zone” (e.g., a manufacturer’s bulletin describing a limitation on operating below certain frequencies). The Generator Owner must communicate these settings that fall inside the “No Trip Zone” to the appropriate entities that model the facility for stability contingencies. This does not mean the entities modeling the facility are aware of how the facility might react when the performance of the auxiliary systems are considered, which is the intent of Requirement R4. No change made to the requirement.</p>		
Wisconsin Electric Power Company	No	<p>We maintain that there is no reliability driven need for R4. Also, such estimates would be of limited accuracy. Should such an estimate be deemed useful, it can be requested informally among the appropriate entities. Standards and associated requirements must be reserved for those items more critical to BES reliability</p>
<p>Response: The SDT thanks you for your comment. The SDT feels Requirement R4 is needed to comply with the SAR for this project that mandates the SDT consider directives in FERC Order 693 – in this case Paragraph 1787. Accurately modeling the performance of generating facilities can impact stability assessments. No change made to the requirement.</p>		
Exelon Corporation and its affiliates	No	<p>In response to Exelon's (and other commenter's) concern that 60 calendar days was not a reasonable amount of time to perform a study in response to a written request from a RC, PC, TOP or TP, the GVSDT stated that it has "modified the structure of the requirement to clarify the intent and the limits of what entities could request a performance estimate;" but the GVSDT was not in agreement with changing the time</p>

Organization	Yes or No	Question 2 Comment
		<p>period allowed to respond. Although the GVSDT states that "[d]etailed unit performance studies are not required to develop the estimate," Exelon continues to maintain that 60 calendar days is not a reasonable amount of time to perform a study of this magnitude based on the predicted scope. Specifically, nuclear generating units have extensive calculations related to how internal systems will respond to frequency and voltage excursions. Exelon believes it is inappropriate to short cycle or challenge the rigorous process required by the Nuclear Regulatory Commission (NRC) at a nuclear generating unit for any such study. In addition, depending on the complexity of the transient requested by the transmission entity, a nuclear generating unit may not have the in-house expertise to perform such a study and may be required to hire an outside vendor.</p>
<p>Response: The SDT thanks you for your comment. The SDT has made it clear in responses to similar comments during previous postings that the SDT does not believe extensive studies or dynamic simulations are required to comply with this requirement. Such studies would achieve only a very minimal increase in the reliability of the estimate given the number of variables involved.</p>		
CenterPoint Energy	No	<p>(a) To improve clarity, CenterPoint Energy recommends deleting the second and third sentences of the first paragraph of R4. CenterPoint Energy does not agree that a Reliability Coordinator, Planning Coordinator, Transmission Operator, or Transmission Planner should provide a voltage or frequency profile at the point of interconnection that is determined by dynamic simulation. Different types of simulated events will produce different voltage and frequency excursions. Also, even the same type of event will produce different voltage and frequency excursion "profiles" as the system changes over time. The SDT feels that if the Generator Owner is not provided an excursion profile, the GO would not know what profile to evaluate. The curves in Attachments 1 and 2 are frequency and voltage magnitude vs. allowable time duration envelopes that encompass the set of possible profiles that could occur. They are not actual excursion profiles.</p> <p>(b) While deleting the second and third sentences of the first paragraph of R4 would provide clarity, it would nevertheless be problematic for reliability because it does</p>

Organization	Yes or No	Question 2 Comment
		<p>not impose any minimum frequency or voltage ride-through requirements for existing generation stations. Failure of a generator to ride-through at least some minimum threshold of frequency and voltage excursions places the reliability burden solely on transmission entities and makes it difficult to compensate for the generator's failure to perform. The SDT believes that existing generating facilities have a good track record of riding through voltage and frequency excursions. Cascading outages caused by trips of multiple generating facilities due to a single event are extremely rare. The SDT does not believe the recommended requirement is necessary.</p>
<p>Response: The SDT thanks you for your comment. See responses to your specific comments above.</p>		
SMUD	No	<p>We agree that a GO can meet the requirements in R1 & R2 and use R3 to note any known limitations. We do not feel the GO can provide any meaningful estimate of overall plant performance beyond meeting the first three requirements. The complexity of what is being asked is simply too great.</p>
<p>Response: The SDT thanks you for your comment. The SDT believes a reasonable estimate can be achieved by determining what auxiliary equipment would cause a turbine or generator trip if that equipment were to shut down due to an excursion. Fans, pumps, compressors, etc., that could cause process upsets if they shut down due to contactor dropout during low voltage or slow down due to frequency decay could be looked at and a worst case estimate developed. The SDT realizes that this type of evaluation may not reflect what happens in actuality, but it will probably be conservative (from the planner's perspective). Performing extensive (and expensive) dynamic simulations would bring only marginal improvement in the accuracy of the estimate given the large number of variables involved.</p>		
Cowlitz PUD	No	<p>Requirement R4 is clear, however it can take 60 calendar days simply to find and retain a consulting firm who is qualified to provide the estimated data to the requesting entity. This will require the GO to perform defensive compliance, that is, to attempt to acquire data before a request is submitted in order to meet the tight two-month response time. There is no provision to allow the GO to negotiate a time frame with the requesting entity.</p>

Organization	Yes or No	Question 2 Comment
<p>Response: The SDT thanks you for your comment. The SDT believes the plant staff should be able to provide a reasonable estimate that satisfies Requirement R4. If they identify which auxiliary equipment (pumps, fans, etc.) would cause a generator trip if that equipment drops out due to voltage excursion, then identify the one that would cause the trip the fastest (e.g., would a boiler pressure excursion due to loss of a fan cause a trip faster than a boiler drum level excursion due to loss of a pump). If Cowlitz still feels the need to contract a consultant, perhaps the contract could be negotiated ahead of time.</p>		
Dominion	Yes	R4.1. and R4.2. are listed in the redline standard, but not in the clean version of the standard.
<p>Response: The SDT thanks you for your comment. The SDT is aware that the redline version does have issues. Please refer to the clean version for the most accurate information.</p>		
Manitoba Hydro	Yes	Manitoba Hydro noticed that the “clean” and “redline” versions of the standard are inconsistent. Both 4.1. and 4.2. should be removed from the “redline” version since both are redundant (included in the text of R4.).
<p>Response: The SDT thanks you for your comment. The SDT is aware that the redline version does have issues. Please refer to the clean version for the most accurate information.</p>		
Idaho Power Company	Yes	Idaho Power System Planning agrees with the revisions made to R4.
<p>Response: The SDT thanks you for your comment.</p>		
Southwest Power Pool Reliability Standards Development Team	Yes	
Pepco Holdings Inc	Yes	
Bonneville Power Administration	Yes	

Organization	Yes or No	Question 2 Comment
pacificorp	Yes	
Southern Company	Yes	
FirstEnergy	Yes	
Wolverine Power Cooperative	Yes	
TransAlta Centralia Generation LLC	Yes	
SERC Reliability Corp	Yes	
PSEG	Yes	
Xcel Energy	Yes	
American Transmission Company	Yes	
Independent Electricity System Operator	Yes	
Northeast Utilities	Yes	
Omaha Public Power District	Yes	
South Carolina Electric and Gas	Yes	
Ameren	Yes	

Organization	Yes or No	Question 2 Comment
Texas Reliability Entity	Yes	
BrightSource Energy	Yes	
Western Electricity Coordinating Council		Should part 4.2 read Identification of the basis rather than Identification of the bases
Response: The SDT thanks you for your comment. The word “bases” is the plural of “basis”.		

3. Do you have any other comment, not expressed in questions above, for the GVSDT?

Summary Consideration: Based on comments from a majority of stakeholders, Requirement R5 (along with its associated Measure M5 and VSL’s) was removed from the Standard. The SDT believes that Requirement R4 achieves the reliability objective of Paragraph 1787 of FERC Order 693 that Requirement R5 was written to address. Other changes were made in response to comments from several stakeholders including:

- Additional wording in the Effective Date section for jurisdictions where regulatory approval is required to address the situation in some Canadian provinces.
- A modification to the high frequency allowable trip point in Attachment 1 for the Eastern and ERCOT Interconnections to match IEEE and IEC standards for generator manufacturers.
- A modification to the final voltage value of the low voltage curve and time duration of Attachment 2 to coordinate with the requirements of PRC-025 Generator Relay Loadability.
- Rearrangement of the sentences in Requirement R4 to better clarify that developing the estimate of performance is to be done only on request of certain planning entities.
- Removal of the Reliability Coordinator and Transmission Operator from the list of functional entities who can request a performance estimate in Requirement R4 and protection settings information in Requirement R6 (now R5) to eliminate duplication with standards IRO-010 and TOP-003.
- Various wording changes made to improve consistent use of terminology and to improve readability.

Several stakeholders pointed out that a portion of the allowable high frequency trip curve for the Eastern, ERCOT, and Quebec Interconnections (Attachment 1) exceeded the off-nominal frequency limits in IEEE C50.13 and IEC 60034 that are used by equipment manufacturers to design generators. The drafting team revised the high frequency portion of the curve from zero to two seconds for the Eastern and ERCOT Interconnections to meet the IEEE and IEC standards. This leaves no margin between the high frequency allowance for UFLS designers in frequency overshoot for that amount of time, but the drafting team feels this is acceptable.

Organization	Yes or No	Question 3 Comment
ACES Power Marketing		(1) We appreciate that the second bullet allows that TP to provide a less stringent voltage envelope for R5. However, it is not clear if the TP can provide a more

Organization	Yes or No	Question 3 Comment
Standards Collaborators		<p>stringent envelope. We believe a more stringent voltage envelope should not be allowed. Please clarify.</p> <p>While Standard PRC-024 (R2 and R5) allows the TP to provide a less stringent voltage envelope, the TP cannot enforce a more stringent voltage envelope.</p> <p>(2) We continue to believe that requirement R5 needs to be modified to recognize that equipment will not always be new and may develop limitations as it ages. These limitations may prevent the generator from meeting the voltage and frequency envelopes defined in Attachment 1 and 2.</p> <p>Based on comments from you and numerous other stakeholders the SDT has decided to remove Requirement R5 from the next draft of the standard. The SDT believes that Requirement R4 meets the reliability objective of the directive in Paragraph 1787 of FERC Order 693. In addition, the SDT agrees with stakeholders who indicated that the additional resources that would be required to design, build, operate and maintain synchronous generating facilities that could ride through any of the defined excursions without fail would not justify the resulting incremental gain in grid reliability. From a low voltage ride-through perspective, the occurrence of severe transmission system faults in the immediate vicinity of a generation facility is rare and the history of transmission faults causing trips of generating facilities is similarly rare. From a frequency excursion perspective, turbines and generators currently on the market easily meet the requirements for coordinating with UFLS programs when challenged with typical frequency excursions. While there have been issues with frequency oscillations in some cases (e.g., lean fuel blowout), the SDT believes that these types of issues can be resolved by market forces without the need for a requirement in a reliability standard.</p> <p>(3) Requirement R6 should be struck. First, the TOP and RC already have the capability to request such data in its data specification from the GO through IRO-010-1a and TOP-003-2 which also compels the GO to comply with the data specification. Thus, if the TO and GO need the data they will write it into their data specifications. Second, this requirement is the type of requirement that the Project 2013-02</p>

Organization	Yes or No	Question 3 Comment
		<p>Paragraph 81 drafting team has proposed eliminating in response to the FERC approval order of the FFT process. Specifically, the requirement meets the Administrative, Purely Reporting and Redundant criteria for the project. It only has to meet one criterion to be proposed for retirement. It is imperative that drafting teams refrain from developing requirements that a future team will retire.</p> <p>Based on comments from you and numerous stakeholders the SDT has decided to modify the wording for requirement R4 and (previous) R6 to include data requests from Planning Coordinators or Transmission Planners not Transmission Operators or Reliability Coordinators.</p> <p>(4) This standard needs to be aligned with the recent NERC compliance enforcement initiatives (i.e. internal controls, entity impact evaluation, elimination of zero-defect expectations). The VSL for Requirement R5 makes it clear that every time a “new unit” (i.e. does not meet footnote 2) trips, an evaluation needs to be conducted to determine if the unit tripped for a voltage or frequency excursion that is inside the no trip zone. To refocus NERC efforts on compliance, the recent compliance enforcement initiatives would allow that GO to make this determination and correct any performance deficiencies without the need to self-report a violation. These approaches are being written into the standards (CIP, COM-003, etc.). We suggest the drafting team coordinate with the appropriate NERC personnel to adopt a similar approach for this requirement.</p> <p>Based on comments from you and numerous other stakeholders the SDT has decided to remove Requirement R5 from the next draft of the standard. The SDT believes that Requirement R4 meets the reliability objective of the directive in Paragraph 1787 of FERC Order 693. In addition, the SDT agrees with stakeholders who indicated that the additional resources that would be required to design, build, operate and maintain synchronous generating facilities that could ride through any of the defined excursions without fail would not justify the resulting incremental gain in grid reliability. From a low voltage ride-through perspective, the occurrence of severe transmission system faults in the immediate vicinity of a generation</p>

Organization	Yes or No	Question 3 Comment
		<p>facility is rare and the history of transmission faults causing trips of generating facilities is similarly rare. From a frequency excursion perspective, turbines and generators currently on the market easily meet the requirements for coordinating with UFLS programs when challenged with typical frequency excursions. While there have been issues with frequency oscillations in some cases (e.g., lean fuel blowout), the SDT believes that these types of issues can be resolved by market forces without the need for a requirement in a reliability standard.</p> <p>(5) Because the voltage envelope is based on assumptions listed on page 20, the VSLs for R5 need to clarify that if a unit does trip in the no trip zone and the system does not reflect these assumptions that this does not represent a violation. For instance, if a synchronous condenser or capacitor (bullet 7 on page 20) is not available that was assumed to be available when evaluating protection relay settings, why would the GO be held accountable for its unit tripping during a voltage excursion? It followed the assumptions set out in the standard.</p> <p>Based on comments from you and numerous other stakeholders the SDT has decided to remove Requirement R5 from the next draft of the standard. The SDT believes that Requirement R4 meets the intent of the directive in Paragraph 1787 of FERC Order 693. In addition, the SDT agrees with stakeholders who indicated that the additional resources that would be required to design, build, operate and maintain synchronous generating facilities that could ride through any of the defined excursions without fail would not justify the resulting incremental gain in grid reliability. From a low voltage ride-through perspective, the occurrence of severe transmission system faults in the immediate vicinity of a generation facility is rare and the history of transmission faults causing trips of generating facilities is similarly rare. From a frequency excursion perspective, turbines and generators currently on the market easily meet the requirements for coordinating with UFLS programs when challenged with typical frequency excursions. While there have been issues with frequency oscillations in some cases (e.g., lean fuel blowout), the SDT believes that these types of issues can be resolved by market forces without</p>

Organization	Yes or No	Question 3 Comment
		<p>the need for a requirement in a reliability standard.</p> <p>(6) Why is the defined term Protection System not used throughout the standard rather than “protective relaying”? We recommend adopting the NERC Glossary Term for consistency.</p> <p>The SDT used the phrase protective relaying within the standard rather than Protective System, because Protective System is a broad definition in which communications, dc power supplies, and includes protective relays. Protective relaying is more applicable to this specific standard.</p> <p>(7) We continue to believe that performance requirements for new units should be part of the interconnection process. As a result, R5 should either be struck or it should be moved to FAC-001 which governs standards for facility connection requirements.</p> <p>Based on comments from you and numerous other stakeholders the SDT has decided to remove Requirement R5 from the next draft of the standard. The SDT believes that Requirement R4 meets the reliability objective of the directive in Paragraph 1787 of FERC Order 693. In addition, the SDT agrees with stakeholders who indicated that the additional resources that would be required to design, build, operate and maintain synchronous generating facilities that could ride through any of the defined excursions without fail would not justify the resulting incremental gain in grid reliability. From a low voltage ride-through perspective, the occurrence of severe transmission system faults in the immediate vicinity of a generation facility is rare and the history of transmission faults causing trips of generating facilities is similarly rare. From a frequency excursion perspective, turbines and generators currently on the market easily meet the requirements for coordinating with UFLS programs when challenged with typical frequency excursions. While there have been issues with frequency oscillations in some cases (e.g., lean fuel blowout), the SDT believes that these types of issues can be resolved by market forces without the need for a requirement in a reliability standard.</p>

Organization	Yes or No	Question 3 Comment
		<p>(8) Requirement R3 and R6 are the types of requirements the Project 2013-02 Paragraph 81 drafting team is proposing to eliminate. They have established a set of criteria to identify requirements with little to minimal reliability impact. Both of these requirements meet one or more of the following criteria: Administrative, Purely Documentation, Purely Reporting, or Little, if any, value as a reliability requirement. Please review all proposed requirements against this criteria and remove requirements as appropriate. While we believe R3 should be removed, we do understand there is a need to document equipment limitations for R1 and R2. We believe the existing associated bullets in R1 and R2 will satisfactorily address the need to document limitations and that the reference to R3 could simply be struck.</p> <p>The SDT has reviewed the criteria for removing requirements per Paragraph 81 and determined that the requirements of PRC-024 do not meet the applicable criteria. In order to be considered for removal, a requirement has to meet Item A as well as at least one part of Item B (see P81 team criteria document). The requirements of PRC-024 do not meet Item A and therefore are not eligible for inclusion.</p> <p>(9) Please remove the RC and TOP from Part 3.1 of R3. Inclusion of the RC and TOP is redundant with IRO-010-1a and TOP-003-2 which require the RC and TOP to develop data specifications. If they need this data, it should be included in their data specification.</p> <p>The reference of the Reliability Coordinator and Transmission Operator is applicable for Part 3.1 of R3 as this sub requirement is applicable for the Generator Owner to communicate the documented equipment limitation, or the removal of a previously documented equipment limitation, to its Reliability Coordinator, Planning Coordinator, Transmission Operator and Transmission Planner. No other standard or subsection of this standard covers this requirement.</p> <p>(10) Please remove “as specified by Requirement R6” in the first half of the R6 VSLs. We found it confusing when it was not included in the second half.</p> <p>For clarity, applicable changes will be made to the VSLs for R6 (now R5).</p>

Organization	Yes or No	Question 3 Comment
		<p>(11) Please copy footnote 1 from R1 on to the page with R2. It was not immediately clear that the footnote in R2 was actually on the previous page.</p> <p>The document has been modified to include footnote 1 on the same page as R1 and R2.</p>
<p>Response: Thank you for your comments. Please see responses to specific comments above.</p>		
<p>Ameren</p>		<p>We commend the GVSDT for considering and addressing our previous comments, and making several changes that improve this proposed standard.</p> <p>(1)In R1 and R2, please add “Generation may trip by properly set volts per hertz protection if a system over excitation abnormality necessitates disconnecting a generating unit.”</p> <p>The voltage ride-through time duration curve (Attachment 2) takes into account properly set volts per hertz relays, assuming that the frequency is 60 Hertz and adjustments are made to the magnitude of the high voltage curve in proportion to deviations of frequency below normal.</p> <p>(2)Based on the GVSDT response to our previous comments we understand the purpose of R6 is to be studies. Given this study purpose, please change “and Transmission Planner” to “or Transmission Planner”, delete “monitors or” and replace “unless otherwise directed by the requesting Reliability Coordinator, Planning Coordinator, Transmission Operator, or Transmission Planner” with “while the requestor’s study is underway”. We believe that it is burdensome for the GO to have to indefinitely continue to send setting changes to the requesting entity. When the requesting entity begins another periodic study, they’ll request them again. Therefore, we request that R6 should then read: “Each Generator Owner shall provide its generator protection trip settings to the Reliability Coordinator, Planning Coordinator, Transmission Operator or Transmission Planner (that models the associated unit), within 60 calendar days of receipt of a written request for the data, and within 60 calendar days of any change to those previously requested trip settings</p>

