NERC
NORTH AMERICAN ELECTRIC RELIABILITY CORPORATION

DER Data Collection Guideline

Rich Hydzik, Avista – DER Subgroup Lead

ERSWG Meeting, DER Subgroup Update

May 18, 2017

RELIABILITY | ACCOUNTABILITY

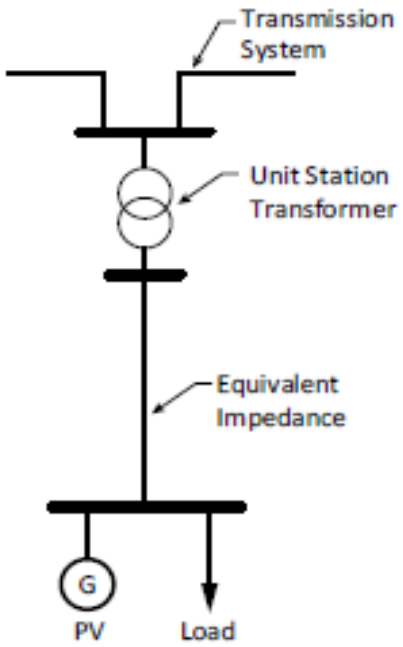



DERTF Report Recommendation

- Page 27, Chapter 7 Recommendations
- Guidelines: The DERTF recommends that a set of guidelines be developed to assist in modeling and assessments, such that owners/operators of the BPS can account for the impact of DER. The DERTF also recommends that Distribution Provider (DP) be added as an applicable entity in MOD-032, replacing the Load Serving Entity that is currently an applicable entity, to provide for collecting pertinent information related to distribution impacts on the BPS (similar to what is already included in TOP-003-3).

Data Collection – DERTF Report

- DERTF Report described modeling (Chapter 3)
- Identified Concerns
  - Frequency Ride Through
  - Voltage Ride Through
  - DER and Load Netting at the load bus
- DER data is needed for
  - Steady state system analysis
  - Transient stability (dynamic) simulations
  - Voltage stability studies (PV/QV)
- Recommended DER aggregation at Load Bus



Data Gathering and Data Modeling

- We are working on a “Data Collection” guideline
  - What to ask for
- Others will specify “Data Modeling”
  - What to do with the data
- Data Collection feeds Data Modeling
  - Better to ask for more than you think you need
  - Do not want to ask twice for data
  - Simple uniform process for data collection

DER Data Collection

- Others are working on DER Data
  - Load Modeling Task Force
  - System Analysis and Modeling Subcommittee
  - Electric Power Research Institute
  - National Renewable Energy Lab
- RAS is looking at this
  - LTRA data collection

Data Collection – DER

- What data is needed from DER?
- Assume DER data is aggregated at the load bus
  - Power and reactive capability
  - Frequency tripping (cease output) points and times
  - Voltage tripping (cease output) points and times
  - Active power control capabilities
    - Voltage regulation parameters
    - Frequency response (droop) parameters
- Probably more, but this is a start
- Hope to have a draft ready for ERSWG at August meeting

Questions and Answers

NERC
NORTH AMERICAN ELECTRIC RELIABILITY CORPORATION

MOD-032-1 Draft SAR

Rich Hydzik, Avista – DER Subgroup Lead

ERSWG Meeting, DER Subgroup Update

May 17, 2017

RELIABILITY | ACCOUNTABILITY




DERTF Report Recommendation

- Page 27, Chapter 7 Recommendations
- Guidelines: The DERTF recommends that a set of guidelines be developed to assist in modeling and assessments, such that owners/operators of the BPS can account for the impact of DER. The DERTF also recommends that Distribution Provider (DP) be added as an applicable entity in MOD-032, replacing the Load Serving Entity that is currently an applicable entity, to provide for collecting pertinent information related to distribution impacts on the BPS (similar to what is already included in TOP-003-3).

Narrow Scope Approach

- This project proposes removing the Load Serving Entity (LSE) from the Applicability Section (4.1.3) and replacing LSE with Distribution Provider (DP) as the applicable entity for Section 4.1.3. LSE is no longer considered a reliability entity due to a change in the NERC Rules of Procedure. The DP is defined as "provides and operates the 'wires' between the transmission system and the end use customer." The DP is the applicable entity to provide data for power system modeling and analysis for distribution systems. Attachment 1 should be modified by replacing the applicable entity LSE with DP.