Organization	Yes or No	Question 3 Comment
		<p>while the requestor’s study is underway.”</p> <p>Based on comments from you and other stakeholders the SDT has made applicable changes to each of the PRC-024 requirements.</p> <p>(3)We believe that M5 expects the GO to retain evidence that proves the negative and is therefore burdensome. Generators trip for many reasons; most of them have to do with the mechanical system. We request that the SDT append “by the generator frequency or voltage protective relaying” after “each unit trip”, and add “or that no such unit trips occurred within the Data Retention period” at the end. M5 should then read: “Each Generator Owner shall have evidence, such as dated unit output records, trip investigation reports or disturbance monitoring records, showing that each unit trip by the generator frequency or voltage protective relaying did not result from a frequency excursion or voltage excursion as specified in Requirement R5, or evidence that a listed exception applied, or that no such unit trips occurred within the Data Retention period.”</p> <p>Since Requirement R5 has been removed from the standard, Measure M5 has been removed as well.</p> <p>(4)VSL’s in R3, R4, and R6 are set up with 10 day increments between the different severity levels, rather than a more typical 30 day increment.</p> <p>The 10-day increments in R3, R4 and R6 (now R5) are based on VSL development guidelines provided by NERC. The SDT so feels that the 10-day increment is appropriate for this standard.</p> <p>(5)As a general comment, NERC should make all the papers listed in the references section of the standard readily available on their website.</p> <p>While this request would aid in understanding a given standard, copyright restriction prevent NERC from satisfying this request.</p>
<p>Response: Thank you for your comments. Please see responses to specific comments above.</p>		

Organization	Yes or No	Question 3 Comment
CenterPoint Energy		<p>(a) In R2 and R5, CenterPoint Energy recommends that “external to the generating plant” be deleted in the phrase “...caused by an event on the transmission system external to the generating plant...” We believe this could cause confusion, as some could consider the transmission interconnection substation as part of the generating plant. Also, such wording is not needed, as both requirements include the following clarifying language: “Generation may trip if clearing a system fault necessitates disconnecting a generating unit.”</p> <p>While the phrase “external to the generating plant” may cause some confusion, the STD felt that this phrase clearly defines which transmission facilities would be subject to evaluation, in the event that transmission and generation facilities are intertwined.</p> <p>(b) CenterPoint Energy cannot support this version of PRC-024 because it does not impose any minimum frequency or voltage ride-through requirements for existing generation stations. Failure of a generator to ride-through at least some minimum threshold of frequency and voltage excursions places the reliability burden solely on transmission entities. This makes it difficult to compensate for the generator’s failure to perform and, therefore, is problematic for BES reliability.</p> <p>The SDT has not seen evidence that lack of ride through capability in existing generation facilities is causing frequent cascading outages. The SDT believes the resources required to retrofit existing plants to meet your recommendation could be better used to improve grid reliability elsewhere.</p>
<p>Response: Thank you for your comments. Please see responses to specific comments above.</p>		
American Electric Power		<p>1) R1: Should R2, first bullet point exception have a similar counterpart in R1?</p> <p>The allowance under R2, bullet one, to trip a unit due to SPS operation is characteristic of a system event that would have voltage implications. The SDT is not aware of a SPS scheme that trips due to a frequency initiated event.</p>

Organization	Yes or No	Question 3 Comment
		<p>2) R2: Does footnote 2 also apply to R2 fourth bullet point?</p> <p>Footnote 2 is related to existing units, but has been eliminated from the updated standard.</p> <p>3) R3: On the last bullet we suggest the word “nameplate” be removed from the sentence.</p> <p>“Nameplate” is accepted industry terminology for defining the capacity of generating units; therefore, the word will not be removed from the standard.</p> <p>4) R5: AEP believes that the requirement of R5 for new units and plants to not trip within the no-â€trip zone of Attachment 1 is reasonable, and has precedence in existing reliability region guidelines. To not trip within the no-â€trip zone of the Attachment 2 is another matter. AEP maintains that Attachment 2 is inappropriate as a requirement on new conventional generation. When AEP previously raised objection to the reference to Attachment 2 by R5, the SDT replied: "The SDT is charged with implementing the reliability improvement recommendations from FERC Order 693 and the 2003 Northeast Blackout Report. The SDT is working under the assumption that when industry approved the SAR for this project it agreed that the standard provided a reliability gain."We note that Order 693, paragraph 1787 does require generation to ride through B and C contingencies. However (and we reference the Consideration of Issues and Directives table associated with PRCâ€024), Order 661â€A which removed the voltage rideâ€through curves of the sort as Attachment 2. The SDT is justifying the imposition of an unprecedented (in North America) and onerous requirement on the basis of outdated information. Moreover, the SAR for Project 2007â€09 was a general authorization to proceed with standard development on the subject of generator performance during frequency and voltage excursions, not an authorization to require the specific voltageâ€ride through requirement for new generation now proposed in R5. Please reconsider the justification for this requirement. The SDT further replied: "If the Transmission Planner for a new generation facility can provide the voltage profile for that specific site, then per Part 5.2 the Generator Owner can design his new facility to</p>

Organization	Yes or No	Question 3 Comment
		<p>ride through that profile even if it is less stringent (i.e. uses faster clearing and faster voltage recovery) than Attachment 2. The voltage envelope described in Attachment 2 provides equipment OEM’s with an outer boundary on the voltage stress they have to design for. "The exception enabled by the second bullet point of R5 may cause a nonuniform level of reliability. If one transmission planner presents a less stringent voltage ride-through characteristic (we assume this would be simulation based) to a potential generator than the TP next door, who for lack of time or resources falls back on Attachment 2, then at best, a nonuniform level of reliability would result. Shouldn't there be some uniformity on what generating units are obligated to achieve? We mention this point, not that the exception be removed, but that the requirement of Attachment 2 for new generation, which has not been seen as necessary for reliability in the past, be removed. The SDT further replied to our concern over cost to comply: "There are similar voltage ride through requirements already in effect in parts of Europe and Asia. The SDT is charged with implementing the reliability improvement recommendations from FERC Order 693 and the 2003 Northeast Blackout Report. The SDT agrees that generating units designed and built to meet Requirement R5 will be more costly than those that cannot meet this reliability goal. The SDT is not in a position to place a monetary value on the consequent reliability gain. The SDT is working under the assumption that when industry approved the SAR for this project it agreed that the standard provided a reliability gain. "The SDT is in error in thinking that the reference to Attachment 2 in R5 is necessary to implement Order 693 or to fulfill the intent of the SAR as noted above. We also question the propriety of adding a new reliability standard requirement without precedent in North America irrespective of any consideration of the cost to comply, and a proposed requirement that will certainly act to disfavor new conventional generation compared to what has always been accepted design practice for conventional generation in the past. The SDT needs to provide a relevant technical argument for the new level of reliability and not an appeal to what other parts of the world may be doing.</p> <p>Based on comments from you and numerous other stakeholders the SDT has</p>

Organization	Yes or No	Question 3 Comment
		<p>decided to remove Requirement R5 from the next draft of the standard. The SDT believes that Requirement R4 meets the reliability objective of the directive in Paragraph 1787 of FERC Order 693. In addition, the SDT agrees with stakeholders who indicated that the additional resources that would be required to design, build, operate and maintain synchronous generating facilities that could ride through any of the defined excursions without fail would not justify the resulting incremental gain in grid reliability. From a low voltage ride-through perspective, the occurrence of severe transmission system faults in the immediate vicinity of a generation facility is rare and the history of transmission faults causing trips of generating facilities is similarly rare. From a frequency excursion perspective, turbines and generators currently on the market easily meet the requirements for coordinating with UFLS programs when challenged with typical frequency excursions. While there have been issues with frequency oscillations in some cases (e.g., lean fuel blowout), the SDT believes that these types of issues can be resolved by market forces without the need for a requirement in a reliability standard.</p> <p>5) If R5 remains in this standard, its associated measure needs to be changed so that evidence would need to be provided for only those unit trips that occurred during a voltage or frequency excursion. As currently written, evidence would need to be provided for every unit trip, which is both unnecessary and unduly burdensome.</p> <p>Based on comments from you and numerous other stakeholders the SDT has decided to remove Requirement R5 from the next draft of the standard. The SDT believes that Requirement R4 meets the reliability objective of the directive in Paragraph 1787 of FERC Order 693. In addition, the SDT agrees with stakeholders who indicated that the additional resources that would be required to design, build, operate and maintain synchronous generating facilities that could ride through any of the defined excursions without fail would not justify the resulting incremental gain in grid reliability. From a low voltage ride-through perspective, the occurrence of severe transmission system faults in the immediate vicinity of a generation facility is rare and the history of transmission faults causing trips of generating facilities is similarly rare. From a frequency excursion perspective, turbines and</p>

Organization	Yes or No	Question 3 Comment
		<p>generators currently on the market easily meet the requirements for coordinating with UFLS programs when challenged with typical frequency excursions. While there have been issues with frequency oscillations in some cases (e.g., lean fuel blowout), the SDT believes that these types of issues can be resolved by market forces without the need for a requirement in a reliability standard.</p> <p>6) R6: As currently drafted, all requests would require continual updates unless otherwise exempted. This should be changed so that all requested are treated as a onetime request unless otherwise specified by the requesting entity.</p> <p>Response: The SDT thanks you for your comment. The requestor would only be asking for trip settings for those protective functions that are used in the stability model. The requestor would need to know when changes are made to these settings so that his model remains accurate. If it is a one-time study, the requestor has the option of informing the Generator Owner of this at the time of the request per the language in the requirement.</p>
<p>Response: Thank you for your comments. Please see responses to specific comments above.</p>		
<p>Duke Energy</p>		<p>1) Feedback from the IEEE Electric Machines Committee and Siemens (a generator equipment OEM) serve as the bases for these statements and are included below. PRC-024 was originally intended to address a relay setting/coordination issue. This appears to be addressed by the current draft of the standard. However, the issues related to plant survivability or performance are more complex. It is not appropriate to attempt to address these issues in a PRC standard. The addition of plant performance aspects appear to be driven by FERC as evidenced by the minutes of the May 2009 meeting - see http://www.nerc.com/docs/standards/dt/GVSDTnotes052809.pdf. Based on comments from you and numerous other stakeholders the SDT has decided to remove the performance Requirement R5 from the next draft of the standard. The SDT believes that Requirement R4 meets the reliability objective of the directive in Paragraph 1787 of FERC Order 693. In addition, the SDT agrees with stakeholders</p>

Organization	Yes or No	Question 3 Comment
		<p>who indicated that the additional resources that would be required to design, build, operate and maintain synchronous generating facilities that could ride through any of the defined excursions without fail would not justify the resulting incremental gain in grid reliability. From a low voltage ride-through perspective, the occurrence of severe transmission system faults in the immediate vicinity of a generation facility is rare and the history of transmission faults causing trips of generating facilities remote (e.g., more than one bus away) from the fault is similarly rare. From a frequency excursion perspective, turbines and generators currently on the market easily meet the requirements for coordinating with UFLS programs when challenged with typical frequency excursions. While there have been issues with frequency oscillations in some cases (e.g., lean fuel blowout), the SDT believes that these types of issues can be resolved by market forces without the need for a requirement in a reliability standard.</p> <p>2) According to attendees at the IEEE EMC meeting, much of the technical justification for the need of a plant performance criteria was based on issues with early design wind generation, however the technical considerations at these types of generation stations are different that steam turbine generation plants, which require heavy induction loads to support operation. These loads are sensitive to upsets in voltage and frequency. The technical implications of the plant performance are not clear and thus this issues should not be standardized at this point in time. It is recommended that the plant performance aspects be removed from the PRC standard and a new SAR be written to address plant performance requirements. This approach would support pulling in the various design expertise (IEEE, Equipment OEMs, Power Plant Design entities, etc) needed to develop a technically correct ride through criteria. See response below</p> <p>3) There also is a need to develop industry accepted methods to determine the capability of a plant to ride through grid transients prior to this becoming a mandatory standard. See response below.</p> <p>4) It appears the +/- 5 % of the rated generator voltage constraint has been removed</p>

Organization	Yes or No	Question 3 Comment
		<p>from the voltage ride thru criteria. Depending on the tap of the GSU, this might be more limiting than the HVRT curve. SDT should consider keeping the constraint.</p> <p>The standard is limited to relay settings during the first 4 seconds of a disturbance. Attachment 2 does reference “Return to voltage between 0.95 PU and 1.05 PU dependent on automatic or manual changes to the system.”</p> <p>5) Related to #5 in the curve clarifications - What is the intend of changing from RMS to crest voltages for the HVRT? What is a crest phase-to-phase voltage?</p> <p>Clarification #5 addresses concerns raised by equipment manufactures that many types of equipment are more sensitive to the crest voltage than to RMS voltage. Basing the standard only on RMS voltage would require equipment to be designed for unknown conditions.</p> <p>6) Related to #6 in the curve clarifications - Voltage relays may not ride through HV or LV disturbances as intended if the curves are not compensated for the rated capabilities of the machine. It would be better to compensate the LVRT curve for operation at the B point on the D-Curve and the HVRT curve for operation at the C point on the D-curve.</p> <p>The curves are voltage duration envelopes based on transmission system voltages. It is up to the GO to evaluate the generator relay setting based on the range of expected initial conditions to assure that the relays will not operate for the envelope of transmission voltages in Attachment 2.</p> <p>7) V/Hz relay should be evaluated in the frequency domain at maximum rated voltage, typically 105%.</p> <p>The SDT agrees that your suggestion is valid, but would argue that they may be evaluated at 60 Hz with the allowance to operate at proportionally lower voltage with lower frequencies. No change made.</p> <p>8) Has any consideration been given to addressing the frequency and voltage excursions in the transmission system in order to arrest the situation locally?</p>

Organization	Yes or No	Question 3 Comment
		<p>The standard applies to Generators Owners. Consideration has been given to transmission system based solutions in R2 where the Transmission Planner can specify less stringent conditions for a specific generator. The UFLS systems designed per standard PRC-006-1 accomplish the suggested activity for frequency excursions. Voltage excursions caused by faults on the transmission system cannot realistically be arrested.</p> <p>9) Information from IEEE Electric Machinery Committee discussion topic “Grid Code Impact on Electric Machine Design” (San Diego 2012 - Papers from the session with supporting information are available): A) PRC-024 VR capability may not be available at any price. BES reliability enhancements requiring technological advances should be addressed with industry groups (e.g. ASME, IEEE) and OEMs to develop commercially available products before appearing as requirements in reliability standards. It is believed the cost of complying with wider standards might increase main generator machine costs as much as 25%, which is not insignificant. This should only be required if there is a defined local system need for higher standards and that these costs should be considered against the cost of other possible resolutions. B) A specific concern in this respect regarding the ride-through capability being sought in PRC-024 R3-5 is that auxiliary buses may drop-out and cause a unit to trip for the excursions specified, which go well beyond the industry's present design criteria, even if the protective relay settings nominally allow such transients. It may be unrealistic to expect that the dynamic behavior of all 4160V and 460V systems in new plant can be dynamically modeled to a degree allowing one to obtain non-drop-out guarantees from equipment suppliers and EPC firms for extreme transients such as 2.0 seconds at 65% voltage, or that the same can be done for existing plants to allow identification of limiting components and accurate estimates of performance. C) The voltage ride through was originally intended to address early deficiencies in wind generation design only and it doesn't make sense to apply such a broad curve to steam plants. The concerns that led to the VRT curve for wind have been addressed by new vintage wind plant designs and thus, the EMC does not believe there is a driving need for a standard VRT criteria. See response below.</p>

Organization	Yes or No	Question 3 Comment
		<p>10) The VRT issue is holding up addressing other significant issues addressed by PRC-024 (relay setting coordination and frequency ride through). The VRT should be pulled out of PRC-024 and a new SAR drafted to address the voltage performance aspects if this is really needed for reliability. See response below.</p> <p>11) Information from Siemens (Generator OEM) perspective: A) Regarding PRC-024, the LVRT curves (on Attachment 1) are subject to misinterpretation, since they seem to imply a very slow, stepped voltage recovery rather than a set of roughly equivalent faults. The curve needs some elaboration and supplemental explanation.</p> <p>Attachment 1 and 2 provide frequency and voltage duration envelopes, not an expected frequency or voltage profile. The curves do not imply a very slow or stepped frequency or voltage recovery. The Clarifications included with the attachment curves provide the requested clarification. See especially Voltage Ride-Through Curve Clarification #3</p> <p>B) The proposed PRC-024 draft allows certain exemptions (e.g., loss of field and loss of synchronism) that are not permitted in the stability assessment of wind plants. This appears to be in conflict with the FERC 693 mandate for technology-neutral ride-through requirements, since wind turbines have no analogous exceptions. Indeed, the reason for the LVRT standard applied to wind turbines was because of the characteristic of induction generator wind turbines to lose synchronism at low voltages.</p> <p>The SDT agrees with you fully that wind turbines provide superior reliability benefits for the power system which industry has indicated that conventional generators simply cannot supply. Based on comments from stakeholders the performance requirements that currently apply to wind plants through FERC Order 661 were not extended to conventional generators in this standard.</p> <p>R1 provides analogs exemptions for both synchronous and power electronic based equipment.</p> <p>C) The Abnormal Frequency ride through curves of PRC-024 (on Attachment 2) have</p>

Organization	Yes or No	Question 3 Comment
		<p>not been coordinated with the equipment standards and exceed the overfrequency limits in the equipment standards in most cases.</p> <p>The Abnormal Frequency ride through curves on Attachment 1 have been adjusted to match IEEE and IEC requirements.</p> <p>D) Further on PRC-024, there is only one reference explicitly cited, yet there are several implicitly cited (e.g., frequency limits) and there are well-known conflicts with equipment standards. The sources of the frequency limits and equipment standard limits should be cited in publicly available documents. Where, for example, are the Eastern Grid and ERCOT overfrequency requirements? They are not generally known. They should be explicitly cited.</p> <p>The Abnormal Frequency ride through curves on Attachment 1 have been adjusted to match IEEE and IEC requirements. References for curves have been added to the standard.</p> <p>E) The LVRT curves stipulate that the stability assessment be performed at rated lagging power factor. This is not a conservative assumption. It should be justified, not simply asserted as standard practice.</p> <p>It is not the most conservative but it is a typical operating point.</p>
<p>Response: The SDT thanks you for your comment. Based on comments from you and numerous other stakeholders the SDT has decided to remove Requirement R5 from the next draft of the standard. The SDT believes that Requirement R4 meets the reliability objective of the directive in Paragraph 1787 of FERC Order 693. In addition, the SDT agrees with stakeholders who indicated that the additional resources that would be required to design, build, operate and maintain synchronous generating facilities that could ride through any of the defined excursions without fail would not justify the resulting incremental gain in grid reliability. From a low voltage ride-through perspective, the occurrence of severe transmission system faults in the immediate vicinity of a generation facility is rare and the history of transmission faults causing trips of generating facilities remote (e.g., more than one bus away) from the fault is similarly rare. From a frequency excursion perspective, turbines and generators currently on the market easily meet the requirements for coordinating with UFLS programs when challenged with typical frequency excursions. While there have been issues with frequency oscillations in some cases (e.g., lean fuel blowout), the SDT believes that these types of issues can be resolved by market forces without the need for a requirement in a reliability standard. This directly addresses</p>		

Organization	Yes or No	Question 3 Comment
<p>your comments 2, 3, 9, 10. Please see other responses above.</p>		
<p>Texas Reliability Entity</p>		<p>1) R5: New generation units may not be able to meet this requirement if auxiliary systems are included. While the standard allows for a temporary or retroactive exemption, it is a difficult task to design and build a new plant and take into account the myriad of pumps, fans, dampers, control systems, instrumentation, etc. that could possible trip the unit during a low frequency or low voltage event. The SDT may want to consider removing the language “and plants (including auxiliary systems)” from the first sentence of this requirement. If the SDT maintains this requirement, consideration should be given to utilizing a lower VSL other than Severe. Additionally, considering the proposed definition of BES, is the auxiliary system phrase applicable?</p> <p>Based on comments from you and numerous other stakeholders the SDT has decided to remove Requirement R5 from the next draft of the standard. The SDT believes that Requirement R4 meets the reliability objective of the directive in Paragraph 1787 of FERC Order 693. In addition, the SDT agrees with stakeholders who indicated that the additional resources that would be required to design, build, operate and maintain synchronous generating facilities that could ride through any of the defined excursions without fail would not justify the resulting incremental gain in grid reliability. From a low voltage ride-through perspective, the occurrence of severe transmission system faults in the immediate vicinity of a generation facility is rare and the history of transmission faults causing trips of generating facilities remote (e.g., more than one bus away) from the fault is similarly rare. From a frequency excursion perspective, turbines and generators currently on the market easily meet the requirements for coordinating with UFLS programs when challenged with typical frequency excursions. While there have been issues with frequency oscillations in some cases (e.g., lean fuel blowout), the SDT believes that these types of issues can be resolved by market forces without the need for a requirement in a reliability standard.</p> <p>2) As written, the standard will apply across all types of BES-defined generation units</p>

Organization	Yes or No	Question 3 Comment
		<p>(Individual generating unit greater than 20 MVA directly connected to the bulk power system, generating plant/ facility consisting of one or more units that are connected to the bulk power system at a common bus with total generation greater than 75 MVA, etc.) regardless of fuel type. Based on this applicability, fossil-fueled conventional units and variable resources (wind, solar, hydro, etc.) must meet the same voltage/frequency criteria. Is this the intent of the SDT? Voltage ride-through capabilities can vary significantly between fossil-fueled plants and wind plants due to their technical dissimilarities. Attempting to apply a single criteria to both will lead to technical difficulties between synchronously-connected and asynchronously-connected machines, as each responds differently voltage disturbances. Attempting a one-size-fits-all approach is inappropriate for this type of standard. The standard should recognize that wind generators and traditional generation facilities are technologically dissimilar and, therefore, cannot be treated the same in this instance.</p> <p>Yes, the intent of the standard is to be technology neutral and apply to all types of generation, as directed by FERC in Paragraph 1787 of FERC Order 693.</p> <p>3) If a Generator Owner has a limitation that is communicated but failed to set its frequency protective relaying to not operate, is that a violation?</p> <p>The Generator Owner is allowed to set a protective relay to operate within the “No Trip Zone” for that portion of the Zone that applies to the equipment limitation that has been communicated per Requirement R3.</p> <p>4) Has there been any consideration of providing separate capability curve figures for each Interconnection?</p> <p>The SDT considered having separate off-nominal frequency curves for each interconnection but elected to include a single curve in the standard. The individual tables provide more accurate information that would be used for determining relay settings.</p>
<p>Response: Thank you for your comments. Please see responses to specific comments above.</p>		

Organization	Yes or No	Question 3 Comment
Wisconsin Electric Power Company		<p>1. In R2, it is not specified whether the voltage ride-through curve (Attachment 2) refers to three-phase voltages or any one phase. This makes an enormous difference in the ability of equipment to withstand the sag. More importantly, the extreme voltage ride through requirements do not appear to be technically feasible to achieve for coal and gas-fired turbine-generators. The voltage ride-through requirements should be re-examined to verify they are justified by reliability need, and separated from the more critical frequency coordination requirements. We believe that a separate standard is needed for the voltage requirements, which are not as clearly justified or supported by existing equipment.</p> <p>The voltage ride-through curves are voltage magnitude vs. duration which would encompass both three-phase and single-phase faults on the transmission system. The duration of the curves in Attachment 2 has been shortened from 10 minutes to 4 seconds to coordinate with the Generator Relay Loadability standard (PRC-025). Following the excursion defined in PRC-024 Attachment 2, the steady-state stressed system conditions described in PRC-025 would apply. Based on comments from you and numerous other stakeholders the SDT has decided to remove Requirement R5 from the next draft of the standard, eliminating the voltage ride through performance requirement for future generating facilities.</p> <p>2. R2 consists of a single sentence with over 100 words. This needs to be corrected.</p> <p>The SDT feels that R2 is clearly written and expresses the reliability objective.</p> <p>3. In R3 and associated M3, the GO is responsible to document equipment limitations that prevent the unit from meeting the frequency and voltage performance curves. However, it is not uncommon for the generating unit to experience problems in a wide variety of plant systems which result in unit trips. Thus the GO is not necessarily aware of the source of these less frequent unit trips caused by external events, such as transmission system faults, and associated voltage sags. Therefore this requirement needs to also apply to the Transmission Owner. The TO (or TP) should be required to identify those events within its system that may</p>

Organization	Yes or No	Question 3 Comment
		<p>have adversely affected generating units. Only then can the GO be responsible to identify its equipment limitations. Without this joint responsibility, this requirement should be removed.</p> <p>The GO is responsible for documenting equipment limitations that require generator protection to be set to operate within the “No Trip Zone” of Attachments 1 or 2 based on the frequency and voltage at the point of interconnection regardless of the transmission system event which caused the voltage or frequency deviation. The Transmission Owner and Transmission Planner do not have the information about the Generator Owners’ equipment to make the assessment being recommended. This has always been the responsibility of the Generator Owner.</p> <p>4. In R3.1, the requirement is for the GO to communicate equipment limitations to four different entities. This requirement is in the long-term planning horizon, and therefore the communication should be limited to the TP only, and not the other entities. The TP is the primary recipient, and they can pass the information to the other entities as necessary, as described in the NERC Functional Model. In addition, the time requirement of 30 days is unreasonably short; we suggest that 90 days would be sufficient for this long-term planning requirement.</p> <p>The SDT feels that 30 days is a reasonable amount of time to compile and send the required information and that sending the material to the four entities is not an unreasonable burden.</p> <p>5. In R5, it does not appear that new thermal plants can meet these requirements, which have largely been developed for wind farms, especially Attachment 2. The auxiliary systems of such plants cannot be guaranteed to meet the performance curves, apart from a strong cooperative effort by equipment suppliers to design these requirements into the equipment. There need to be industry standards (e.g., IEEE) in place before this requirement is ready for industry use, such as performance standards for equipment like variable-speed drives, for one example.</p>

Organization	Yes or No	Question 3 Comment
		<p>Based on comments from you and numerous other stakeholders the SDT has decided to remove Requirement R5 from the next draft of the standard. The SDT believes that Requirement R4 meets the reliability objective of the directive in Paragraph 1787 of FERC Order 693. In addition, the SDT agrees with stakeholders who indicated that the additional resources that would be required to design, build, operate and maintain synchronous generating facilities that could ride through any of the defined excursions without fail would not justify the resulting incremental gain in grid reliability. From a low voltage ride-through perspective, the occurrence of severe transmission system faults in the immediate vicinity of a generation facility is rare and the history of transmission faults causing trips of generating facilities remote (e.g., more than one bus away) from the fault is similarly rare. From a frequency excursion perspective, turbines and generators currently on the market easily meet the requirements for coordinating with UFLS programs when challenged with typical frequency excursions. While there have been issues with frequency oscillations in some cases (e.g., lean fuel blowout), the SDT believes that these types of issues can be resolved by market forces without the need for a requirement in a reliability standard.</p>
<p>Response: The SDT thanks you for your comment. Please see responses above.</p>		
Tennessee Valley Authority		<p>1. The technical justification for the need of a plant performance criteria appears to be based on issues with early design wind generation. The technical considerations at these types of generation stations are different than steam turbine generation plants, which require heavy induction loads to support operation and these loads are sensitive to upsets in voltage and frequency. The technical implications of the plant performance are not clear. Recommend generating a separate SAR and bring in industry technical SMEs such as IEEE, EPRI, Equipment OEMs, Power Plant Design entities, technical academia, etc. to assist in the technical analysis and standard development.</p>

Organization	Yes or No	Question 3 Comment
		<p>2. Likewise, industry technical SMEs such as IEEE, EPRI, Equipment OEMs, Power Plant Design entities, technical acadamia, etc. can develop acceptable methods to determine the capability of a plant to ride through grid transients.</p> <p>3. The following are IEEE Electric Machines Committee comments for PRC-024-1 consideration The IEEE Electric Machinery Committee hosted a discussion topic on “Grid Code Impact on Electric Machine Design” in San Diego at this year’s Power Engineering Society meeting and offers the following input.</p> <ul style="list-style-type: none"> o Minor changes in the Under-frequency Ride Through Curve are suggested to better match existing machine design standards in IEEE C50????. o The PRC-024 Voltage Ride Through criteria is technically not ready to be a standard, for the following reasons; 1. PRC-024 VR capability may not be available at any price. BES reliability enhancements requiring technological advances should be addressed with industry groups (e.g. ASME, IEEE) and OEMs to develop commercially available products before appearing as requirements in reliability standards. It is believed the cost of complying with wider standards might increase main generator machine costs as much as 25%, which is not insignificant. This should only be required if there is a defined local system need for higher standards and that these costs should be considered against the cost of other possible resolutions. 2. A specific concern in this respect regarding the ride-through capability being sought in PRC-024 R3-5 is that auxiliary buses may drop-out and cause a unit to trip for the excursions specified, which go well beyond the industry’s present design criteria, even if the protective relay settings nominally allow such transients. It may be unrealistic to expect that the dynamic behavior of all 4160V and 460V systems in new plant can be dynamically modeled to a degree allowing one to obtain non-drop-out guarantees from equipment suppliers and EPC firms for extreme transients such as 2.0 seconds at 65% voltage, or that the same can be done for existing plants to allow identification of limiting components and accurate estimates of performance. 3. The voltage ride through was originally intended to address early deficiencies in wind generation design only and it doesn’t make sense to apply such a broad curve to steam plants. The concerns that led to the VRT curve for wind have been addressed by new vintage wind plant designs and thus, the EMC does not

Organization	Yes or No	Question 3 Comment
		<p>believe there is not driving need for a standard VRT criteria. o The VRT issue is holding up addressing other significant issues addressed by PRC-024 (relay setting coordination and frequency ride through). The VRT should be pulled out of PRC-024 and a new SAR drafted to address the voltage performance aspects if this is really needed for reliability. o More clarity in defining plant MVARs available to support grid voltage is needed. Specifically, generation plants have not been designed to operate outside a normal band of 95 to 105% on the generator terminals. GSU settings are typically chosen to optimize MVAR support under normal operations, however is not reasonable to assume the full leading or lagging reactive support would be available under normal grid conditions.</p>
<p>Response: The SDT thanks you for your comments. Based on comments from you and numerous other stakeholders the SDT has decided to remove Requirement R5 from the next draft of the standard. The SDT believes that Requirement R4 meets the reliability objective of the directive in Paragraph 1787 of FERC Order 693. In addition, the SDT agrees with stakeholders who indicated that the additional resources that would be required to design, build, operate and maintain synchronous generating facilities that could ride through any of the defined excursions without fail would not justify the resulting incremental gain in grid reliability. From a low voltage ride-through perspective, the occurrence of severe transmission system faults in the immediate vicinity of a generation facility is rare and the history of transmission faults causing trips of generating facilities remote (e.g., more than one bus away) from the fault is similarly rare. From a frequency excursion perspective, turbines and generators currently on the market easily meet the requirements for coordinating with UFLS programs when challenged with typical frequency excursions. While there have been issues with frequency oscillations in some cases (e.g., lean fuel blowout), the SDT believes that these types of issues can be resolved by market forces without the need for a requirement in a reliability standard.</p> <p>The Abnormal Frequency ride-through curves on Attachment 1 have been adjusted to match IEEE and IEC requirements. References for curves have been added to the standard.</p>		
Independent Electricity System Operator		<p>1. We appreciate the SDT’s effort in making clarifying changes to the Implementation Plan to separate the effective dates for jurisdictions where regulatory is and isn’t required. And we understand that the phrase “following applicable regulatory authority” includes regulatory bodies from Canadian provinces requiring regulatory body approval. However, the separation alone and leaving the phrase “following</p>

Organization	Yes or No	Question 3 Comment
		<p>applicable regulatory authority” unchanged do not address the situation in Ontario where (a) regulatory approval is required” but (b) the effective dates are not necessarily tied with the effective dates indicated in the Sub-Section that applies to those jurisdictions where regulatory is required. In other words, the proposed language only partially reflects Canadian regulatory framework and we suggest additional wording, as described below. We request the following phrase be added to each sentence under the “In those jurisdictions where regulatory approval is required” of the Implementation Plan: “, or as otherwise made effective pursuant to the laws applicable to such ERO governmental authorities.” right after “following applicable regulatory approval”. The revised first bullet, for example, will read: o By the first day of the first calendar quarter, two calendar years following applicable regulatory approval, or as otherwise made effective pursuant to the laws applicable to such ERO governmental authorities, each Generator Owner shall have verified at least 40 percent of its applicable Facilities are fully compliant with Requirements R1, R2, R3, R4, and R6. And the same change to each of the sentences in Section A5.1 of the standard should also be made.</p> <p>The SDT agrees with your suggestion and has included the requested language.</p> <p>2. The impact of disconnecting a generating unit less than 20 MVA or a generation plant less than 75 MVA during frequency or voltage excursions is very limited. We suggest to add the following facility thresholds into the applicability section: a. Generating unit with a gross nameplate rating greater than 20 MVA b. Generating plant with an aggregated gross nameplate rating greater than 75 MVA</p> <p>The applicability for this standard is based on the Registry Criteria, so your suggested change is already included.</p> <p>3. There is a typo on the R2 footnote on “protective relaying”. It should be 2 instead of 1.</p> <p>This is supposed to be the same footnote as in R1, as it applies to both requirements.</p>

Organization	Yes or No	Question 3 Comment
<p>Response: The SDT thanks you for your comment. Please see responses above.</p>		
<p>Essential Power, LLC</p>		<p>1.The risk of incurring resonant vibration of steam turbine last-stage blades is generally related to blade length, so the off-frequency ride-through criteria in Att. 1 of PRC-024-1 are a concern for larger units. Nuclear plants in particular may be required to operate not only outside of OEM recommendations but at conditions that are unsafe. R3 allows the GO to document, and provide to the documentation to the Reliability Coordinator, Planning Coordinator, Transmission Operator and Transmission Planner, the known equipment limitations which will not allow the equipment to meet the criteria of Attachments 1 and 2. This allows the Generator Owner to set protection to trip the generator inside the “No Trip Zone” for the specific limitations communicated. These would include both of your examples (protecting the turbine from operating at low frequencies that the OEM has specified will damage the turbine and for operating under conditions prohibited by the NRC).</p> <p>2.Some gas turbines may experience surge or combustion upsets (including flame-out) at the off-speed conditions of Att. 1, in addition to potentially incurring blade vibration issues similar to those described above. When the upsets described above can be proven as true limitations, then R3 allows the GO to document, and provide to the documentation to the Reliability Coordinator, Planning Coordinator, Transmission Operator and Transmission Planner, the known equipment limitations which will not allow the equipment to meet the criteria of Attachments 1 and 2.</p> <p>3.Auxiliary equipment contactors are likely to drop-out at the off-design voltage values specified in Att. 2 of PRC-024-1, especially if the high-side voltage swings specified in this standard are magnified at plant MV and LV aux buses. Auxiliary equipment contactors are not considered part of the generator protection as defined for Requirements R1 and R2 in this standard. The Generator Owner will need to take into consideration the performance of this equipment during voltage or frequency excursions only if requested to provide the estimate contained in</p>

Organization	Yes or No	Question 3 Comment
		<p>Requirement R4.</p> <p>4. Fan and pump performance will be affected at the frequency limits of Att. 1, and below-rated voltage per Att. 2 may cause this equipment to stall, causing main flame trips, high/low duct pressure trips, drum level oscillations below the low water cut-out point and the like. This is especially the case if cycling above and below the rated frequency during Disturbances (but within the limits of Att. 1) magnifies system oscillations or drives automatic control systems unstable. While frequency and voltage protective relaying or functions will be set per Attachments 1 and 2 of PRC-024-1, the GO will need to take into consideration the above mentioned equipment only if requested to provide the estimate contained in R4.</p> <p>5. The prohibition against tripping for existing units applies not just to actuation of Protection Systems but to “protective relaying,” which per footnote #1 in PRC-024 includes “protective functions within control systems...based on frequency or voltage inputs.” It is unclear whether or not this definition covers contactor drop-out or actuation of fan stall protection systems at extreme under-voltage conditions. The definition of protective relaying and protective functions does not cover contactor drop-out or actuation of fan stall protection systems.</p> <p>6. The basis of compliance for new units is simply, “will not trip,” i.e. covering all issues cited above plus any unpredictable other factors that may take units down. It is not realistic to expect such sweeping guarantees to be available on a system-wide basis, even if some individual pieces of equipment can ostensibly comply with Atts. 1 and 2, effectively shutting-down the new power plant industry unless an owner were willing to take unbounded risk. Based on comments from you and numerous other stakeholders the SDT has decided to remove Requirement R5 from the next draft of the standard. The SDT believes that Requirement R4 meets the reliability objective of the directive in Paragraph 1787 of FERC Order 693. In addition, the SDT agrees with stakeholders who indicated that the additional resources that would be required to design, build, operate and maintain synchronous generating facilities that could ride through any of the defined excursions without fail would not justify</p>

Organization	Yes or No	Question 3 Comment
		<p>the resulting incremental gain in grid reliability. From a low voltage ride-through perspective, the occurrence of severe transmission system faults in the immediate vicinity of a generation facility is rare and the history of transmission faults causing trips of generating facilities is similarly rare. From a frequency excursion perspective, turbines and generators currently on the market easily meet the requirements for coordinating with UFLS programs when challenged with typical frequency excursions. While there have been issues with frequency oscillations in some cases (e.g., lean fuel blowout), the SDT believes that these types of issues can be resolved by market forces without the need for a requirement in a reliability standard.</p> <p>7. A “will not trip” obligation may also effectively ban entire classes of equipment, including combined cycle plants (as regards the chances of incurring lean blow-out) and (as mentioned earlier) nuclear facilities. It is noteworthy in this respect that environmental regulators have for decades been pushing gas turbine dry low-NOx combustors to the brink of instability during even steady-state operation, with inevitable negative implications for survival of Disturbances. Greater consideration of BES reliability may be needed, but doing so by issuing dueling regulations would not constitute an appropriate approach. See answer to 6 regarding the removal of R5 from the previously posted standard.</p> <p>8. M5 causes new-unit tripping due to frequency or voltage excursions within PRC-024 limits to constitute a violation, but it seems unlikely to expect an “or” event. That is, Disturbances are likely to cause frequency and voltage to simultaneously deviate from the rated values, and it is unclear how this combination of factors will be addressed in assessing compliance with the stands-separate basis of Att. 1 and Att. 2 in this standard. See answer to 6 regarding the removal of R5 from the previously posted standard.</p> <p>9. The grandfathering of existing units in R1 and R2 for, “documented and communicated equipment limitations,” is problematical; since the propensity to incur drum level fluctuations, air/flue gas flow oscillations and the like during Disturbances</p>

Organization	Yes or No	Question 3 Comment
		<p>will not be defined in OEM literature, nor is it generally possible to predict by calculations when such problems will occur, especially if a Disturbance involves cycling between above and below the rated frequency (but within the Att. 1 boundaries). The same is true regarding predicting transient fluctuations of aux bus voltages, ref. risk of contactor drop-out and stalling major auxiliary equipment. The exemptions in requirement R3 based on requirement R1 and R2 relay settings apply only to equipment protected by generator protective relaying and not relaying associated with in-plant equipment.</p> <p>10. The concern above applies also to having to make reference per R3 to, “study results, experience from an actual event, or manufacturers advisory.” Few if any GOs are likely to possess such documentation for Disturbances as extreme as those specified in Att. 1 and Att. 2. The list of types of evidence in R3 is not exclusive, but it is difficult to imagine alternative forms of hard evidence that could be developed other than for the comparatively few plants that possess high-fidelity simulators. The generator owner will be required to support the exemption by documentation but this only applies to equipment that is protected by generator protective relaying only. The equipment manufacturer should provide operating limitation documentation with the equipment.</p> <p>11. The same concerns regarding availability of information apply for the, “estimate of the time duration the existing generation unit will remain connected,” in R4. Relying on “sound engineering judgment” is permitted, and R4 states that “detailed unit performance studies are not required;” but the word “sound” implies that the estimate is to be based on accurate data, and how such information could be developed without a detailed study is unclear. Requirement R4 was worded to address the concern that detailed studies are not required. The entity should use available data and its knowledge of the plant design to develop an estimate.</p> <p>12. Confusion is created by making grandfathering, “in accordance with Requirement R3,” in R1 and R2 of PRC-024-1; while R3 excludes, “limitations that are caused by generator frequency and voltage protective relays.” Are such protective relays meant</p>