Points to Consider

- DER Report recommended the change in applicable entity from Load Serving Entity (LSE) to Distribution Provider (DP)
- LSE is no longer applicable to a standard
- Distributed Energy Resource (DER) is not defined by NERC
- Attachment 1 contains a catchall statement
  - "Other information requested by the PC or TP necessary for modeling purposes"
  - Steady-state
  - Dynamic
  - Short circuit
- TOP-003-3 R1 and R2 are similar

Comments from DERTF/LMTF WebEx

- Concern that if “DER” is added to MOD-032-1, a glossary definition will be required
- Difficulty in getting data from DP if it is not explicitly requested
- Adequate P and Q DER data – minimum expectation
- Adding DER to Attachment 1 exceeds Recommendation approved by NERC Board
- General consensus comment
  - LSE becoming DP is good change

Two Phase Approach?

- ERSWG / DER group has been directed to:
  - Submit SAR to change applicable entity from LSE to DP
  - Develop data collection guideline for DER data
    - This can inform on going Standard Process
- More action needed?
  - If so, determine next step
- Recommendation
  - Proceed with narrowly scoped draft MOD-032-1 SAR
  - Begin work on data collection guideline
    - To be completed by year end 2017

Questions and Answers

NERC
NORTH AMERICAN ELECTRIC RELIABILITY CORPORATION

Frequency Response Modeling Improvements

Olushola J. Lutalo, MS, P.E., PMP, Senior Engineer of System Analysis
Ganesh Velummylum, Senior Manger of System Analysis
ERSWG Meeting
May 17, 2017, Atlanta, GA

RELIABILITY | ACCOUNTABILITY




Modeling Improvements Overview

- Frequency Response(FR) study model findings
- FR dynamics modeling recommendations
- Communication/feedback loop to model designee/Generator Owners
- Benchmarking with recent event (Millstone Generation) as part of model validation using the;
  - 2015 Series ERAG/MMWG 2021 Light Load Base Case
  - 2016 Series ERAG/MWWG 2017 Light Load Base Case
-

2015 Series Frequency Response Dynamic Model Findings

- It was not possible to obtain a valid initialization after running the ERAG/MMWG provided files on the 2015 Series ERAG/MMWG 2021 Light Load Base Case.
- The required DLL models were not made available for the DC Equivalents with the base cases.
- There is no deadband modeling for the most used PSS/E models.
- Secondary Frequency Response modeling is inadequate.
- Several parameters remained severely out of tolerance over the 60 second no-disturbance simulation.

2015 Series Frequency Response Dynamic Model Recommendations:

- The required DLL models must be made available for the DC Equivalents with the base cases.
- Modeling data submitted by all entities must be supplied to (ERAG)/MMWG in a consistent PSS/E Version.
- PTI should add deadbands in the speed signal of the turbine-governor (TG) models in the PSS®E Library. Make use of these revised models in future frequency responsive models.
- Most used governor models are the TGOV1, TGOV2, TGOV3, TGOV4, TGOV5,IEESGO, IEEEG1, and GGOV1.
- Convert the *GENSAL* and *GENROU* models to the *GENTPJ* model – to accurately model magnetic saturation characteristics
- EX21BR model should be used to represent the EX2000, EX2100, or EX2100e excitation system – modeling of field current limiter