Organization	Yes or No	Question 3 Comment
		<p>to correspond to the “protective relaying” discussed above? It is semantically unclear whether or not any grandfathering is actually being allowed. The exemptions in requirement R3 are based on the inability of a generating unit meeting the criteria in Requirements R1 or R2. Inability to set existing protection to meet these Requirements does not constitute a valid reason for setting the protection to trip the generator within the no-trip zone in Attachments 1 and 2.</p> <p>13. The exemption take-back in the last bullet item of R3.1 (a 10% increase in nameplate capacity) again may effectively ban entire classes of equipment, or at least prevent units from ever receiving capacity and efficiency enhancements. If an entity replaces a piece of equipment that is causing a limitation per Requirement R3 and increases capacity by 10%, it must address the limitations. This is analogous to New Source Standards for pollution control.</p> <p>14. Steam turbine off-frequency limits are generally set by OEMs lifetime limits as regards duration, but there is no discussion in PRC-024-1 as to how often the specified excursions may occur, leaving users with ostensibly compliant equipment still at risk if major upsets take place more often than had been anticipated. The drafting team realizes that multiple under/over frequency events may occur that result is turbine blade loss of life resulting in an entity changing relay settings that effectively allows for tripping in the no trip zone. If this were to occur, the entity would supply documentation that supports exemption in requirement R3.</p> <p>15. An additional “may trip” exclusion is needed for R1 and R2 related to V/Hz set properly to limit over excitation of generators or transformers. Volts per hertz relaying is evaluated in requirement R2 as a voltage relay with a constant 60 hertz frequency. Per Clarification #4, the high voltage portion of the curves in Attachment 2 should be lowered proportionately for evaluating at frequencies lower than 60 Hz.</p> <p>16. Objection to R5 - the additional costs involved for re-designing generating stations so that every control subsystem can ride through the excursions defined by the attached curves is not economically justifiable considering the very small probability</p>

Organization	Yes or No	Question 3 Comment
		<p>of a voltage and/or frequency excursion occurring. Furthermore, we believe it is fundamentally inappropriate to support approval of such a requirement until the technical issues that would require changes to the industry standards for plant systems and equipment are resolved. We recommend this requirement be removed so the standard can move forward to address the shorter term goals that are achievable. Based on comments from you and numerous other stakeholders the SDT has decided to remove Requirement R5 from the next draft of the standard. The SDT believes that Requirement R4 meets the reliability objective of the directive in Paragraph 1787 of FERC Order 693. In addition, the SDT agrees with stakeholders who indicated that the additional resources that would be required to design, build, operate and maintain synchronous generating facilities that could ride through any of the defined excursions without fail would not justify the resulting incremental gain in grid reliability. From a low voltage ride-through perspective, the occurrence of severe transmission system faults in the immediate vicinity of a generation facility is rare and the history of transmission faults causing trips of generating facilities is similarly rare. From a frequency excursion perspective, turbines and generators currently on the market easily meet the requirements for coordinating with UFLS programs when challenged with typical frequency excursions. While there have been issues with frequency oscillations in some cases (e.g., lean fuel blowout), the SDT believes that these types of issues can be resolved by market forces without the need for a requirement in a reliability standard.</p> <p>17. Does R6 refer to ALL generator trips? This should be limited to Protection System relaying set to trip on over/under voltage or over/under frequency, or over volts/Hertz, not ALL generator trips. Also, this requirement may repeat requirements that are being developed in revisions to PRC-001. Although unlikely, there may be cases where a planner may require relay settings from other generator protective functions to perform studies. It is to the Generator Owner's advantage with little burden to provide such data for a Transmission Planner's study to be as accurate as possible.</p> <p>18. It is inconceivable that most plants can ride through a + or - 10% voltage</p>

Organization	Yes or No	Question 3 Comment
		<p>excursion for 10 minutes per PRC-024, Attachment 2. Almost all would have to take exceptions. The curves in Attachment 2 have been revised and shortened from 600 seconds to 4 seconds in order to coordinate better with the Generator Relay Loadability standard (PRC-025). The philosophy is that PRC-024 applies during excursions and PRC-025 applies subsequently during steady-state stressed system conditions.</p>
<p>Response: The SDT thanks you for your comments. See individual responses to your questions above.</p>		
Pepco Holdings Inc		<p>A footnote 2 reference to qualify the term “existing generating unit” should also be included in the last bullet in Requirement R2. Also, the language in footnote 2 should begin with “Includes ...” rather than “To include...”</p>
<p>Response: The SDT thanks you for your comments. Due to the SDT removing the ride-thru provisions of R5 in the previously posted version of this standard, the term "existing generating unit" and the footnote has been removed from the next draft.</p>		
SERC Reliability Corp		<p>An additional “may trip” exclusion is needed for R1 and R2 related to properly set V/Hz relaying. The SDT reviewed IEEE standards and published OEM V/Hz capabilities and believes that the high voltage curve (in conjunction with Clarification #4) allow V/Hz protection to be set to protect the equipment while still meeting the requirements of this standard without additional exclusions .</p> <p>Does R6 refer to ALL generator trips? This should be limited to Protection System relaying set to trip on over/under voltage or over/under frequency, or over volts/Hertz, not ALL generator trips. Note: Depending on approval dates, R6 may repeat requirements that are being developed in revisions to PRC-001 and/or PRC-027. The GO must provide all requested protective settings. These settings would be those that are included in the planner’s stability models. It is important for grid stability that these stability models contain accurate information. The SDT does not see this as an undue burden. No such settings reporting requirements exist in PRC-001 or PRC-027.</p>

Organization	Yes or No	Question 3 Comment
		<p>Not really protection related: The additional costs involved for re-designing generating stations under R5 so that every control subsystem can ride through the excursions defined by the attached curves is not economically justifiable considering the very small probability of a voltage and/or frequency excursion occurring. It is inappropriate to support approval of such a requirement until the technical issues that would require changes to the industry standards for plant systems and equipment are resolved. Based on comments from you and numerous other stakeholders the SDT has decided to remove Requirement R5 from the next draft of the standard. The SDT believes that Requirement R4 meets the reliability objective of the directive in Paragraph 1787 of FERC Order 693. In addition, the SDT agrees with stakeholders who indicated that the additional resources that would be required to design, build, operate and maintain synchronous generating facilities that could ride through any of the defined excursions without fail would not justify the resulting incremental gain in grid reliability. From a low voltage ride-through perspective, the occurrence of severe transmission system faults in the immediate vicinity of a generation facility is rare and the history of transmission faults causing trips of generating facilities is similarly rare. From a frequency excursion perspective, turbines and generators currently on the market easily meet the requirements for coordinating with UFLS programs when challenged with typical frequency excursions. While there have been issues with frequency oscillations in some cases (e.g., lean fuel blowout), the SDT believes that these types of issues can be resolved by market forces without the need for a requirement in a reliability standard.</p>
<p>Response: The SDT thanks you for your comments. See individual responses to your questions above.</p>		
Southern Company		<p>1) An additional “may trip” exclusion is needed for R1 and R2 related to V/Hz set properly to limit overexcitation of generators or transformers. The SDT reviewed IEEE standards and published OEM V/Hz capabilities and believes that the high voltage curve (in conjunction with Clarification #4) allow V/Hz protection to be set to protect the equipment while still meeting the requirements of this standard</p>

Organization	Yes or No	Question 3 Comment
		<p>without additional exclusions .</p> <p>2) Please consider a requirement for the TP to perform location-specific system voltage recovery studies referenced in R2. This should be a requirement for the TP prior to requiring the severe voltage profile of Attachment 2. The SDT feels the profile of Attachment 2 can be accomplished by the vast majority of applicable generating units. The GO may request the voltage recovery characteristics of a location-specific Transmission Planner’s study for any generating unit.</p> <p>3) Both the exemption of existing units using the exceptions in R1 and R2 for “documented and communicated equipment limitations” and “the estimation of time a unit will remain connected” per R4 are problematical. Power plants exhibit a tendency for have drum level fluctuations, air/flue gas flow oscillations, or other plant subsystem instability during system disturbances which are not defined in OEM literature. It is generally not possible to determine when such problems will occur especially if a disturbance involves cycling above and below the rated frequency within the Attachment 1 boundaries. The same is true regarding predicting transient fluctuations of auxiliary system bus voltages. These voltage fluctuations affect power distribution equipment in the power plant by contactor or control relay drop-out, major auxiliary equipment stalls, etc. Predicting when a plant trip will occur due to these types of power plant system responses is problematic. The SDT agrees with your comment, but believes that the wording of R4, "The Generator Owner may develop the estimates based on experience, actual event histories, or sound engineering judgment," allows the GO to provide an estimate.</p> <p>4) The “10% power increase” exemption loss (in the last bullet item of R3.1) may effectively ban entire classes of equipment or prevent units from ever receiving capacity and efficiency enhancements. . If an entity replaces a piece of equipment that is causing a limitation per Requirement R3 and increases capacity by 10%, it must address the limitations. This is analogous to New Source Standards for pollution control.</p> <p>5) We object to R5 - the additional costs involved for re-designing generating stations</p>

Organization	Yes or No	Question 3 Comment
		<p>so that every control subsystem can ride through the excursions defined by the attached curves is not economically justifiable considering the very small probability of a voltage and/or frequency excursion occurring. Furthermore, we believe it is fundamentally inappropriate to support approval of such a requirement until the technical issues that would require changes to the industry standards for plant systems and equipment are resolved. We recommend this requirement be removed so the standard can move forward to address the shorter term goals that are achievable. Further comments regarding R5: Currently, there exist too many engineering challenges to permit the requirement of R5. These include the following: Fan and pump performance will be affected at the frequency limits of Att. 1, and below-rated voltage per Att. 2 may cause this equipment to stall, causing main flame trips, high/low duct pressure trips, drum level oscillations below the low water cut-out point and the like. This is especially the case if cycling above and below the rated frequency during Disturbances (but within the limits of Att. 1) magnifies system oscillations or drives automatic control systems unstable. Auxiliary equipment contactors and energized control relays are likely to drop-out at the off-design voltage values specified in Att. 2 of PRC-024-1, especially if the high-side voltage swings specified in this standard are magnified at plant MV and LV aux buses. This dropout will occur within a few cycles. The basis of compliance for new units is simply, "will not trip," i.e. covering all issues cited above plus any unpredictable other factors that may take units down. It is not realistic to expect such sweeping guarantees to be available on a system-wide basis, even if some individual pieces of equipment can ostensibly comply with Atts. 1 and 2, effectively shutting-down the new powerplant industry unless an owner were willing to take unbounded risk. This will require revision of, not only plant equipment standards, but "plant system" standards. Even if we could certify all of the components, you cannot guarantee once they are implemented into a system they will respond as planned. Disturbances are likely to cause frequency and voltage to simultaneously deviate from the rated values, and it is unclear how this combination of factors will be addressed in assessing compliance with the stands-separate basis of Att. 1 and Att. 2 in this standard. The SDT stated in</p>

Organization	Yes or No	Question 3 Comment
		<p>their previous PRC-024 Consideration of Comments that grid requirements similar to R5 are already in effect in parts of Europe. U.S. standards still prevail for design, construction, and operation of plants in the U.S. We believe it is inappropriate to implement a national standard requiring U.S. plants be designed to the requirements of R5 until the industry can demonstrate through additional research, development, and revision of the plant equipment and system standards that such requirements can be practically met. Based on comments from you and numerous other stakeholders the SDT has decided to remove Requirement R5 from the next draft of the standard. The SDT believes that Requirement R4 meets the reliability objective of the directive in Paragraph 1787 of FERC Order 693. In addition, the SDT agrees with stakeholders who indicated that the additional resources that would be required to design, build, operate and maintain synchronous generating facilities that could ride through any of the defined excursions without fail would not justify the resulting incremental gain in grid reliability. From a low voltage ride-through perspective, the occurrence of severe transmission system faults in the immediate vicinity of a generation facility is rare and the history of transmission faults causing trips of generating facilities is similarly rare. From a frequency excursion perspective, turbines and generators currently on the market easily meet the requirements for coordinating with UFLS programs when challenged with typical frequency excursions. While there have been issues with frequency oscillations in some cases (e.g., lean fuel blowout), the SDT believes that these types of issues can be resolved by market forces without the need for a requirement in a reliability standard.</p> <p>6) Please consider requirements for TO to address the frequency and voltage excursions in the transmission system in order to arrest the abnormal condition locally. The standard applies to Generators Owners. Consideration has been given to transmission system based solutions in R2 where the Transmission Planner can specify less stringent conditions for a specific generator. The UFLS systems designed per standard PRC-006-1 accomplish the suggested activity for frequency excursions. Voltage excursions caused by faults on the transmission system cannot</p>

Organization	Yes or No	Question 3 Comment
		<p>realistically be arrested.</p> <p>7) Does R6 refer to ALL generator trips? This should be limited to Protection System relaying set to trip on over/under voltage or over/under frequency, or over volts/Hertz, not ALL generator trips. Also , this requirement may repeat requirements that are being developed in revisions to PRC-001. The GO must provide all requested protective settings. These settings would be those that are included in the planner’s stability models. It is important for grid stability that these stability models contain accurate information. The SDT does not see this as an undue burden. No such settings reporting requirements exist in PRC-001 or PRC-027.</p> <p>8) It is inconceivable that most plants can ride through a + or - 10% voltage excursion for 10 minutes per PRC-024, Attachment 2. Almost all would have to take exception. All of our nuclear plants would trip as would the new nuclear plant currently under construction. The curves in Attachment 2 have been revised and shortened from 600 seconds to 4 seconds in order to coordinate better with the Generator Relay Loadability standard (PRC-025). The philosophy is that PRC-024 applies during excursions and PRC-025 applies subsequently during steady-state stressed system conditions.</p>
<p>Response: The SDT thanks you for your comments. See individual responses to your questions above.</p>		
BrightSource Energy		<p>BrightSource is voting affirmative with the understanding that individual Regions can have requirements that are more stringent than NERC Standards. Therefore, even though R3 only requires GOs to “document each known equipment limitation (excluding limitations that are caused by generator frequency and voltage protective relays) that prevents a generating unit, from meeting the criteria in Requirements R1 or R2”, it does not relieve the GOs of their obligations under the WECC Coordinated Off-Nominal Load Shedding Plan for generators that connects to the Western Interconnection.</p>
<p>Response: The SDT thanks you for your comment and agrees with its content.</p>		

Organization	Yes or No	Question 3 Comment
Consumers Energy		<p>Consumers Energy's previous comments - "Related to undervoltage criteria, the 18 cycle at 45% of generator voltage would put a great deal of strain on the plant auxiliary systems and that may not be something these systems are able to withstand. The same would be true of a fault that produces 65% voltage at the generator terminals for 2 seconds. These comments relate specifically to Consumers Energy. However, it is likely that many others have similar equipment and would have the same issues. Please also note that the proposed standard does not align with ANSI C37.102, IEEE Guide for AC Generator Protection or with the NERC Technical Reference Document entitled Power Plant and Transmission System Protection Coordination." Previous SDT reply - Thank you for your comments. Please note that the voltage levels specified in Attachment 2 are at the point of interconnection to the transmission system. They would not correlate directly with the auxiliary bus voltages, especially if the auxiliaries are unit-connected. The SDT does not believe this proposed standard is in conflict with either the IEEE or the NERC documents cited. Please inform the SDT of the specifics of your concerns." We believe our comments still apply. Specific to the fault that produces 65% voltage at the generator terminals for 2 seconds, plant auxiliary equipment would not be able to withstand such a drop for the specified duration and would fall offline.</p>
<p>Response: The SDT thanks you for your comments. The SDT does not believe this proposed standard is in conflict with either the IEEE or the NERC documents cited. The SDT believes that the wording of R4, "The Generator Owner may develop the estimates based on experience, actual event histories, or sound engineering judgment," will allow the GO to provide an estimate. However, if the GO feels his equipment is not capable of meeting the undervoltage criteria of Attachment 2, then R3 would apply. Also, note that Attachment 2 has been modified for the next draft and now only extends to 4 seconds.</p>		
Cowlitz PUD		<p>Cowlitz supports the comments from the NAGF SRT:</p> <ol style="list-style-type: none"> 1. The risk of incurring resonant vibration of steam turbine last-stage blades is generally related to blade length, so the off-frequency ride-through criteria in Att. 1 of PRC-024-1 are a concern for larger units. Nuclear plants in particular may be required to operate not only outside of OEM recommendations but at conditions

Organization	Yes or No	Question 3 Comment
		<p>that are unsafe.</p> <p>Requirement R3 allows the GO to document, and provide to the documentation to the Reliability Coordinator, Planning Coordinator, Transmission Operator and Transmission Planner, the known equipment limitations which require generator protection to be set to trip inside the no-trip zone of Attachments 1 and 2.</p> <p>2. Some gas turbines may experience surge or combustion upsets (including flame-out) at the off-speed conditions of Att. 1, in addition to potentially incurring blade vibration issues similar to those described above.</p> <p>Requirement R3 allows the GO to document, and provide to the documentation to the Reliability Coordinator, Planning Coordinator, Transmission Operator and Transmission Planner, the known equipment limitations which require generator protection to be set to trip inside the no-trip zone of Attachments 1 and 2.</p> <p>3. Auxiliary equipment contactors are likely to drop-out at the off-design voltage values specified in Att. 2 of PRC-024-1, especially if the high-side voltage swings specified in this standard are magnified at plant MV and LV aux buses.</p> <p>Auxiliary equipment contactors are not considered part of the generator protection as defined for Requirements R1 and R2 in this standard. The Generator Owner will need to take into consideration the performance of this equipment during voltage or frequency excursions only if requested to provide the estimate contained in Requirement R4</p> <p>4. Fan and pump performance will be affected at the frequency limits of Att. 1, and below-rated voltage per Att. 2 may cause this equipment to stall, causing main flame trips, high/low duct pressure trips, drum level oscillations below the low water cut-out point and the like. This is especially the case if cycling above and below the rated frequency during Disturbances (but within the limits of Att. 1) magnifies system oscillations or drives automatic control systems unstable.</p> <p>Fans and pumps are not considered part of the generator protection as defined for Requirements R1 and R2 in this standard. The Generator Owner will need to take</p>

Organization	Yes or No	Question 3 Comment
		<p>into consideration the performance of this equipment during voltage or frequency excursions only if requested to provide the estimate contained in Requirement R4.</p> <p>5. The prohibition against tripping for existing units applies not just to actuation of Protection Systems but to “protective relaying,” which per footnote #1 in PRC-024 includes “protective functions within control systems...based on frequency or voltage inputs.” It is unclear whether or not this definition covers contactor drop-out or actuation of fan stall protection systems at extreme under-voltage conditions.</p> <p>The definition of protective relaying and protective functions does not cover contactor drop-out or actuation of fan stall protection systems.</p> <p>6. The basis of compliance for new units is simply, “will not trip,” i.e. covering all issues cited above plus any unpredictable other factors that may take units down. It is not realistic to expect such sweeping guarantees to be available on a system-wide basis, even if some individual pieces of equipment can ostensibly comply with Atts. 1 and 2, effectively shutting down the new power plant industry unless an owner is willing to take unbounded risk.</p> <p>Based on comments from you and numerous other stakeholders the SDT has decided to remove Requirement R5 from the next draft of the standard. The SDT believes that Requirement R4 meets the reliability objective of the directive in Paragraph 1787 of FERC Order 693. In addition, the SDT agrees with stakeholders who indicated that the additional resources that would be required to design, build, operate and maintain synchronous generating facilities that could ride through any of the defined excursions without fail would not justify the resulting incremental gain in grid reliability. From a low voltage ride-through perspective, the occurrence of severe transmission system faults in the immediate vicinity of a generation facility is rare and the history of transmission faults causing trips of generating facilities is similarly rare. From a frequency excursion perspective, turbines and generators currently on the market easily meet the requirements for coordinating with UFLS programs when challenged with typical frequency excursions. While</p>