2015 Series Frequency Response Dynamic Model Recommendations:

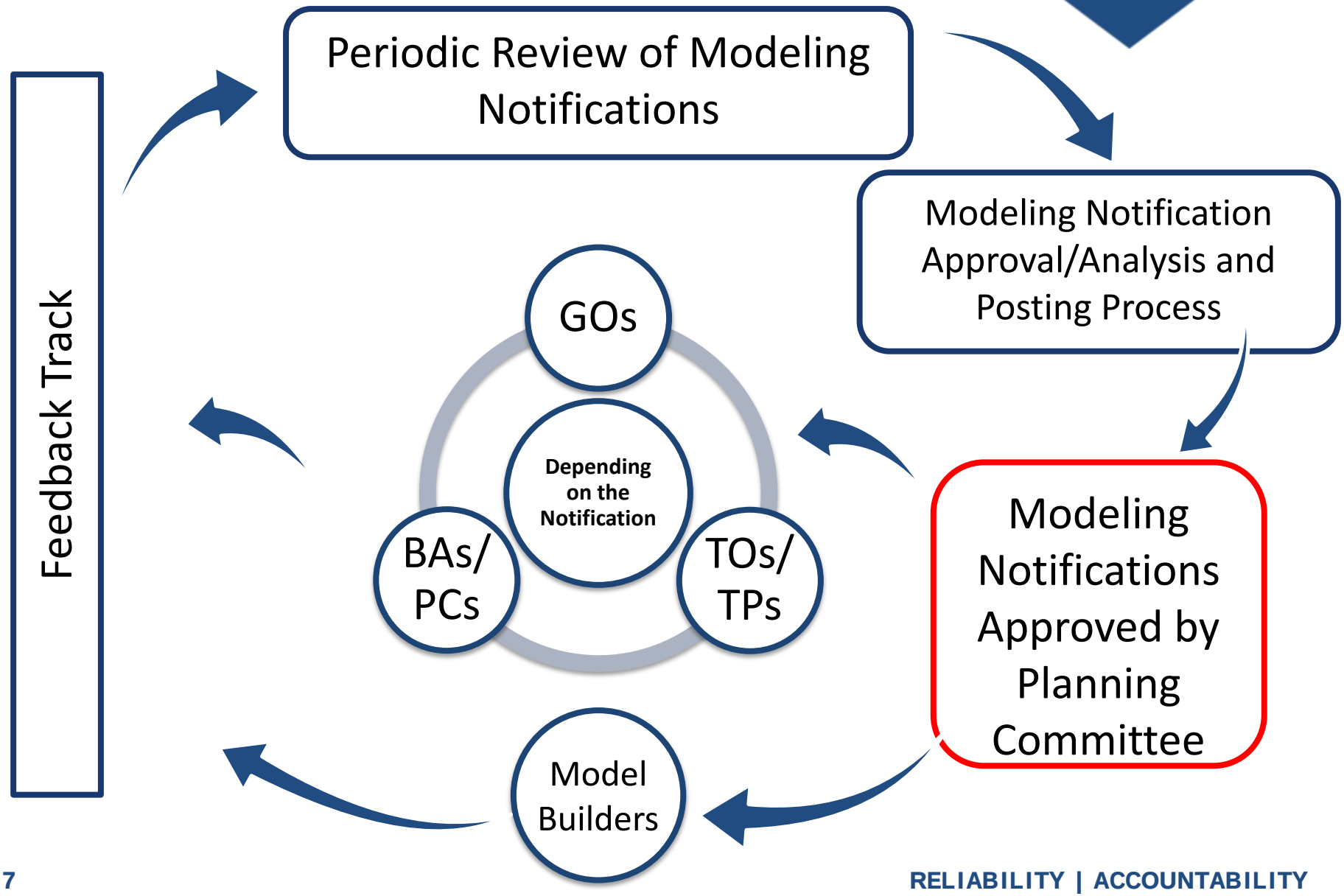
- Synchronous generating unit within each Region should be assigned one of three possible classifications of governor response/modeling parameters;
  - "Fully Responsive" – The plant power output is fully sensitive to grid frequency in accordance with the primary control action of the governor, with other plant control elements supporting the action of the governor
  - "Squelched" – The power output is adjusted by the governor but the adjustment is overridden by the supervising action of a plant 'load controller' that returns plant output to a scheduled value within 10-20 seconds.
    - Modify the Reset Gain—Available on for the GGOV models
    - Change the LCFB1 Outer Loop Controller setting.
  - "Non-responsive" – The power output changes minimally in the first few seconds after the disturbance
  - Deadband settings of +/-0.036 Hz are recommended
  - Synchronous generation with droop setting of 5% are recommended

2015 Series Frequency Response Dynamic Model Recommendations:

- Non – synchronous generating unit (wind) within each Region should have the following parameters model accurately;
  - (Kpg, Kig) - Proportional gain for power control (pu)
  - fdbd1, Deadband for frequency control, lower threshold (<=0)
  - fdbd2, Deadband for frequency control, upper threshold (>=0)
  - Ddn, droop for over-frequency conditions (pu)
  - Dup, droop for under-frequency conditions (pu)
  - Tft, Lead time constant (s)
  - Tfv, Lag time constant (s)
  - Kp, Reactive power PI control proportional gain (pu)
  - Ki, Reactive power PI control integral gain (pu)