Organization	Yes or No	Question 3 Comment
		<p>there have been issues with frequency oscillations in some cases (e.g., lean fuel blowout), the SDT believes that these types of issues can be resolved by market forces without the need for a requirement in a reliability standard.</p> <p>7. A “will not trip” obligation may also effectively ban entire classes of equipment, including combined cycle plants (as regards the chances of incurring lean blow-out) and (as mentioned earlier) nuclear facilities. It is noteworthy in this respect that environmental regulators have for decades been pushing gas turbine dry low-NOx combustors to the brink of instability during even steady-state operation, with inevitable negative implications for survival of Disturbances. Greater consideration of BES reliability may be needed, but doing so by issuing dueling regulations would not constitute an appropriate approach.</p> <p>See answer to 6 regarding the removal of R5 from the previously posted standard.</p> <p>8. M5 causes new-unit tripping due to frequency or voltage excursions within PRC-024 limits to constitute a violation, but it seems unlikely to expect an “or” event. That is, Disturbances are likely to cause frequency and voltage to simultaneously deviate from the rated values, and it is unclear how this combination of factors will be addressed in assessing compliance with the stands-separate basis of Att. 1 and Att. 2 in this standard.</p> <p>See answer to 6 regarding the removal of R5 from the previously posted standard.</p> <p>9. The grandfathering of existing units in R1 and R2 for, “documented and communicated equipment limitations,” is problematical; since the propensity to incur drum level fluctuations, air/flue gas flow oscillations and the like during Disturbances will not be defined in OEM literature, nor is it generally possible to predict by calculations when such problems will occur, especially if a Disturbance involves cycling between above and below the rated frequency (but within the Att. 1 boundaries). The same is true regarding predicting transient fluctuations of aux bus voltages, ref. risk of contactor drop-out and stalling major auxiliary equipment.</p> <p>The exemptions in requirement R3 based on requirement R1 and R2 relay settings</p>

Organization	Yes or No	Question 3 Comment
		<p>apply only to equipment protected by generator protective relaying and not relaying associated with in-plant equipment.</p> <p>10. The concern above applies also to having to make reference per R3 to, “study results, experience from an actual event, or manufacturers advisory.” Few if any GOs are likely to possess such documentation for Disturbances as extreme as those specified in Att. 1 and Att. 2. The list of types of evidence in R3 is not exclusive, but it is difficult to imagine alternative forms of hard evidence that could be developed other than for the comparatively few plants that possess high-fidelity simulators.</p> <p>The SDT believes this would typically apply to limitations documented by OEM bulletins or by regulatory (e.g., NRC) operating restrictions which are generally available to Generator Owners. A Generator Owner may have performed a finite element analysis of a set of turbine blades to determine off-nominal frequency capability. While the SDT acknowledges this would be unusual, the intent of the wording in Requirement R3 was not to limit the type of evidence.</p> <p>11. The same concerns regarding availability of information apply for the, “estimate of the time duration the existing generation unit will remain connected,” in R4. Relying on “sound engineering judgment” is permitted, and R4 states that “detailed unit performance studies are not required;” but the word “sound” implies that the estimate is to be based on accurate data, and how such information could be developed without a detailed study is unclear.</p> <p>Requirement R4 was written to address the concern that detailed studies are not required. The entity should use available data and its knowledge of the plant design to develop an estimate.</p> <p>12. Confusion is created by making grandfathering, “in accordance with Requirement R3,” in R1 and R2 of PRC-024-1; while R3 excludes, “limitations that are caused by generator frequency and voltage protective relays.” Are such protective relays meant to correspond to the “protective relaying” discussed above? It is semantically unclear whether or not any grandfathering is actually being allowed.</p>

Organization	Yes or No	Question 3 Comment
		<p>The exemptions in requirement R3 are based on the inability of a generating unit meeting the criteria in Requirements R1 or R2. Inability to set existing protection to meet these Requirements does not constitute a valid reason for setting the protection to trip the generator within the no-trip zone in Attachments 1 and 2.</p> <p>13. The exemption take-back in the last bullet item of R3.1 (a 10% increase in nameplate capacity) again may effectively ban entire classes of equipment, or at least prevent units from ever receiving capacity and efficiency enhancements.</p> <p>If an entity replaces a piece of equipment that is causing a limitation per Requirement R3 and increases capacity by 10%, it must address the limitations. This is analogous to New Source Standards for pollution control.</p> <p>14. Steam turbine off-frequency limits are generally set by OEMs lifetime limits as regards duration, but there is no discussion in PRC-024-1 as to how often the specified excursions may occur, leaving users with ostensibly compliant equipment still at risk if major upsets take place more often than had been anticipated.</p> <p>The drafting team realizes that multiple under/over frequency events may occur that result is turbine blade loss of life resulting in an entity changing relay settings that effectively allows for tripping in the no trip zone. If this were to occur, the entity would supply documentation that supports exemption in requirement R3.</p> <p>15. An additional “may trip” exclusion is needed for R1 and R2 related to V/Hz set properly to limit over excitation of generators or transformers.</p> <p>Volts per hertz relaying is evaluated in requirement R2 as a voltage relay with a constant 60 hertz frequency. If the relay cannot be set according to Attachment 2, an exemption is allowed using requirement R3.</p> <p>16. Objection to R5 - the additional costs involved for re-designing generating stations so that every control subsystem can ride through the excursions defined by the attached curves is not economically justifiable considering the very small probability of a voltage and/or frequency excursion occurring. Furthermore, we believe it is fundamentally inappropriate to support approval of such a requirement</p>

Organization	Yes or No	Question 3 Comment
		<p>until the technical issues that would require changes to the industry standards for plant systems and equipment are resolved. We recommend this requirement be removed so the standard can move forward to address the shorter term goals that are achievable.</p> <p>Based on comments from you and numerous other stakeholders the SDT has decided to remove Requirement R5 from the next draft of the standard. The SDT believes that Requirement R4 meets the reliability objective of the directive in Paragraph 1787 of FERC Order 693. In addition, the SDT agrees with stakeholders who indicated that the additional resources that would be required to design, build, operate and maintain synchronous generating facilities that could ride through any of the defined excursions without fail would not justify the resulting incremental gain in grid reliability. From a low voltage ride-through perspective, the occurrence of severe transmission system faults in the immediate vicinity of a generation facility is rare and the history of transmission faults causing trips of generating facilities is similarly rare. From a frequency excursion perspective, turbines and generators currently on the market easily meet the requirements for coordinating with UFLS programs when challenged with typical frequency excursions. While there have been issues with frequency oscillations in some cases (e.g., lean fuel blowout), the SDT believes that these types of issues can be resolved by market forces without the need for a requirement in a reliability standard.</p> <p>17. Does R6 refer to ALL generator trips? This should be limited to Protection System relaying set to trip on over/under voltage or over/under frequency, or over volts/Hertz, not ALL generator trips. Also, this requirement may repeat requirements that are being developed in revisions to PRC-001.</p> <p>Although unlikely, there may be cases where a planner may require relay settings from other generator protective functions to perform studies. It is to the Generator Owner’s advantage with no undue burden to provide such data for a Transmission Planner’s study to be as accurate as possible.</p> <p>18. It is inconceivable that most plants can ride through a + or - 10% voltage</p>

Organization	Yes or No	Question 3 Comment
		<p>excursion for 10 minutes per PRC-024, Attachment 2. Almost all would have to take exception.</p> <p>Requirement R4 has been revised and the reference to 10 minutes has been removed.</p>
<p>Response: The drafting team thanks you for your comments. Please see the answers to each comment above.</p>		
<p>Exelon Corporation and its affiliates</p>		<p>1) Exelon is concerned that there are no set criteria for the transients nor any guidelines in the Standard on the number of requests that the RC, PC, TOP or TP could ask for. This is problematic in that the generating units could be subject to multiple requests for different combinations of transients without any cost benefit or justification. Exelon therefore suggests that the GVSDT evaluate adding language to the Standard that includes a provision for a set periodicity in which the transmission entities can request such data (e.g., an annual request or following a significant event on the transmission system).</p> <p>Requirement R4 was revised that requests may only be sent from a Planning Coordinator or Transmission Planner. In the event that multiple requests are received, it is permissible to use the initial response for each request.</p> <p>2) Exelon previously requested that the GVSDT split the Off Normal Frequency Capability Curve (Attachment 1) be split into separate tables for each Interconnect to make it easier to read. The response from the GVSDT states that they do not believe adding more graphs would add clarification since there are separate data tables. Although Exelon agrees that you could reference the data tables to ensure you are following the correct curve; unless the Off Normal Frequency Capability Curve is printed in color it is difficult to distinguish which line corresponds to which interconnection. Exelon still maintains that for clarity that each data table for each Interconnection should have a separate corresponding graph.</p> <p>The drafting team realizes that the frequency graph may be difficult to follow but</p>

Organization	Yes or No	Question 3 Comment
		believes that adding the table to assist in clarifying the data points alleviates the need for multiple graphs.
<p>Response: The drafting team thanks you for your comments. Please see the answers to each comment above.</p>		
Omaha Public Power District		<p>Footnote 1, which is referenced in R1 and R2, has two separate purposes: one is to provide a definition of frequency or voltage protective relaying, and the other is to state that each Generator Owner is not required to have frequency or voltage protective relaying installed or activated on its unit. Accordingly, it should be split into two separate sentences. We recommend that Footnote 1 be replaced by the following paragraph: Frequency or voltage protective relaying includes but is not limited to frequency and voltage protective functions for discrete relays, volts per hertz relays evaluated at nominal frequency, impedance relays, voltage controlled overcurrent relays, multi-function protective devices or protective functions within control systems that directly trip or provide tripping signals to the generator based on frequency, speed, or voltage inputs. Each Generator Owner is not required to have frequency or voltage protective relaying installed or activated on its unit. Note the addition of the word “speed” in the definition of frequency or voltage protective relaying.</p>
<p>Response: The drafting team thanks you for your comment. The drafting team believes that the footnote has sufficient clarity on examples of relays included in the standard and an entity is not required to install or activate any of the protective functions.</p>		
Wolverine Power Cooperative		<p>I would recommend that the standard applicability be narrowed to BES units only. The way I read the standard draft it would apply to all generating units. This seems to be a significant cost and amount of work for smaller units that will not have a great impact on the BES. I would suggest that in the applicability section of the standard that the BES unit definitions be used (greater than 85MVA, connected >100kV, etc).</p>
<p>Response: The drafting team thanks you for your comment. The drafting team believes that all units without exception for a registered Generation Owner are required to comply with this standard.</p>		

Organization	Yes or No	Question 3 Comment
American Transmission Company		<p>In Requirement 3.1 - ATC recommends replacing the wording of “shall communicate the documented equipment limitation” with “shall communicate the documented equipment limitation and the expected duration of the limitation, if it is known”. The addition of expected limitation duration could be valuable reliability information.</p>
<p>Response: The drafting team thanks you for your comment. The SDT believes that in the vast majority of cases, the limitations are effectively permanent so providing information on the expected duration would be of little value.</p>		
Ingleside Cogeneration LP (voting under entity name Occidental Chemical Corporation)		<p>Ingleside Cogeneration LP agrees that Transmission Planners and other operating entities must be able to rely on a generator’s availability when voltage and frequency transients occur at the interconnection point. However, we are not convinced that the project teams assertion that all technologies can accommodate the ride-through thresholds posed in PRC-024-1 R5 simply because some European nations already require them. This trivializes a major concern that a generator and all its auxiliary systems must remain online while severe stress is imposed upon mechanical systems spinning at high speeds. Our vendors are telling us that they don’t know if they can accommodate the specified thresholds - and they have decades of engineering experience behind their assessments. In addition, we are concerned with the aggregate work load that all five standards in Project 2007-09 will place upon our engineering and operations organizations. Each has its own unique purpose, which means unique processes to support them - as well as results that demonstrate compliance.</p> <p>Based on comments from you and numerous other stakeholders the SDT has decided to remove Requirement R5 from the next draft of the standard. The SDT believes that Requirement R4 meets the reliability objective of the directive in Paragraph 1787 of FERC Order 693. In addition, the SDT agrees with stakeholders who indicated that the additional resources that would be required to design, build, operate and maintain synchronous generating facilities that could ride through any of the defined excursions without fail would not justify the resulting incremental gain in grid reliability. From a low voltage ride-through perspective, the occurrence</p>

Organization	Yes or No	Question 3 Comment
		<p>of severe transmission system faults in the immediate vicinity of a generation facility is rare and the history of transmission faults causing trips of generating facilities is similarly rare. From a frequency excursion perspective, turbines and generators currently on the market easily meet the requirements for coordinating with UFLS programs when challenged with typical frequency excursions. While there have been issues with frequency oscillations in some cases (e.g., lean fuel blowout), the SDT believes that these types of issues can be resolved by market forces without the need for a requirement in a reliability standard.</p> <p>With so much uncertainty surrounding this program, we cannot agree to proceed without the following items being addressed:</p> <ol style="list-style-type: none"> 1) All requirements that look for evidence that a unit does not trip in response to a transient (R5) must contain language that focuses on the strength of the process - not the actual performance. This could be similar to that used in the CIP version 5 standards calling for the Responsible Entity to implement an action “in a manner that identifies, assesses, and corrects deficiencies”. Experience has shown that without this preface, auditors will automatically assess a violation regardless of whether the trip was necessary to protect equipment or safety. The CEA’s focus needs to be on the entity’s commitment to establishing the necessary ride-through settings over the longer term. 2) The Compliance organization needs to be engaged in the development process so that industry stakeholders have a sense of how adherence to the standard will be determined. The existing process is disconnected - leading to inconsistent interpretations of the drafting team’s original intent. Other projects have begun to post drafts of the RSAWs concurrently with the standards for exactly this reason. The SDT should take note that these modifications are consistent with the risk-based compliance direction that both NERC and FERC support. The intent is to focus industry and regulatory resources on the reliability aspects of the initiative - not its administrative aspects. <p>Your issues (1 & 2 above) relate to the “Find, Fix and Track” process that was</p>

Organization	Yes or No	Question 3 Comment
		<p>most notably incorporated in the CIP body of standards. For example, CIP-003-5, Requirement R2 states: "Each Responsible Entity for its assets identified in CIP-002-5, Requirement R1, Part R1.3, shall implement, in a manner that <i>identifies, assesses, and corrects deficiencies</i>, one or more documented cyber security policies that collectively address the following topics, and review and obtain CIP Senior Manager approval for those policies at least once every 15 calendar months." This requirement relates to a specific program that addresses a wide range of topics, including documentation of the processes involved. The requirements of PCR-024 are to ensure that generators remain in service during frequency and voltage excursions and providing others with information about limitations. There is no inherent program deficiency that can be identified and corrected. The GVSDT does not believe that this approach is applicable to the requirements that we have developed.</p>
<p>Response: The drafting team thanks you for your comments. Please see the answers to each comment above.</p>		
JEA		<p>JEA supports the comments of the NAGF and believes that the SDT team should accept a request by the NAGF to have a joint meeting to discuss and resolve the many differences since these differences are so substantial that the usual iterative process will be excessively long. We also support NAGF's suggestion to evaluate these standards using the Cost Effective Analysis Process.</p>
<p>Response: The SDT thanks you for your comment. No such request for a joint meeting has been received by the SDT. However, based on comments from you and numerous other stakeholders the SDT has decided to remove Requirement R5 from the next draft of the standard. The SDT believes that Requirement R4 meets the reliability objective of the directive in Paragraph 1787 of FERC Order 693. In addition, the SDT agrees with stakeholders who indicated that the additional resources that would be required to design, build, operate and maintain synchronous generating facilities that could ride through any of the defined excursions without fail would not justify the resulting incremental gain in grid reliability. From a low voltage ride-through perspective, the occurrence of severe transmission system faults in the immediate vicinity of a generation facility is rare and the history of transmission faults causing trips of generating facilities is similarly rare. From a frequency excursion perspective, turbines and generators currently on</p>		

Organization	Yes or No	Question 3 Comment
<p>the market easily meet the requirements for coordinating with UFLS programs when challenged with typical frequency excursions. While there have been issues with frequency oscillations in some cases (e.g., lean fuel blowout), the SDT believes that these types of issues can be resolved by market forces without the need for a requirement in a reliability standard.</p>		
<p>PPL Corporation NERC Registered Affiliates</p>		<p>1) Looking at the Table for the Eastern Interconnection in Attachment 1 of the Standard, this table does not correlate to our company procedures for EOP-003, in which generators are expected to isolate from the system anytime the frequency goes to 58.2 Hz or lower. The risk of incurring resonant vibration of steam turbine last-stage blades is generally related to blade length, so the off-frequency ride-through criteria in Att. 1 of PRC-024-1 are a concern for larger units. Nuclear plants in particular may be required to operate not only outside of OEM recommendations but at conditions that are unsafe. Please see in this respect the SERC Generation Subcommittee Nuclear Plant Review of PRC-024 Curves presentation made at the SERC Engineering Committee Meeting of March 16, 2011 at Charlotte, NC.</p> <p>Generating unit(s) may trip within a portion of the “no trip zone” of PRC-024 Attachment 1 or Attachment 2 for documented and communicated equipment limitations in accordance with Requirement R3.</p> <p>2) Some gas turbines may experience surge or combustion upsets (including flame-out) at the off-speed conditions of Att. 1, in addition to potentially incurring blade vibration issues similar to those described above. See also in this respect the AREVA NP White Paper on PRC-24. Auxiliary equipment contactors are likely to drop-out at the off-design voltage values specified in Att. 2 of PRC-024-1, especially if the high-side voltage swings specified in this standard are magnified at plant MV and LV aux buses. Fan and pump performance will be affected at the frequency limits of Att. 1, and below-rated voltage per Att. 2 may cause this equipment to stall, causing main flame trips, high/low duct pressure trips, drum level oscillations below the low water cut-out point and the like. This is especially the case if cycling above and below the rated frequency during Disturbances (but</p>

Organization	Yes or No	Question 3 Comment
		<p>within the limits of Att. 1) magnifies system oscillations or drives automatic control systems unstable. The prohibition against tripping for existing units applies not just to actuation of Protection Systems but to “protective relaying,” which per footnote #1 in PRC-024 includes “protective functions within control systems...based on frequency or voltage inputs.” It is unclear whether or not this definition covers contactor drop-out or actuation of fan stall protection systems at extreme under-voltage conditions .The basis of compliance for new units is simply, “will not trip,” i.e. covering all issues cited above plus any unpredictable other factors that may take units down. It is not realistic to expect such sweeping guarantees to be available on a system-wide basis, even if some individual pieces of equipment can ostensibly comply with Atts. 1 and 2, effectively shutting-down the new power plant industry unless an owner were willing to take unbounded risk. A “will not trip” obligation may also effectively ban entire classes of equipment, including combined cycle plants (as regards the chances of incurring lean blow-out) and (as mentioned earlier) nuclear facilities. “It is noteworthy in this respect that environmental regulators have for decades been tightening gas turbine dry low-NOx combustor emissions limits, taking these devices to the brink of instability during even steady-state operation, with inevitable negative implications for survival of Disturbances, and there were in fact many gas turbine flame-out trips during the blackout of ‘03. That is, the EPA and NERC may be trying to achieve divergent and even incompatible goals, so merely allowing time for development of new designs is not a solution. NERC, NAGF, the EPA, OEMs and industry groups should develop a mutually acceptable set of performance requirements.”</p> <p>Generating unit(s) may trip within a portion of the “no trip zone” of PRC-024 Attachment 1 or Attachment 2 for documented and communicated equipment limitations in accordance with Requirement R3.</p> <p>3) M5 causes new-unit tripping due to frequency or voltage excursions within PRC-</p>

Organization	Yes or No	Question 3 Comment
		<p>024 limits to constitute a violation, but it seems unlikely to expect an “or” event. That is, Disturbances are likely to cause frequency and voltage to simultaneously deviate from the rated values, and it is unclear how this combination of factors will be addressed in assessing compliance with the stands-separate basis of Att. 1 and Att. 2 in this standard.</p> <p>Based on comments from you and numerous other stakeholders the SDT has decided to remove Requirement R5 from the next draft of the standard. The SDT believes that Requirement R4 meets the reliability objective of the directive in Paragraph 1787 of FERC Order 693. In addition, the SDT agrees with stakeholders who indicated that the additional resources that would be required to design, build, operate and maintain synchronous generating facilities that could ride through any of the defined excursions without fail would not justify the resulting incremental gain in grid reliability. From a low voltage ride-through perspective, the occurrence of severe transmission system faults in the immediate vicinity of a generation facility is rare and the history of transmission faults causing trips of generating facilities is similarly rare. From a frequency excursion perspective, turbines and generators currently on the market easily meet the requirements for coordinating with UFLS programs when challenged with typical frequency excursions. While there have been issues with frequency oscillations in some cases (e.g., lean fuel blowout), the SDT believes that these types of issues can be resolved by market forces without the need for a requirement in a reliability standard.</p> <p>4) The grandfathering of existing units in R1 and R2 for, “documented and communicated equipment limitations,” is problematical; since the propensity to incur drum level fluctuations, air/flue gas flow oscillations and the like during Disturbances will not be defined in OEM literature, nor is it generally possible to predict by calculations when such problems will occur, especially if a Disturbance involves cycling between above and below the rated frequency (but within the Att. 1 boundaries). The same is true regarding predicting transient fluctuations of aux bus voltages, ref. risk of contactor drop-out and stalling major auxiliary equipment. The concern above applies also to having to make reference per R3</p>

Organization	Yes or No	Question 3 Comment
		<p>to, “study results, experience from an actual event, or manufacturer’s advisory.” Few if any GOs are likely to possess such documentation for Disturbances as extreme as those specified in Att. 1 and Att. 2. The list of types of evidence in R3 is not exclusive, but it is difficult to imagine alternative forms of hard evidence that could be developed other than for the comparatively few plants that possess high-fidelity simulators.</p> <p>R1, R2, and R3 now apply to all units, existing and new. R5, previously written for “new” units, has been deleted.</p> <p>5) Confusion is created by making grandfathering, “in accordance with Requirement R3,” in R1 and R2 of PRC-024-1; while R3 excludes, “limitations that are caused by generator frequency and voltage protective relays.” Are such protective relays meant to correspond to the “protective relaying” discussed above? It is unclear whether or not any grandfathering is actually being allowed.</p> <p>The exclusion of the relays listed is so that they alone are not allowed to be the reason that the unit is permitted to trip.</p> <p>6) The exemption take-back in the last bullet item of R3.1 (a 10% increase in nameplate capacity) again may effectively ban entire classes of equipment, or at least prevent units from ever receiving capacity and efficiency enhancements. Steam turbine off-frequency limits are generally set by OEMs lifetime limits as regards duration, but there is no discussion in PRC-024-1 as to how often the specified excursions may occur, leaving users with ostensibly compliant equipment still at risk if major upsets take place more often than had been anticipated.</p> <p>If an entity replaces a piece of equipment that is causing a limitation per Requirement R3 and increases capacity by 10%, it must address the limitations. This is analogous to New Source Standards for pollution control.</p>
<p>Response: Thank you for your comments. Please find responses to your individual comments above.</p>		

Organization	Yes or No	Question 3 Comment
Cogentrix Energy		<p>1) Project 2007-09 Generator Verification includes draft standard PRC-024, Generator Performance During Frequency and Voltage Excursions. Requirements R3 and R4 are for existing generating units. R3 allows an exemption from portions of the ride through curves in PRC-024 Attachments 1 and 2 for documented cases where generator protective relaying cannot be set, and directs those generators to communicate that limitation to the RC, PC, TOP and TP so its performance can be modeled correctly. R4 requires a Generator Owner to estimate the time duration for remaining on-line based on a Transmission Planner’s dynamic study. Requirement R5 directs all new generating facilities to be designed, built and maintained so that they are able to ride through the excursions defined in Attachment 1 and 2. Voltage Ride-Through Background In FERC Order 661 (June 2, 2005), Final Rule on Interconnection for Wind Energy, the Commission adopted a low voltage ride-through standard for wind generators, but provided that a wind plant is required to meet the standard only if the Transmission Provider shows, in the System Impact Study, that low voltage ride-through capability is needed to ensure safety or reliability. The standard, if applicable, requires the wind generator to stay online for specified time periods and at associated voltage levels where there is a disturbance on the transmission system. Several entities requested rehearing of various aspects of the low voltage ride-through requirement and standard included in the Final Rule. In FERC Order 661-A (December 12, 2005) page 2, the Commission noted “that the standard interconnection procedures and agreement were based on the needs of traditional generation facilities and that a different approach might be more appropriate for generators relying on other technologies, such as wind plants. Accordingly, the Commission granted certain clarifications, and also added a blank Appendix G to the standard Large Generation Interconnection Agreement (LGIA) for future adoption of requirements specific to other technologies.” The Commission went on to adopt in Appendix G to the LGIP limited special interconnection procedures applicable to wind plants only. The basis for the change to the standard regarding voltage ride through starts with FERC Order</p>

Organization	Yes or No	Question 3 Comment
		<p>693, Paragraph 1787 (March 16, 2007), which states "... the Commission directs the ERO to modify the Reliability Standard to explicitly require either that all generators are capable of riding through the same set of Category B and C contingencies, as required by wind generators in Order No. 661, or that those generators that cannot ride through be simulated as tripping. "Discussion, Voltage Ride-Through Although FERC Order 661-A does make a provision for future adoption of voltage ride through requirements for all generators, the Order is careful to differentiate between wind generation technologies and other, traditional generation facilities. No instruction is given for other technologies in the Order. Nowhere in any of the FERC Orders (661,661A, 693) is there a single requirement for non-wind generators to meet ride-through requirements. Docket No. RM05-4-000 (Order No. 661) discusses this subject directly. The Notice of Proposed Rulemaking (NOPR) Interconnection for Wind Energy and Other Alternative Technologies dated January 24, 2005, sought comments on certain specific issues, including whether there are other non-synchronous technologies, or other technologies in addition to wind, that should also be covered by the proposed Appendix G. In FERC Order No. 661, the Final Rule on Interconnection for Wind Energy, the Commission noted "These technical requirements for the interconnection of wind plants recognize the unique design and operating characteristics of wind plants,1 their increasing size and increasing level of penetration on some transmission systems, and the effects they have on the transmission system." Further, they wrote, "The Final Rule Appendix G we adopt here applies only to the interconnection of wind plants. The Commission does not believe at this time that the standard procedures and technical requirements in this Final Rule are appropriate for other alternative generating technologies that may supply over 20 MW at one Point of Interconnection. The standard procedures and technical requirements adopted here recognize the unique characteristics of wind plants, including the fact that they use induction generators, consist of several or numerous small generators connected to a collector system, and do not respond to grid disturbances in the same manner as</p>

Organization	Yes or No	Question 3 Comment
		<p>large conventional generators. "The Final Rule also noted that while low voltage ride-through capability is needed for wind plants, it is less of a concern for large synchronous generating facilities because most of these facilities are equipped with automatic voltage control devices to increase output during low voltage events. The Commission concluded that the Final Rule Appendix G exceptions to the LGIP and1 As noted above, wind plants over 20 MW in total size are subject to the standard technical requirements in the Final Rule Appendix G. These wind plants are generally made up of several small induction wind generating turbines, laid out over a large area, and connected through a medium voltage collector system. This collectors system is connected to the low voltage side of the step-up transformer, which is then connected to the transmission system at a single Point of Interconnection. LGIA apply only to large wind plants. Appendix G was designed around the special needs and design characteristics of wind generators. The Appendix G provisions adopted "focuses on the special characteristics of large wind plants, particularly the fact that they utilize many induction generators connected to the transmission system at a single point through a medium-voltage collector system. The Commission has not found at this time that any other technologies, including the solar generators without fueled backup ..., have similar characteristics." The Project 2007-09 Generator Verification Standard Drafting Team has presented the current draft of the standard as a technology-neutral version, ignoring the fact that power plant performance in asynchronous vs. synchronous units for transmission excursions are significantly different and are technology dissimilar for reasons of voltage regulation ability and plant auxiliary design. The NERC System Protection and Control Subcommittee wrote, in previous comments, "FERC 661-A is a wind generator facility ride-through performance criterion, not a synchronous generator relay setting requirement. They cannot be considered as being the same. This requirement in PRC-024 should only apply to non-synchronous machines." Constellation Power wrote, "The idea of a ride-through curve originated with wind farms, and is not conceptually appropriate. For example, this approach is not conceptually</p>

Organization	Yes or No	Question 3 Comment
		<p>appropriate for cylindrical rotor synchronous machines.” PPL Energy commented, “PPL is concerned with the following concepts in the standard: 1) The standard applies equally to asynchronous and synchronous machines, salient pole and round rotor machines, photovoltaic, and other resources and as such the standard does not appear to recognize that these technologies respond differently to voltage and frequency excursions.” AEP posited “The proposed VRT criteria requires more study and analyses before introducing it so broadly in this standard for other than for wind turbine generators for which it has already been applied.” PacifiCorp offered “Many European generator interconnection standards and requirements include different voltage ride-through requirements for synchronous and non-synchronous generation. PacifiCorp is concerned that the SDT has inappropriately developed a “one-size fits all” standard applicable to all generation platforms.” Furthermore, OEM’s have not yet developed a solution to voltage ride through for non-wind generators. Assured compliance with PRC-024 may not be available at any price. BES reliability enhancements requiring technological advances should be addressed with industry groups (e.g. ASME, IEEE) and OEMs to develop commercially available products before appearing as requirements in reliability standards. Regulation should not come before a solution is available. A specific concern in this respect regarding the ride-through capability being sought in PRC-024 R3-5 is that auxiliary buses may drop-out and cause a unit to trip for the excursions specified, which go well beyond the industry's present design criteria, even if the protective relay settings nominally allow such transients. It may be unrealistic to expect that the dynamic behavior of medium and low voltage auxiliary systems in a plant can be accurately modeled. In response to numerous questions on the feasibility of a plant design with the new voltage and frequency ride through curves, the Standard Drafting Team responded that “The implementation schedule calls for six years beyond approval of the standard before Requirement R5 goes into effect. The SDT believes this is enough time to develop the required designs.” Thus the SDT has recognized that the technology to comply does not exist today. Southern Company noted that</p>

Organization	Yes or No	Question 3 Comment
		<p>“We highly doubt that the requirement is technically feasible based on our experience with vendors and the various technical requirements and modifications that would have to be made to make sure that low or high voltage ride thru is possible. Complicating factors include the many different equipment suppliers, limited control of manufacturing standards by the purchasers, and continuing changes in technology must be considered to be able to determine whether or not all plant sub-systems can ride through. The economic impact and technical feasibility of this requirement has not yet been considered by suppliers.” Duke Energy states in their comments, “An R&D effort should be considered to investigate steam plant ride through capabilities if a criteria is needed.” Indiana Municipal Power Agency questioned whether the technology to meet this requirement was currently available to a newly built generating facility. “To force such a requirement on newly built generating facilities at this time, one is speculating that the technology will be available. Can we risk reliability of the grid on such speculation (Generator Owners not building generating facilities because they cannot meet this requirement)? What if the technology is not available?” In a previous posting of the standard, GenOn Energy suggested “It does not appear that the SDT has carefully considered the possible impact of Attachment2 on plant electrical auxiliary motors and contactors. The SDT should ask a power plant engineering company the impact on the electrical auxiliaries of an 800MW coal unit with a scrubber.” If a solution is identified prior to implementation, preliminary estimates suggest the potential cost of complying with wider standards might increase machine costs as much as 25%, which is not insignificant. The result would be a considerable increase in capital and O&M costs for new (non-wind) generation due to increased equipment costs to meet more robust design specifications. The increase in costs, in combination with the compliance risk associated with not having a technical solution available at time of construction, will likely discourage new power plant construction outside of wind generation. This barrier to new construction could lead to mid-term reliability concerns, particularly in markets already stressed with tight reserve</p>

Organization	Yes or No	Question 3 Comment
		<p>margins. Finally, the Standard Drafting Team has not demonstrated a grid-wide reliability gap justifying the need for voltage ride through for traditional (non-wind) generators. The US Bureau of Reclamation noted “We believe there is no convincing reliability based rationale to expand the scope of the FERC Order via this standard to include synchronous machines, noting that Generators are already required (PRC-001-1) to coordinate settings with the host Transmission Operator.” Both EPRI and IEEE have held discussions on this topic and have expressed concerns related to those issues noted previously. While these legitimate concerns about voltage ride through requirements for non-wind generators are being debated, they are also holding up other significant issues to be addressed by PRC-024 such as relay setting coordination and frequency ride through.</p> <p>Based on comments from you and numerous other stakeholders the SDT has decided to remove Requirement R5 from the next draft of the standard. The SDT believes that Requirement R4 meets the reliability objective of the directive in Paragraph 1787 of FERC Order 693. In addition, the SDT agrees with stakeholders who indicated that the additional resources that would be required to design, build, operate and maintain synchronous generating facilities that could ride through any of the defined excursions without fail would not justify the resulting incremental gain in grid reliability. From a low voltage ride-through perspective, the occurrence of severe transmission system faults in the immediate vicinity of a generation facility is rare and the history of transmission faults causing trips of generating facilities is similarly rare. From a frequency excursion perspective, turbines and generators currently on the market easily meet the requirements for coordinating with UFLS programs when challenged with typical frequency excursions. While there have been issues with frequency oscillations in some cases (e.g., lean fuel blowout), the SDT believes that these types of issues can be resolved by market forces without the need for a requirement in a reliability standard.</p> <p>Additionally, Requirements R1, R2, and R3 now are applicable to all generating</p>

Organization	Yes or No	Question 3 Comment
		<p>units, not only existing units. The time frame of the voltage ride thru curve of Attachment 2 has been reduced to 4 seconds.</p> <p>2) Discussion, Frequency Ride-Through The risk of incurring resonant vibration of steam turbine last-stage blades is generally related to blade length, so the off-frequency ride-through criteria in Att. 1 of PRC-024-1 are a concern for larger units. Nuclear plants in particular may be required to operate not only outside of OEM recommendations but at conditions that are unsafe. Please see in this respect the SERC Generation Subcommittee Nuclear Plant Review of PRC-024 Curves presentation made at the SERC Engineering Committee Meeting of March 16, 2011 at Charlotte, NC. Steam turbine off-frequency limits are moreover generally subject to lifetime duration limits, but there is no discussion in PRC-024-1 as to how often the specified excursions may occur, leaving users with ostensibly compliant equipment still at risk if major upsets take place more often than had been anticipated. Some gas turbines may experience surge or combustion upsets (including flame-out) at the off-speed conditions of Att. 1, in addition to potentially incurring blade vibration issues similar to those described above.</p> <p>Generating unit(s) may trip within a portion of the “no trip zone” of PRC-024 Attachment 1 or Attachment 2 for documented and communicated equipment limitations in accordance with Requirement R3.</p> <p>3) Additional costs associated with maintaining voltage sensitive equipment (power transformer, rotating equipment, breaker controls, etc.). Fan and pump performance will be affected at the frequency limits of Att. 1, and below rated voltage per Att. 2 may cause this equipment to stall, causing main flame trips, high/low duct pressure trips, drum level oscillations below the low water cut-out point and the like. This is especially the case if cycling above and below the rated frequency during Disturbances (but within the limits of Att. 1) magnifies system oscillations or drives automatic control systems unstable. The basis of compliance</p>

Organization	Yes or No	Question 3 Comment
		<p>for new units is simply, “will not trip,” i.e. covering all issues cited above plus any unpredictable other factors that may take units down. It is not realistic to expect such sweeping guarantees to be available on a system-wide basis, even if some individual pieces of equipment can ostensibly comply with Atts. 1 and 2, effectively shutting-down the new power plant industry unless an owner were willing to take unbounded risk. A “will not trip” obligation may also effectively ban entire classes of equipment, including combined cycle plants (as regards the chances of incurring lean blow-out) and (as mentioned earlier) nuclear facilities. It is noteworthy in this respect that environmental regulators have for decades been pushing gas turbine dry low-NOx combustors to the brink of instability during even steady-state operation, with inevitable negative implications for survival of Disturbances, and there were in fact many gas turbine flameout trips during the blackout of ‘03. Greater consideration of BES reliability may be needed, but doing so by issuing dueling regulations would not constitute an appropriate approach. That is, we believe that passage of PRC-024 in its present form would cause the available design room between environmental and NERC regulations for gas turbines to become less than zero, so merely allowing time for development of new designs is not a solution. NERC, the EPA, OEMs and industry groups need to develop a mutually acceptable set of performance requirements.</p> <p>Based on comments from you and numerous other stakeholders the SDT has decided to remove Requirement R5 from the next draft of the standard. The SDT believes that Requirement R4 meets the reliability objective of the directive in Paragraph 1787 of FERC Order 693. In addition, the SDT agrees with stakeholders who indicated that the additional resources that would be required to design, build, operate and maintain synchronous generating facilities that could ride through any of the defined excursions without fail would not justify the resulting incremental gain in grid reliability. From a low voltage ride-through perspective, the occurrence of severe transmission system faults in the immediate vicinity of a generation facility is rare and the history of</p>

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		<p>transmission faults causing trips of generating facilities is similarly rare. From a frequency excursion perspective, turbines and generators currently on the market easily meet the requirements for coordinating with UFLS programs when challenged with typical frequency excursions. While there have been issues with frequency oscillations in some cases (e.g., lean fuel blowout), the SDT believes that these types of issues can be resolved by market forces without the need for a requirement in a reliability standard.</p> <p>4) Other Concerns M5 of PRC-024 causes new-unit tripping due to frequency or voltage excursions within the specified limits to constitute a violation, but it is unlikely that “or” events would occur. That is, Disturbances are likely to cause frequency and voltage to simultaneously deviate from the rated values, and it is unclear how this combination of factors would be addressed in assessing compliance with the stands-separate basis of Att. 1 and Att. 2 in this standard.</p> <p>Based on comments from you and numerous other stakeholders the SDT has decided to remove Requirement R5 from the next draft of the standard. The SDT believes that Requirement R4 meets the reliability objective of the directive in Paragraph 1787 of FERC Order 693. In addition, the SDT agrees with stakeholders who indicated that the additional resources that would be required to design, build, operate and maintain synchronous generating facilities that could ride through any of the defined excursions without fail would not justify the resulting incremental gain in grid reliability. From a low voltage ride-through perspective, the occurrence of severe transmission system faults in the immediate vicinity of a generation facility is rare and the history of transmission faults causing trips of generating facilities is similarly rare. From a frequency excursion perspective, turbines and generators currently on the market easily meet the requirements for coordinating with UFLS programs when challenged with typical frequency excursions. While there have been issues with frequency oscillations in some cases (e.g., lean fuel blowout), the SDT believes that these types of issues can be resolved by market forces without the</p>

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		<p>need for a requirement in a reliability standard.</p> <p>5) The grandfathering of existing units in R1 and R2 for, “documented and communicated equipment limitations,” is problematical; since the propensity to incur drum level fluctuations, air/flue gas flow oscillations, flame-out and the like during Disturbances will not be defined in OEM literature, nor is it possible to predict by calculations when such problems will occur, especially if a complex Disturbance involves cycling between above and below the rated frequency (but within the Att. 1 boundaries). The same is true Page 8 of 8 regarding predicting transient fluctuations of aux bus voltages, ref. risk of contactor drop-out and stalling major auxiliary equipment. The concern above applies also to having to make reference per R3 to, “study results, experience from an actual event, or manufacturers advisory.” Few if any GOs are likely to possess such documentation for Disturbances as extreme as those specified in Att. 1 and Att. 2. The list of types of evidence in R3 is not exclusive; but it is difficult to imagine alternative forms of hard evidence that could be developed, other than for the comparatively few plants that possess high-fidelity dynamic simulators.</p> <p>Generating unit(s) may trip within a portion of the “no trip zone” of PRC-024 Attachment 1 or Attachment 2 for documented and communicated equipment limitations in accordance with Requirement R3. Requirements R1, R2, and R3 now are applicable to all generating units, not only existing units.</p> <p>6) The same concerns regarding availability of information apply for the, “estimate of the time duration the existing generation unit will remain connected,” in R4. Relying on “sound engineering judgment” is permitted, and R4 states that “detailed unit performance studies are not required;” but the word “sound” implies that the estimate is to be based on accurate data, and such information could be developed only via a detailed study (which, as noted above, would be impossible to perform).</p>