Approval / Analysis and Posting Process

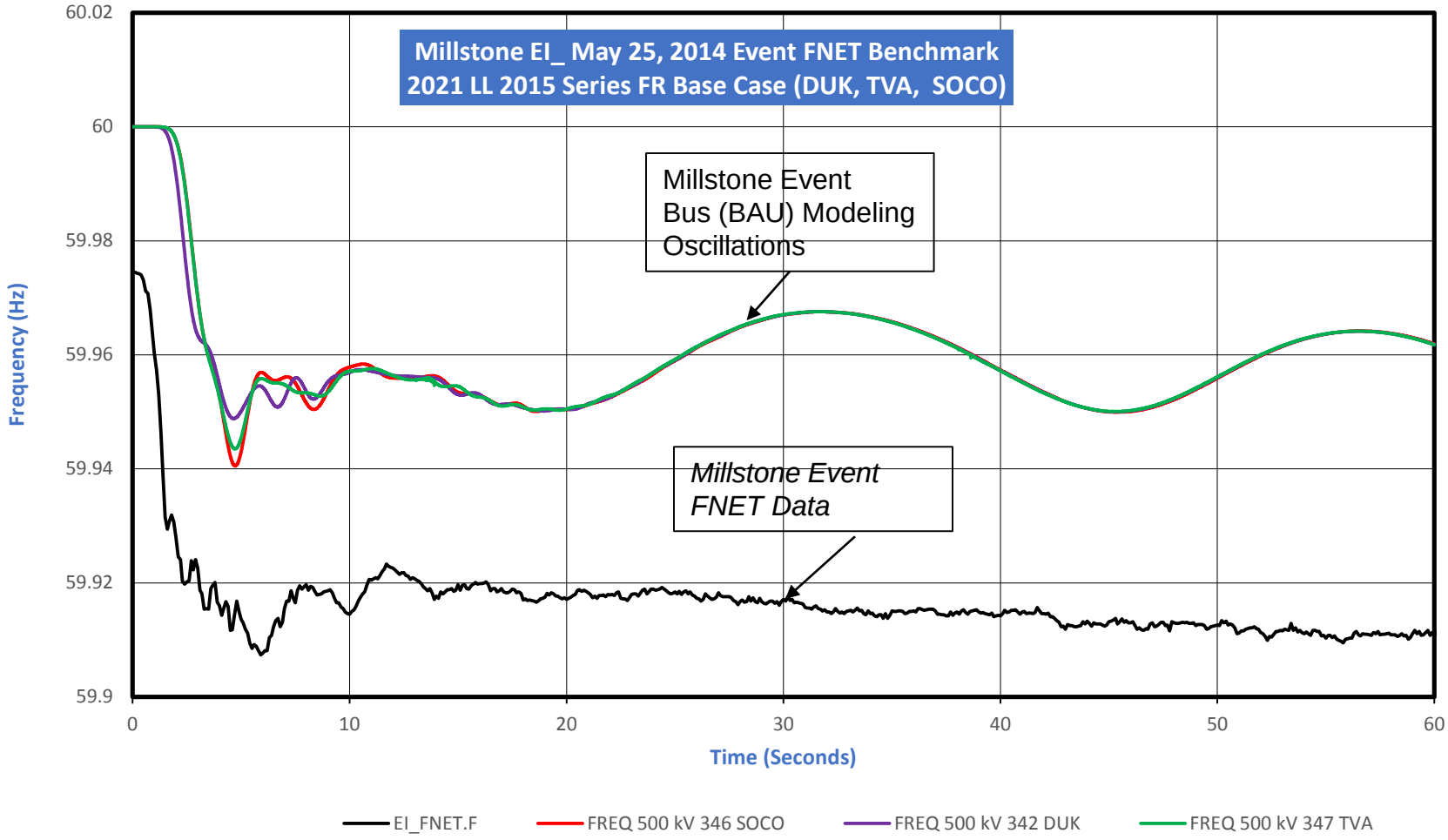
Feedback Cycle



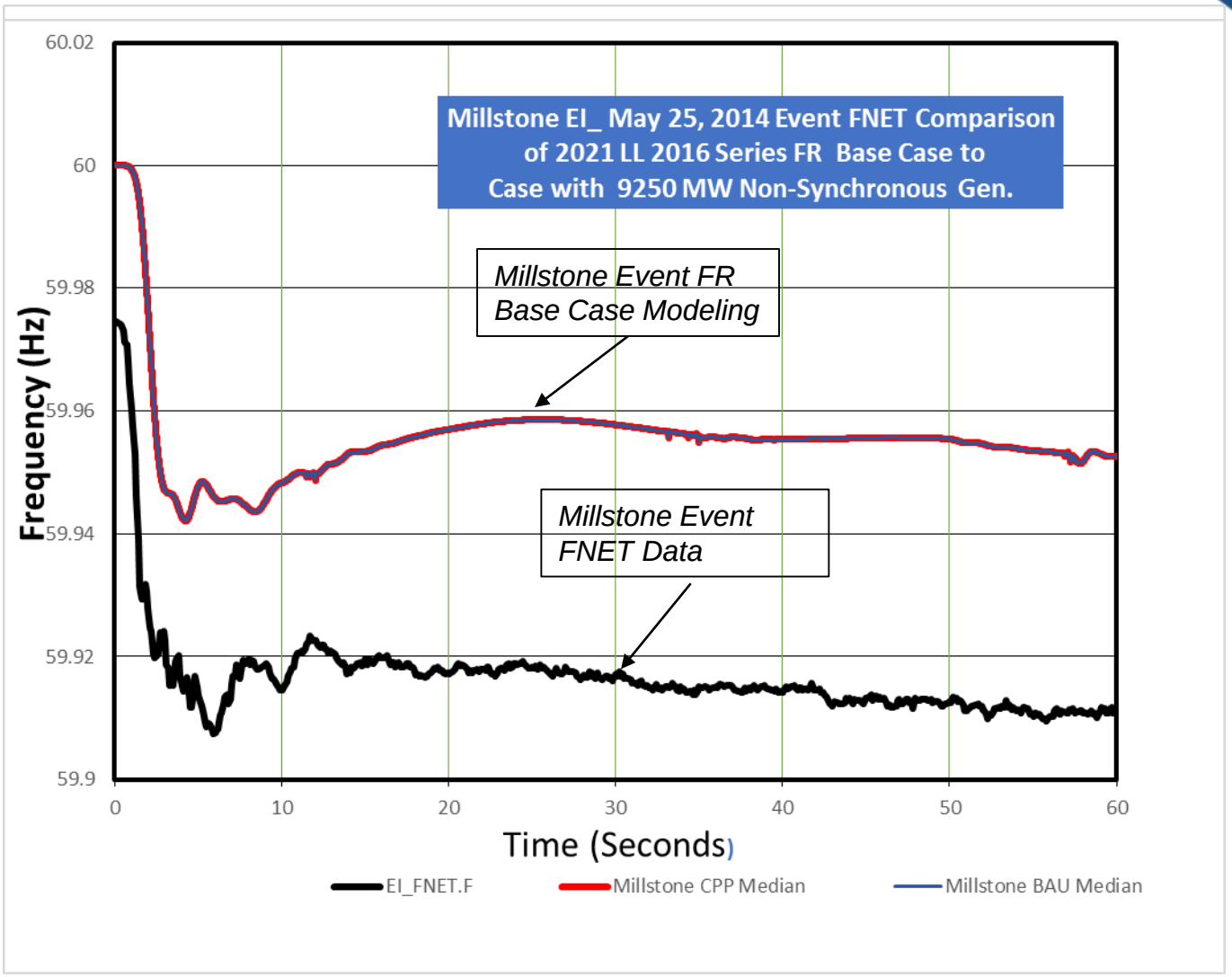
Benchmarking to Recent system Outage events,

- Methodology for benchmarking basically compared the RoCof and Points A, B, and C on the FR of the dynamic models to the FNET data for the Event.
  - The RoCoF compared very well for the Primary Frequency Response (PFR) period.
  - Point A and Point C on the FR curves benchmarked very well during the PFR period.
  - Point B on the FR curve benchmarking showed an improvement due to the recommended change of Governor and Load Controller Modeling

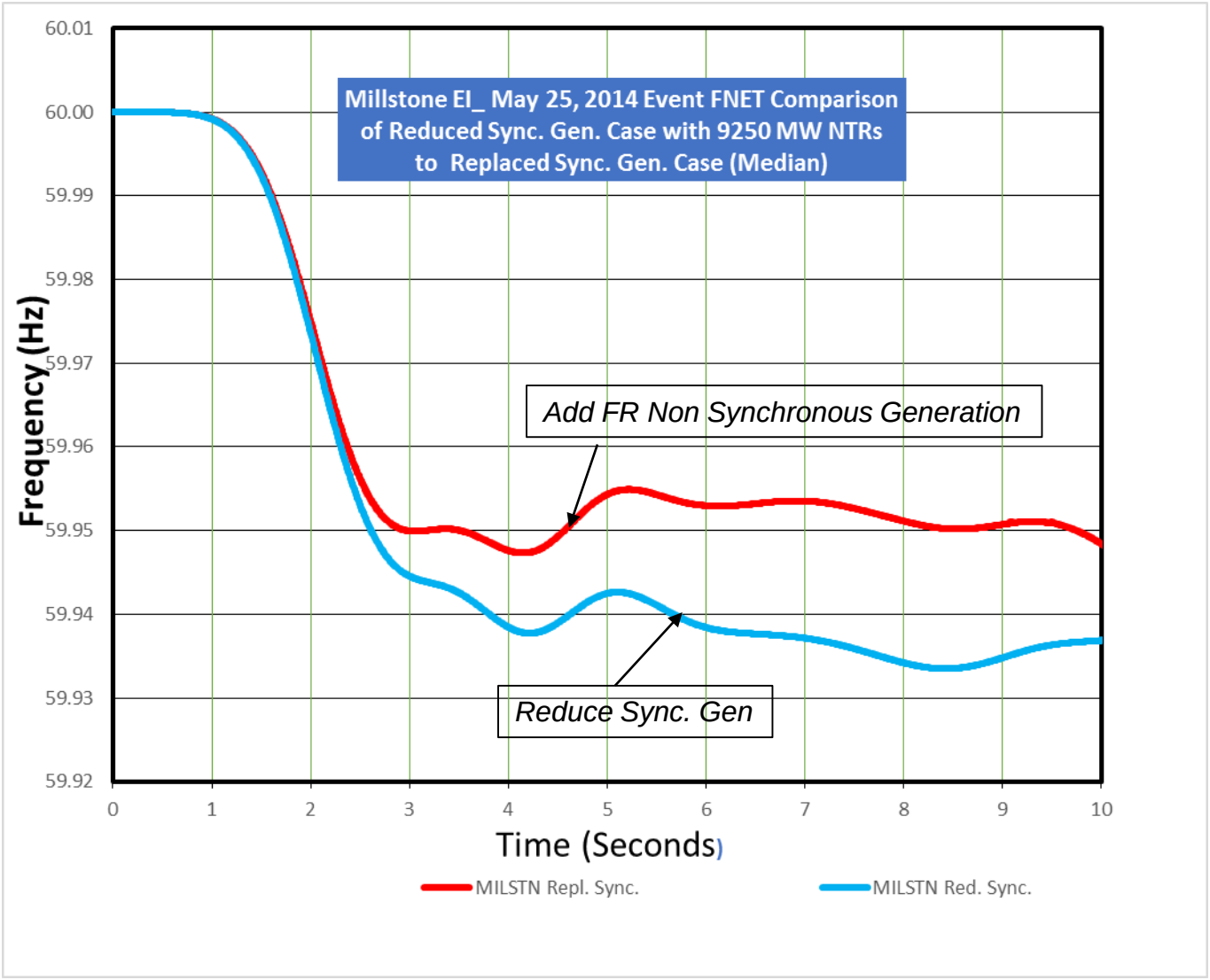
Oscillations in Millstone May 25, 2014 Event Benchmark to 2015 Series FR Case