Organization	Yes or No	Question 3 Comment
		<p>The methods of determination listed within R4 are provided to emphasize that detailed studies are not required.</p> <p>7) The prohibition against tripping for existing units applies not just to actuation of Protection Systems but to “protective relaying,” which per footnote #1 in PRC-024 includes “protective functions within control systems...based on frequency or voltage inputs.” It is unclear whether or not this definition covers contactor drop-out or actuation of fan stall protection systems at extreme under-voltage conditions. Confusion is created by making grandfathering of protective relay settings, “in accordance with Requirement R3,” in R1 and R2 of PRC-024-1; while R3 excludes, “limitations that are caused by generator frequency and voltage protective relays.” It is semantically unclear whether or not any grandfathering is actually being allowed.</p> <p>Footnote 1 does not cover the items you have listed above. The exclusion of the relays listed is so that they alone are not allowed to be the reason that the unit is permitted to trip.</p> <p>8) The exemption take-back in the last bullet item of R3.1 (a 10% increase in nameplate capacity) again may again effectively ban entire classes of equipment, or at least prevent units from ever receiving capacity and efficiency enhancements.</p> <p>If an entity replaces a piece of equipment that is causing a limitation per Requirement R3 and increases capacity by 10%, it must address the limitations. This is analogous to New Source Standards for pollution control.</p> <p>9) Conclusion & Recommendation Based on the issues discussed above, the SRT recommends against adoption of Draft4 (dated Oct. 4, 2012) of PRC-024-1. Furthermore, the SRT recommends that a deputation of NAGF members meet with the SDT for the purpose of developing a mutually-acceptable draft standard. This effort should include discussions with OEMs and industry groups regarding identifying the technical state of the art, and also with environmental regulators,</p>

Organization	Yes or No	Question 3 Comment
		<p>if necessary, for achieving suitable emissions vs. BES reliability balance.</p> <p>The GVSDT has had many active participants throughout the life of the project representing generator owners and operators, as well as OEMs. All meetings to develop this standard have been open to all participants. The drafting team has considered each comment received on this standard during each posting and made appropriate revisions. Based on your comments and the comments of numerous other stakeholders, the SDT has decided to remove Requirement R5 from the next draft of the standard. The SDT believes that Requirement R4 meets the reliability objective of the directive in Paragraph 1787 of FERC Order 693. In addition, the SDT agrees with stakeholders who indicated that the additional resources that would be required to design, build, operate and maintain synchronous generating facilities that could ride through any of the defined excursions without fail would not justify the resulting incremental gain in grid reliability. From a low voltage ride-through perspective, the occurrence of severe transmission system faults in the immediate vicinity of a generation facility is rare and the history of transmission faults causing trips of generating facilities is similarly rare. From a frequency excursion perspective, turbines and generators currently on the market easily meet the requirements for coordinating with UFLS programs when challenged with typical frequency excursions. While there have been issues with frequency oscillations in some cases (e.g., lean fuel blowout), the SDT believes that these types of issues can be resolved by market forces without the need for a requirement in a reliability standard.</p>
<p>Response: Thank you for your comments. Please find responses to your individual comments above.</p>		
seattle city light		<p>Reliability Coordinator, Planning Coordinator, Transmission Operator and Transmission Planner should be added to the Applicability section because one or another of these are asked in R4 to provide information to the Generator Operator to</p>

Organization	Yes or No	Question 3 Comment
		begin the evaluations.
<p>Response: These entities were not added to the Applicability because a request for the data specified in R4 may or may not be desired by the parties. Mention of the RC and TOP have been removed from R4.</p>		
ReliabilityFirst		<p>ReliabilityFirst votes in the affirmative for this standard because the standard further enhances reliability by ensuring that generating units remain connected during frequency excursions. Even though ReliabilityFirst votes in the affirmative, we offer the following comments for consideration: VSL Requirement R5 - ReliabilityFirst still believes the VSL for Requirement R5 is not meeting the intent of FERC VSL Guideline #3 "Violation Severity Level Assignment Should Be Consistent with the Corresponding Requirement." Requirement R5 states "Each Generator Owner shall design, build, and maintain its new unit or new generating plant so that it will not trip due to a frequency excursion or voltage excursion." The VSL states "The Generator Owner's generator tripped due to a Frequency Excursion within the no-trip parameters set forth in attachment 1". Based on the FERC Guideline #3, the language in the requirement is not consistent with the associated VSL. It is not a violation of Requirement R5 if the generator tripped offline within the no-trip parameters, rather it is a violation if the GO failed to design, build, and maintain its new unit or new generating plant so that it will not trip due to a frequency excursion or voltage excursion within the no-trip parameters set forth in Attachment 1. Furthermore the SDT noted in the response to comments that the VSL relates to Measure M5. ReliabilityFirst would like to remind the SDT that based on the NERC definition of VSL (as noted in the NERC Standard Processes Manual), "VSLs define the degree to which compliance with a Requirement was not achieved." There is no mention of VSLs being written based on the measurement of the requirement. ReliabilityFirst recommends either modifying the requirement or VSL so they both use consistent language.</p>
<p>Response: Based on comments from numerous stakeholders the SDT has decided to remove Requirement R5 from the next draft</p>		

Organization	Yes or No	Question 3 Comment
<p>of the standard. In doing this, Measure M5 and the VSL's for Requirement R5 also have been removed.</p>		
<p>Idaho Power Company</p>		<p>1) Requirement R1 and R2: Idaho Power System Planning comments that the GVSDT clarify if this standard applies to voltage or frequency elements only or if it applies to all generator protection elements as suggested in footnote 1. Footnote 1 clarifies which protective relaying is included in the scope of R1 and R2.</p> <p>2) Requirement R5: Idaho Power System Planning comments that the GVSDT consider adding an exception to Requirement R5 that generation may trip if the Generator Owner has a documented over/under frequency limitation that cannot meet the stepped "no trip" curve shown in Attachment 1 provided that the Generator Owner and Transmission Operator have a documented mitigation plan approved by the Reliability Coordinator to trip equal load for instances of anticipated generation loss (similar to Item 13 of the WECC Off-Nominal Frequency Load Shedding Plan). Based on comments from you and numerous other stakeholders the SDT has decided to remove Requirement R5 from the next draft of the standard. The SDT believes that Requirement R4 meets the reliability objective of the directive in Paragraph 1787 of FERC Order 693. In addition, the SDT agrees with stakeholders who indicated that the additional resources that would be required to design, build, operate and maintain synchronous generating facilities that could ride through any of the defined excursions without fail would not justify the resulting incremental gain in grid reliability. From a low voltage ride-through perspective, the occurrence of severe transmission system faults in the immediate vicinity of a generation facility is rare and the history of transmission faults causing trips of generating facilities is similarly rare. From a frequency excursion perspective, turbines and generators currently on the market easily meet the requirements for coordinating with UFLS programs when challenged with typical frequency excursions. While there have been issues with frequency oscillations in some cases (e.g., lean fuel blowout), the SDT believes that these types of issues can be resolved by market forces</p>

Organization	Yes or No	Question 3 Comment
		<p>without the need for a requirement in a reliability standard.</p> <p>3) Page 20: Idaho Power System Planning comments that the GVDST should clarify if Items 6a-6c are expected to be met simultaneously as it is not likely that a generator be capable of operating at full load (Pmax) and 0.95 pf lagging continuously. Idaho Power System Planning comments that the GVDST consider a 0.95 leading power factor condition in addition to the item included in Items 6a-6c.</p> <p>The load point specified in Clarifications 6a-6c are provided to enable the calculation of the generator bus voltage during the periods of transmission system voltage exclusion described by the curve of Attachment 2. It is presumed to be typical of the normal operating condition of many generators. As the generator over/undervoltage relays are often connected to generator bus PTs, this calculation is necessary to determine their operating characteristic during transmission system voltage excursions. The SDT believes that this load point is adequate for determining if the voltage relays will operate during these conditions.</p> <p>4) Requirement R6 is overly burdensome with questionable impact on reliability. This requirement is only applicable after a request has been made to the GO. The RC and TOP have been removed from this requirement as those parties have the ability to ask for this type of information through IRO-010 and/or TOP-003. The requesting entities would be using the information in stability studies. Having accurate information for these standards has a significant impact on grid reliability.</p> <p>5) Items 6a-6c on page 20 are not consistent with nor relevant to normal relay setting development practice. Initial operating points should be developed from good engineering judgment, not prescribed in this way. The SDT believes that the use of this operating point will provide an adequate solution for determining the voltage relay response to a transmission system voltage excursion. Note that the automatic voltage regulator response has not been addressed in this calculation method. In consideration of this response,</p>

Organization	Yes or No	Question 3 Comment															
		the load point specified will yield a conservative result.															
<p>Response: Thank you for your comments. Please find responses to your individual comments above.</p>																	
Associated Electric Cooperative, Inc. - JRO00088		Requirement R3 qualifies “each known equipment limitation”. Measure M3 omits the “known” qualifier, stating the expectation of measurement is to have “any equipment limitations” documented. Is the expectation for “any” to mean “some”, or “all known”?															
<p>Response: Thank you for your comments. “Known” has been added to M3. The expectation is that any and all known equipment limitations be documented.</p>																	
Northeast Power Coordinating Council		<p>1) Suggest the SDT specifically identify or show examples of how to match the percentage thresholds outlined in the Effective Date sections of the Standard and the associated Implementation Plans. Given recent experience with other Standards, it would be helpful for the SDT to establish how the entities can demonstrate meeting the requisite threshold percentages. Over time, we have observed that in some cases percentages were established by the number of devices or units; but in other cases, the measurement has been based upon magnitude of nameplate ratings.</p> <p>The requirements are written generally on a generating unit basis. For plants that are in the scope due to an aggregate of small units, those should be counted on a complete facility basis. From the total number of individual units and aggregate facilities, one can simply calculate a ratio of number completed versus total number.</p> <p>2) Regarding the Table for the Quebec Interconnection in Attachment 1, the data should read:</p> <table border="0" data-bbox="825 1274 1885 1461"> <tr> <td>High Frequency Duration</td> <td>Frequency (Hz)</td> <td>Time</td> </tr> <tr> <td>(Sec)Greater than 66.0</td> <td>Instantaneous Trip</td> <td>Greater than 63.0</td> </tr> <tr> <td>5Greater than 61.5</td> <td>90</td> <td>Greater than 60.6</td> </tr> <tr> <td>660Less than or equal to 60.6</td> <td>Continuous Operation</td> <td>Low Frequency</td> </tr> <tr> <td>Duration</td> <td>Frequency (Hz)</td> <td>Time (Sec)Less than 55.5</td> </tr> </table>	High Frequency Duration	Frequency (Hz)	Time	(Sec)Greater than 66.0	Instantaneous Trip	Greater than 63.0	5Greater than 61.5	90	Greater than 60.6	660Less than or equal to 60.6	Continuous Operation	Low Frequency	Duration	Frequency (Hz)	Time (Sec)Less than 55.5
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Organization	Yes or No	Question 3 Comment
		<p>specified time periods and at associated voltage levels where there is a disturbance on the transmission system. Several entities requested rehearing of various aspects of the low voltage ride-through requirement and standard included in the Final Rule. In FERC Order 661-A (December 12, 2005) page 2, the Commission noted “that the standard interconnection procedures and agreement were based on the needs of traditional generation facilities and that a different approach might be more appropriate for generators relying on other technologies, such as wind plants. Accordingly, the Commission granted certain clarifications, and also added a blank Appendix G to the standard Large Generation Interconnection Agreement (LGIA) for future adoption of requirements specific to other technologies.” The Commission went on to adopt in Appendix G to the LGIP limited special interconnection procedures applicable to wind plants only. The basis for the change to the standard regarding voltage ride through starts with FERC Order 693, Paragraph 1787 (March 16, 2007), which states “... the Commission directs the ERO to modify the Reliability Standard to explicitly require either that all generators are capable of riding through the same set of Category B and C contingencies, as required by wind generators in Order No. 661, or that those generators that cannot ride through be simulated as tripping. “Discussion / Reliability Impact Although FERC Order 661-A does make a provision for future adoption of voltage ride-through requirements for all generators, the Order is careful to differentiate between wind generation technologies and other, traditional generation facilities. No instruction is given for other technologies in the Order. Nowhere in any of the FERC Orders (661, 661A, 693) is there a single requirement for non-wind generators to meet ride-through requirements. Docket No. RM05-4-000 (Order No. 661) discusses this subject directly. The Notice of Proposed Rulemaking (NOPR) Interconnection for Wind Energy and Other Alternative Technologies dated January 24, 2005, sought comments on certain specific issues, including whether there are other non-synchronous technologies, or other technologies in addition to wind, that should also be covered by the proposed Appendix G. In FERC Order No. 661, the Final Rule on Interconnection for Wind Energy, the Commission noted “These technical requirements for the interconnection</p>

Organization	Yes or No	Question 3 Comment
		<p>of wind plants recognize the unique design and operating characteristics of wind plants, their increasing size and increasing level of penetration on some transmission systems, and the effects they have on the transmission system.” Further, they wrote, “The Final Rule Appendix G we adopt here applies only to the interconnection of wind plants. The Commission does not believe at this time that the standard procedures and technical requirements in this Final Rule are appropriate for other alternative generating technologies that may supply over 20 MW at one Point of Interconnection. The standard procedures and technical requirements adopted here recognize the unique characteristics of wind plants, including the fact that they use induction generators, consist of several or numerous small generators connected to a collector system, and do not respond to grid disturbances in the same manner as large conventional generators.” The Final Rule also noted that while low voltage ride-through capability is needed for wind plants, it is less of a concern for large synchronous generating facilities because most of these facilities are equipped with automatic voltage control devices to increase output during low voltage events. The Commission concluded that the Final Rule Appendix G exceptions to the LGIP and LGIA apply only to large wind plants. Appendix G was designed around the special needs and design characteristics of wind generators. The Appendix G provisions adopted “focuses on the special characteristics of large wind plants, particularly the fact that they utilize many induction generators connected to the transmission system at a single point through a medium-voltage collector system. The Commission has not found at this time that any other technologies, including the solar generators without fueled backup ..., have similar characteristics.” The Project 2007-09 Generator Verification Standard Drafting Team has presented the current draft of the standard as a technology-neutral version, ignoring the fact that power plant performance in asynchronous vs. synchronous units for transmission excursions are significantly different and are technology dissimilar for reasons of voltage regulation ability and plant auxiliary design. o The NERC System Protection and Control Subcommittee wrote, in previous comments, “FERC 661-A is a wind generator facility ride-through performance criterion, not a synchronous generator</p>

Organization	Yes or No	Question 3 Comment
		<p>relay setting requirement. They cannot be considered as being the same. This requirement in PRC-024 should only apply to non-synchronous machines.”</p> <ul style="list-style-type: none"> o Constellation Power wrote, “The idea of a ride-through curve originated with wind farms, and is not conceptually appropriate. For example, this approach is not conceptually appropriate for cylindrical rotor synchronous machines.” o PPL Energy commented, “PPL is concerned with the following concepts in the standard: 1) The standard applies equally to asynchronous and synchronous machines, salient pole and round rotor machines, photovoltaic, and other resources and as such the standard does not appear to recognize that these technologies respond differently to voltage and frequency excursions.” o AEP posited “The proposed VRT criteria requires more study and analyses before introducing it so broadly in this standard for other than for wind turbine generators for which it has already been applied.” o Pacificorp offered “Many European generator interconnection standards and requirements include different voltage ride-through requirements for synchronous and non-synchronous generation. PacifiCorp is concerned that the SDT has inappropriately developed a “one-size fits all” standard applicable to all generation platforms.” Furthermore, OEM’s have not yet developed a solution to voltage ride through for non-wind generators. Assured compliance with PRC-024 may not be available at any price. BES reliability enhancements requiring technological advances should be addressed with industry groups (e.g. ASME, IEEE) and OEMs to develop commercially available products before appearing as requirements in reliability standards. Regulation should not come before a solution is available. A specific concern in this respect regarding the ride-through capability being sought in PRC-024 R3-5 is that auxiliary buses may drop-out and cause a unit to trip for the excursions specified, which go well beyond the industry's present design criteria, even if the protective relay settings nominally allow such transients. It may be unrealistic to expect that the dynamic behavior of medium and low voltage auxiliary systems in a plant can be accurately modeled. o In response to numerous questions on the feasibility of a plant design with the new voltage and frequency ride through curves, the Standard Drafting Team responded that “The implementation schedule calls for

Organization	Yes or No	Question 3 Comment
		<p>six years beyond approval of the standard before Requirement R5 goes into effect. The SDT believes this is enough time to develop the required designs.” Thus the SDT has recognized that the technology to comply does not exist today. o Southern Company noted that “We highly doubt that the requirement is technically feasible based on our experience with vendors and the various technical requirements and modifications that would have to be made to make sure that low or high voltage ride thru is possible. Complicating factors include the many different equipment suppliers, limited control of manufacturing standards by the purchasers, and continuing changes in technology must be considered to be able to determine whether or not all plant sub-systems can ride through. The economic impact and technical feasibility of this requirement has not yet been considered by suppliers.” o Duke Energy states in their comments, “An R&D effort should be considered to investigate steam plant ride through capabilities if a criteria is needed.” o Indiana Municipal Power Agency questioned whether the technology to meet this requirement was currently available to a newly built generating facility. “To force such a requirement on newly built generating facilities at this time, one is speculating that the technology will be available. Can we risk reliability of the grid on such speculation (Generator Owners not building generating facilities because they cannot meet this requirement)? What if the technology is not available?” o In a previous posting of the standard, GenOn Energy suggested “It does not appear that the SDT has carefully considered the possible impact of Attachment 2 on plant electrical auxiliary motors and contactors. The SDT should ask a power plant engineering company the impact on the electrical auxiliaries of an 800MW coal unit with a scrubber.” If a solution is identified prior to implementation, preliminary estimates suggest the potential cost of complying with wider standards might increase machine costs as much as 25%, which is not insignificant. The result would be a considerable increase in capital and O&M costs for new (non-wind) generation due to increased equipment costs to meet more robust design specifications. The increase in costs, in combination with the compliance risk associated with not having a technical solution available at time of construction, will likely discourage new power plant construction outside of wind</p>

Organization	Yes or No	Question 3 Comment
		<p>generation. This barrier to new construction could lead to mid-term reliability concerns, particularly in markets already stressed with tight reserve margins. Finally, the Standard Drafting Team has not demonstrated a grid-wide reliability gap justifying the need for voltage ride through for traditional (non-wind) generators. o The US Bureau of Reclamation noted “We believe there is no convincing reliability based rationale to expand the scope of the FERC Order via this standard to include synchronous machines, noting that Generators are already required (PRC-001-1) to coordinate settings with the host Transmission Operator.” Both EPRI and IEEE have held discussions on this topic and have expressed concerns related to those issues noted previously. While these legitimate concerns about voltage ride through requirements for non-wind generators are being debated, they are also holding up other significant issues to be addressed by PRC-024 such as relay setting coordination and frequency ride through. Summary and Conclusion The Standard Drafting Team should remove Requirements R4 and R5 from the current version of PRC-024 to facilitate passage of the more critical elements of the standard such as voltage and frequency relay setting requirements. The current technology neutral draft standard PRC-024 is inconsistent with the intent of FERC Order 661 -A in that it applies “equal” requirements to all generators, rather than requirements solely for wind generators which is the focus of the FERC Order. The Standard must recognize that wind generators and traditional generation facilities are technologically dissimilar and, therefore, cannot be treated the same in this instance. With no technology currently commercially available to provide guaranteed voltage ride through capabilities for traditional generation, the standard should not require this (unavailable) technology be in place in order to meet the requirements of the standard. When the technology becomes available, a new SAR may be drafted to address the voltage performance aspects of non-wind generators if an identified reliability gap exists. The new Cost Effective Analysis Process can be used at that time to evaluate the costs and benefits associated with the new requirement, as well as facilitate consideration of alternative methods to achieve the reliability objective which may result in less implementation costs and resource expenditures.</p>