(Median) Millstone May 25, 2014 Event Comparison to 2016 Series FR Base Case



(Median) Millstone May 25, 2014 Event 2016 Series Replace FR Sync. Gen. Case

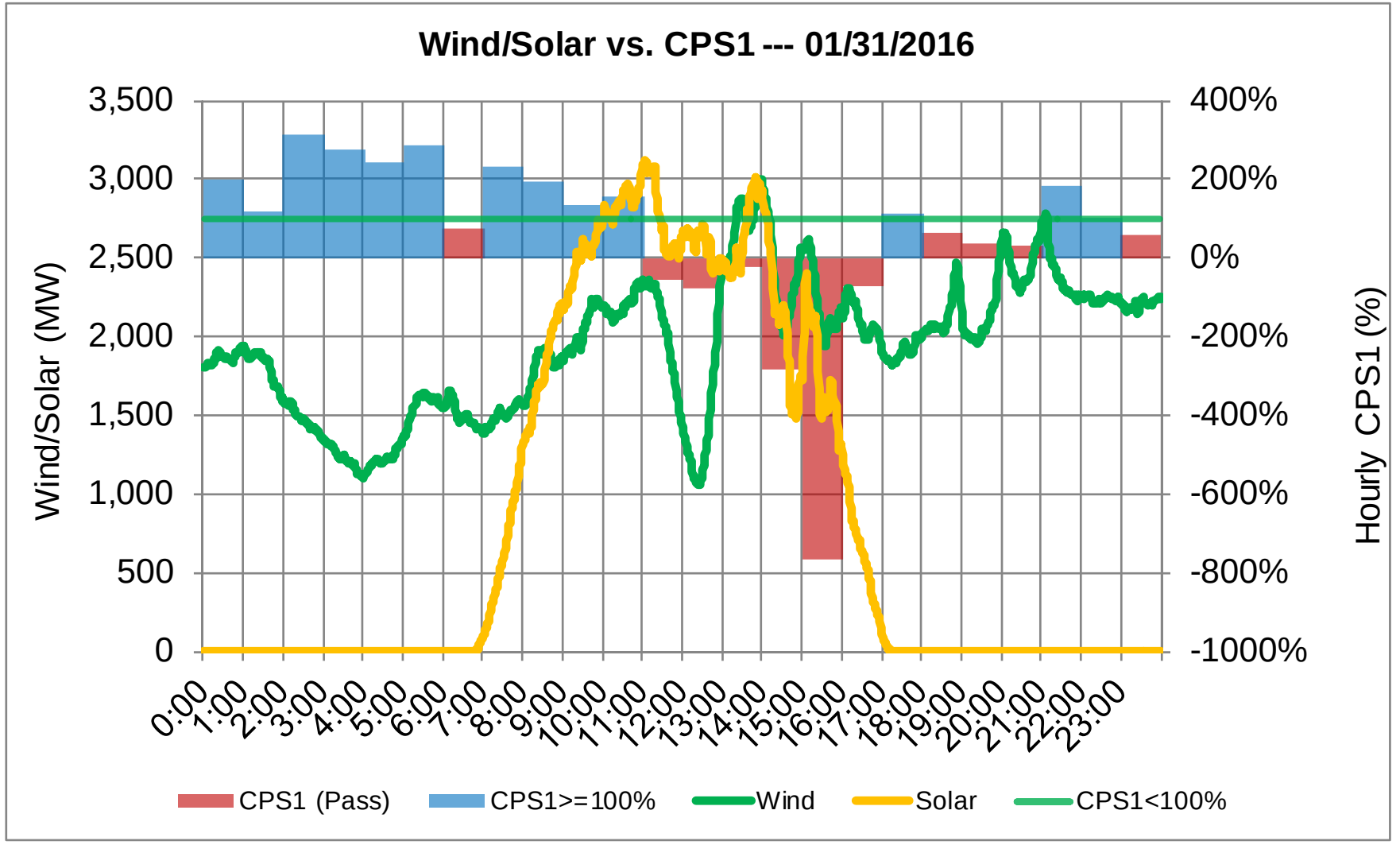


FR Dynamic Modeling Improvements Conclusion

- 2016 dynamic case initialized well for no-disturbance simulation
- 2016 Series ERAG/MMWG 2017 Lightload FR dynamic case benchmark very well to the FNET data for the loss of Millstone unit 2 (870MW) and Millstone unit 3(1,233 MW)
- Synchronous generation governor should be modeled appropriately to capture the following governor response classifications
  - Fully Responsive
  - Squelched
  - Non-Responsive
- Non – synchronous generating unit (wind) FR parameters should be modeled appropriately

Questions and Answers

Intra-hour variability and uncertainty could result in inability to control the interconnection frequency in real-time



CPS1 is evaluated on a rolling 12-month average. Over the past few years, the rolling average has been declining as a result of some poor daily performances. Thus, the CAISO need to take measures to improve daily performance on days with higher variability.