Organization	Yes or No	Question 3 Comment
<p>Response: Thank you for your comments. Based on comments from you and numerous other stakeholders the SDT has decided to remove Requirement R5 from the next draft of the standard. The SDT believes that Requirement R4 meets the reliability objective of the directive in Paragraph 1787 of FERC Order 693. In addition, the SDT agrees with stakeholders who indicated that the additional resources that would be required to design, build, operate and maintain synchronous generating facilities that could ride through any of the defined excursions without fail would not justify the resulting incremental gain in grid reliability. From a low voltage ride-through perspective, the occurrence of severe transmission system faults in the immediate vicinity of a generation facility is rare and the history of transmission faults causing trips of generating facilities is similarly rare. From a frequency excursion perspective, turbines and generators currently on the market easily meet the requirements for coordinating with UFLS programs when challenged with typical frequency excursions. While there have been issues with frequency oscillations in some cases (e.g., lean fuel blowout), the SDT believes that these types of issues can be resolved by market forces without the need for a requirement in a reliability standard.</p>		
<p>TransAlta Centralia Generation LLC</p>		<p>The UFLS curves for Eastern Interconnection and Quebec Interconnection are different from those curves on NPCC Directory 12. Which one to be compliant?</p>
<p>Response: The SDT thanks you for your comment. The curve for the Eastern Interconnection coordinates with the requirements for UFLS system design documented in PRC-006-1. If the generator frequency protection is set in accordance with Attachment 1 of PRC-024, it should coordinate with the local UFLS program. The Quebec Interconnection does have unique requirements the information for Quebec was provided by Hydro Quebec and is also found in PRC-006-1.</p>		
<p>PSEG</p>		<p>1) This FIRST comment was provided for MOD-025-1, MOD-026-1, MOD-027-1, and PRC-024-1.1. DATA SHARING POLICY: For all of the MOD standards in this, only Transmission Planners are the recipient of the data developed. We asked that the standard require that the TP be required to share the data with others. The response we received is that the Functional Model requires the TP to share data with the TOP. Unfortunately, the Functional Model is unenforceable. We note that in PRC-024-1, R6 requires the GO to share its data with the RC, PC, TOP, and TO, upon request. Unless the same data is shared across all “modelers,” the result will be outdated data in someone’s model, which can have a bad result. The team should have one broad</p>

Organization	Yes or No	Question 3 Comment
		<p>“data sharing” policy in the three MOD standards and PRC-024-1. Since the TP receives data in three of the standards, we suggest this language or similar language: “The GO shall provide data to its TP within 60 days of its development [describe the data]. The TP shall provide the same data to any RC, PC, TP, or TOP within 60 days of receiving a request for it.”</p> <p>The information discussed in PRC-024 of potential interest to planners (generator voltage and frequency protection system settings) is not necessarily included in all models. The SDT feels the current wording is adequate to allow those planners who need the information to obtain it from the Generator Owners. Note that the SDT has removed the RC and TOP from data reporting requirements described in Requirements R4 and R5 (previously R6). This was done in response to stakeholders who pointed out that these functional entities can request this information via standards IRO-010 (RC) and TOP-003 (TOP).</p> <p>2) We do NOT believe that R5, which sets requirements for new generators (including balance-of-plant equipment) to the requirements in Attachment 1 and Attachment 2, has been appropriately vetted by the SDT. Many stakeholders are unfamiliar with the performance capability of new generators, including the cost of achieving the performance requirements in R5. Therefore, the SDT should develop additional expert information to confirm that the requirements in R5 represent the norm for new generation. We suggest that the SDT reach out to the NERC Planning Committee, who in turn may research this topic with the IEEE and the North American Generator Forum and develop a report on their findings. With all due respect to the SDT, until stakeholders have independent confirmation regarding R5, it will be difficult for them to accept it.</p> <p>Based on comments from you and numerous other stakeholders the SDT has decided to remove Requirement R5 from the next draft of the standard. The SDT believes that Requirement R4 meets the reliability objective of the directive in Paragraph 1787 of FERC Order 693. In addition, the SDT agrees with stakeholders who indicated that the additional resources that would be required to design, build,</p>

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		<p>operate and maintain synchronous generating facilities that could ride through any of the defined excursions without fail would not justify the resulting incremental gain in grid reliability. From a low voltage ride-through perspective, the occurrence of severe transmission system faults in the immediate vicinity of a generation facility is rare and the history of transmission faults causing trips of generating facilities is similarly rare. From a frequency excursion perspective, turbines and generators currently on the market easily meet the requirements for coordinating with UFLS programs when challenged with typical frequency excursions. While there have been issues with frequency oscillations in some cases (e.g., lean fuel blowout), the SDT believes that these types of issues can be resolved by market forces without the need for a requirement in a reliability standard.</p>
<p>Response: The SDT thanks you for your comment. See answers to your specific questions above.</p>		
Dynergy		<p>This Standard is similar to the PRC-006-NPCC-1 and PRC-006-SERC-01 Automatic Underfrequency Load Shedding Standards. PRC-024-1 requires continuous operation at >59.5 Hz. PRC-006-NPCC-1 requires continuous operation at >59.0 Hz. This is confusing. These three Standards should be coordinated or the GO applicability should be removed from PRC-006-NPCC-1 and PRC-006-SERC-01.</p>
<p>Response: The SDT thanks you for your comment. Regional standards may be more stringent than the continent-wide NERC standards. PRC-024-1 is the controlling document in regions that do not have an equivalent regional standard.</p>		
Utility Services		<p>Utility Services suggests the SDT specifically identify or show examples of how to match the percentage thresholds outlined in the Effective Date sections of the standard and the associated Implementation Plans. Given our recent experience in other standards, it would be helpful for the SDT to establish how the entities can demonstrate meeting the requisite threshold percentages. Over time, we have observed that in some cases, percentages were established by the number of devices or units; but in other cases, the measurement has been based upon magnitude of nameplate ratings.</p>

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<p>Response: The SDT thanks you for your comment. The percentage numbers refer to the number of applicable generating facilities (units or aggregate plants). This is the default interpretation in lieu of any other description in the standard.</p>		
<p>Manitoba Hydro</p>		<p>1) VSLs - The VSLs for R1, R2 and R5 have been omitted for both Low, Moderate and High. Is there any rationale for this omission? Compliance with R1 and R2 is binary (i.e., the relays are either set to ride through the defined excursion or they are not). NERC requires binary compliance requirements to be assigned to the Severe level only.</p> <p>2) Attachment 1 - Attachment 1 in MOD-026 and MOD-027 assist in adding clarity to the periodicity of exciter and turbine/governor model testing. These attachments also allow low capacity factor units and equivalent units connected at the same location to not be tested every 10 years, which is prudent. Manitoba Hydro would like the drafting team to consider whether conditions in row numbers 1-5 and 7 in attachment 1 of MOD-026 could also be applied to standards PRC-019, MOD-025 and possibly PRC-024. The SDT does not believe the cited attachments in MOD-026 and MOD-027 apply to PRC-024.</p> <p>3) R1 and R2 - The requirement speaks about the ‘unit’ tripping but the sub requirements speak about the ‘Generation’ tripping - is this not inconsistent? The SDT agrees and has made the wording consistently use “generating unit(s)”.</p> <p>4) R1 and R2 -1. The language in R2 currently reads, “Each Generator Owner that has generator voltage protective relaying activated to trip its generating unit shall set its protective relaying such that the voltage protective relaying does not trip as a result of a voltage excursion (at the point of interconnection) caused by an event on the transmission system external to the generating plant that remains within the “no trip zone” of PRC-024 Attachment 2 or within the voltage recovery characteristics of a location-specific Transmission Planner’s study if the Transmission Planner allows less stringent voltage relay settings than those required to meet PRC-024 Attachment 2 subject to the following exceptions”. Manitoba Hydro made the following comment to draft 3 of PRC-024-1 during /29/12-03/29/12 commenting period, “R1 - the facility</p>

Organization	Yes or No	Question 3 Comment
		<p>interconnection document required through FAC-001 should supersede Attachment 1 in order to best address local area issues. R1 should be revised to specify this.” The drafting team responded, “The SDT was charged with creating continent-wide requirements for frequency and voltage excursions and believes that consistency will not occur if various Transmission Service Providers apply various “no trip zones.” Requirement R1, therefore, should not be dictated by FAC-001.” Even though the drafting stated that other standards (eg. FAC-001) shouldn’t set continent wide settings, the drafting team has permitted less stringent voltage relay settings in R2 as long as it is accompanied by a Transmission Planning study. Manitoba Hydro understands that continent wide-standards are preferred but there should be flexibility for local area considerations as has been done in R2. Manitoba Hydro requests the drafting team consider the following language added to R1: ...or within the frequency recovery characteristics of a location-specific Transmission Planner’s study if the Transmission Planner allows different (more or less stringent) frequency relay settings than those required to meet PRC-024 Attachment 1...And the following modification to R2:...or within the voltage recovery characteristics of a location-specific Transmission Planner’s study if the Transmission Planner allows different (more or less stringent) voltage relay settings than those required to meet PRC-024 Attachment 2... The SDT does not see where frequency recovery characteristics apply as long as the frequency remains within the envelope required by the UFLS standard (PRC-006-1). The NERC standard does not preclude more stringent voltage recovery profiles from being used under the requirements of a LGIA or regional standard.</p> <p>5) The drafting team has removed the following exception in R1, “A generating unit or generating plant is allowed to trip within the “no trip zone” if the frequency rate of change is more than 2.5 Hz/sec.” What is the technical basis for removing this exception? Is the intent that no tripping in the “no trip zone” is permitted regardless of the potential rate of change of frequency? There were no comments on this item in the last draft. There have been comments about the rate of change of frequency caveat in the past. The SDT was challenged by FERC to justify the value of 2.5</p>

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		<p>Hz/sec. While this is a default value for Aurora scenario protective devices, the SDT could not provide any other justification for this value and felt obligated to remove it. The SDT would appreciate any assistance from Manitoba Hydro to justify the 2.5 Hz/sec (or any other number MH can support).</p> <p>6) R2 - The first bullet has a typo - ‘tripping’ should be changed to ‘trip’. The redline version that was posted did have this error but the clean version (that the SDT uses) indicates the change was already made. No change required.</p> <p>7) R3 - This requirement requires that Generator Owners document each ‘known’ equipment limitation. The word 'known' can be legally ambiguous - known to whom? actual knowledge or ‘should have known’, ‘could have known’? The intent is that the Generator Owner can set protection to operate inside the “No Trip Zone” for limitations he is aware of (i.e., “known” limitations). He would not be able to do this for limitations he is not aware of (unknown limitations). The SDT believes that the most common use of this allowance is for older steam turbines that have limited low frequency operating capability as defined by the equipment manufacturer.</p> <p>8) R5 - The text of footnote 5 has been deleted, but the footnote remains. This is an artifact of the redline function. If you look at the clean version you will see that this has been addressed.</p> <p>9) General Comments: 1. Manitoba Hydro has a concern with respect to the phased in implementation measured by percent compliance. We believe that this may lead to a potential for some uncertainty and debate. Does a phased in implementation such as this, do anything to increase reliability? The SDT believes the phased implementation plan allows Generator Owners to implement any changes in protection system settings during normally scheduled unit outages.</p> <p>10) 2. Attachment 1 of MOD-026-1 (Note 2) and MOD-027-1 (Note 3) contain a section titled “Consideration for early Compliance” with language pertaining to previous testing and model verification which were completed under the applicable</p>

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		<p>regional policies, guidelines or criteria or which are compliant with the requirements of the standard. Manitoba Hydro recommends that similar language be included in the other standards (PRC-019-1, MOD-025-2 and PRC-024-1). There are no verification tests involved with PRC-024-1, so the cited section does not apply to this standard.</p>
<p>Response: The SDT thanks you for your comment. See answers to your specific questions above.</p>		
<p>SMUD</p>		<p>1) We much prefer a performance based, RBS approach using the internal controls process than the approach taken by the SDT. We would prefer to evaluate post event trips for compliance with the settings rather than keep extensive, zero-defect compliance documentation for all unit settings. (Intentional Space).... Based on comments from you and numerous other stakeholders the SDT has decided to remove Requirement R5 from the next draft of the standard. The SDT believes that Requirement R4 meets the reliability objective of the directive in Paragraph 1787 of FERC Order 693. In addition, the SDT agrees with stakeholders who indicated that the additional resources that would be required to design, build, operate and maintain synchronous generating facilities that could ride through any of the defined excursions without fail would not justify the resulting incremental gain in grid reliability. From a low voltage ride-through perspective, the occurrence of severe transmission system faults in the immediate vicinity of a generation facility is rare and the history of transmission faults causing trips of generating facilities is similarly rare. From a frequency excursion perspective, turbines and generators currently on the market easily meet the requirements for coordinating with UFLS programs when challenged with typical frequency excursions. While there have been issues with frequency oscillations in some cases (e.g., lean fuel blowout), the SDT believes that these types of issues can be resolved by market forces without the need for a requirement in a reliability standard.</p> <p>2) Specific Comments: It appears that R1 & R2 are meant to be “document the settings” requirements since they refer to the Long-term Planning Time Horizon and</p>

Organization	Yes or No	Question 3 Comment
		<p>M1 & M2 ask for settings documentation. The requirements themselves suggest that compliance is evaluated based on actual events, though. For instance, the first bullet in R1 mentions “..impending or actual loss of synchronism..” which would not be evaluated in the Long-term Planning Time Horizon. R2 states “...such that the voltage protective relaying does not trip...” which again implies evaluating the results of an actual event. R1 & R2 are not clearly pre-event documentation only or post event analysis only - they currently try to have it both ways. Please correct this.(Intentional Space).... Requirements R1 and R2 are not simply to document settings, but rather to ensure the protection is set so that it does not operate to trip the generator for voltage and frequency excursions that remain within the no-trip zones described in Attachments 1 and 2.</p> <p>3) We agree with the compliance approach used in R5 and encourage the SDT to use this same approach for requirements R1 & R2 The SDT believes the compliance approach used in Requirements R1 and R2 is adequate. Requirement R5 has been removed (see response to next comment).</p> <p>4) SMUD recommends the following changes the the 5th bullet of R5: (Intentional Space)....”Generation may trip if the Generator Owner has a temporary exemption granted by its Reliability Coordinator based on a documented equipment limitation. If a legitimate equipment limitation is identified following a plant trip caused by a frequency or voltage excursion, the Reliability Coordinator shall grant a retroactive exemption for the identified limitation.” (Intentional Space)....The stuck language lends itself to arbitrary determinations and, where no fix is possible, automatically forces a non-compliance situation for an unknown condition.(Intentional Space).... Based on comments from you and numerous other stakeholders the SDT has decided to remove Requirement R5 from the next draft of the standard. The SDT believes that Requirement R4 meets the reliability objective of the directive in Paragraph 1787 of FERC Order 693. In addition, the SDT agrees with stakeholders who indicated that the additional resources that would be required to design, build, operate and maintain synchronous generating facilities that could ride through any of the defined excursions without fail would not justify the resulting incremental</p>

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		<p>gain in grid reliability. From a low voltage ride-through perspective, the occurrence of severe transmission system faults in the immediate vicinity of a generation facility is rare and the history of transmission faults causing trips of generating facilities is similarly rare. From a frequency excursion perspective, turbines and generators currently on the market easily meet the requirements for coordinating with UFLS programs when challenged with typical frequency excursions. While there have been issues with frequency oscillations in some cases (e.g., lean fuel blowout), the SDT believes that these types of issues can be resolved by market forces without the need for a requirement in a reliability standard.</p> <p>6) We disagree with R6. First, the GO must provide the generator protection trip settings - this phrasing is not limited to voltage or frequency trip points, but ALL trip settings. This is unreasonable. Second, the GO should not be subjected to an indefinite requirement to constantly update an entity that sends a single written request. By the requirements in this standard, the various Coordinators and Planners know that the plant's trip settings must follow the curves. Why isn't this enough? If the Coordinators or Planners want specific setting data, they should be required to ask for it each time. Otherwise, they should model the plant as meeting the curves contained in this standard. Based on comments from other stakeholders, the SDT has removed two of the possible requestors from Requirement R6. The SDT would like to point out that the planners that design UFLS systems require the frequency trip setting information and that PRC-006 specifically links to this reporting requirement in PRC-024. The SDT does not believe having to report other protection settings information imposes an undue burden on the Generator Owner if so requested.</p>
<p>Response: The SDT thanks you for your comment. See answers to your specific questions above.</p>		
<p>Western Electricity Coordinating Council</p>		<p>WECC is concerned that Requirement R3 of PRC-024-1, which requires Generator Owners to document each known equipment limitation that prevents a generating unit from meeting the frequency requirements of Requirement R1 may be in conflict</p>

Organization	Yes or No	Question 3 Comment
		<p>with or less stringent than the requirement in the WECC Off-Nominal Frequency Load Shedding Plan that requires Generator Owners that have generators that do not meet the frequency requirements to automatically trip load to match the anticipated generation loss or have contractual relationships providing for automatic load shedding. The concern is that Generator Owners may interpret Requirement R3 of PRC-024 to relieve them of their obligations under the WECC Coordinated Off-Nominal Load Shedding Plan. This is a concern because the original design and subsequent simulations conducted to validate the effectiveness of the WECC Off-Nominal Frequency Load Shedding Plan reflect simulation of the generator underfrequency and overfrequency operation requirements, and any deviations from these requirements would invalidate the effectiveness studies and could potentially require modifications to the existing approved WECC Coordinated Plan.</p>
<p>Response: The SDT thanks you for your comment. Regional Entities are able to implement requirements via regional standards that are more stringent than the continent-wide NERC standards. PRC-024-1 does not preclude WECC from setting the requirement described. The SDT does wonder how a generator can selectively trip load that matches a dynamically changing generation output.</p>		
<p>Xcel Energy</p>		<p>1) Xcel Energy would like to point out that the high frequency duration curves for the Eastern, ERCOT, and Quebec Interconnections exceed the allowable short-term frequencies specified in IEEE C50.13 and IEC 60034 which the OEM’s use to design their generators. Attachment 1 should be modified to meet the IEEE and IEC standards. The high frequency curve for the Eastern and ERCOT Interconnections in Attachment 1 have been revised to meet the cited IEEE and IEC standards. Quebec has a unique situation and their generators are hydro-electric units that are able to meet their high frequency requirements.</p> <p>2) Also, Xcel Energy continues to believe that Requirement R5 would result in a large cost increase in the cost of building new generating units which would defer resources that could be better used elsewhere to improve grid reliability. Xcel recommends that this requirement be revised such that if a generating unit did trip</p>

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		<p>during a voltage or frequency excursion, the Generator Owner investigate the cause and develop a corrective action plan to address the trip. Based on comments from you and numerous other stakeholders the SDT has decided to remove Requirement R5 from the next draft of the standard. The SDT believes that Requirement R4 meets the reliability objective of the directive in Paragraph 1787 of FERC Order 693. In addition, the SDT agrees with stakeholders who indicated that the additional resources that would be required to design, build, operate and maintain synchronous generating facilities that could ride through any of the defined excursions without fail would not justify the resulting incremental gain in grid reliability. From a low voltage ride-through perspective, the occurrence of severe transmission system faults in the immediate vicinity of a generation facility is rare and the history of transmission faults causing trips of generating facilities is similarly rare. From a frequency excursion perspective, turbines and generators currently on the market easily meet the requirements for coordinating with UFLS programs when challenged with typical frequency excursions. While there have been issues with frequency oscillations in some cases (e.g., lean fuel blowout), the SDT believes that these types of issues can be resolved by market forces without the need for a requirement in a reliability standard.</p>
<p>Response: The SDT thanks you for your comment. See answers to your specific questions above.</p>		
Northeast Utilities		No comment

END OF REPORT