



Technical Issues Relating to Frequency Response Requirements for the Eastern, Western and Texas Interconnections

Docket Number RM06-16-11

**Technical Conference
September 23, 2010**

AGENDA

10:00 Welcome and Opening Remarks

- The purpose of this conference is to obtain a better understanding of the technical complexities associated with establishing a specific frequency response requirement.
- Inadequate frequency response raises significant reliability concerns.
- Among the issues we seek industry input on are:
 - How do various magnitudes of Frequency Response impact the reliable operation of each interconnection?
 - How have the three interconnections performed in terms of frequency response?
 - Which entity(ies) should be responsible for frequency response and how should allocations be made among the balancing authorities?
 - How can frequency response data be obtained and measured?

Industry Participants for both panels:

- Steven. D. Ashbaker, Director of Operations, Western Electricity Coordinating Council (WECC)
- Don Badley, System Operations Manager, Northwest Power Pool (NWPP)
- Terry Bilke, Director, Standards Compliance & Strategy, Midwest ISO
- Thomas J. Bradish, Director – Reliability Standards, RRI Energy on behalf of the Electric Power Supply Association (EPSA)
- Robert W. Cummings, Director of System Analysis and Reliability Initiatives, North American Electric Reliability Corporation (NERC)
- H. William Herbsleb, Senior Engineer, PJM Interconnection, L.L.C.

- Douglas E. Hils, Director of Midwest Control Area Operation, Duke Energy Corporation
- Brendan Kirby, Consultant, on behalf of the American Wind Energy Association (AWEA)
- Dmitry Kosterev, Electrical Engineer, Transmission Planning, Bonneville Power Administration (BPA)
- Kenneth McIntyre, Manager, Standards Compliance, Electric Reliability Council of Texas (ERCOT)
- Sydney L. Niemeyer, Control System Specialist, NRG Energy
- Guy Quintin, Manager – System Control Center, Hydro-Québec TransÉnergie

10:10 Session 1 – Fundamentals

This session will explore the fundamental physics that determine the frequency response of an interconnected Alternating Current power system and the reliability impacts of different magnitudes of response. The session will discuss generation resources, frequency responsive loads, transmission elements, and the necessary coordination with protection and control systems. This session will include a discussion of the range of actual frequency response in the various interconnections and identify the reliability impact if a credible contingency occurred during times of low magnitude frequency response.

- Panelists should be prepared to discuss for each interconnection:
 - The factors that determine the initial frequency slope (such as $\Delta P / (D + 2H)$)
 - The factors that initially arrest the frequency decline as well as the impact of different magnitudes and speeds of delivery of those factors (such as achieving an energy balance at the lower frequency)
 - The coordination of the frequency nadir and UFLS
 - The factors that determine the settling frequency
 - The factors that determine the frequency nadir and the settling frequency for each of the interconnections (especially when nadir is a higher frequency than the settling frequency)
 - The extent to which a frequency deviation is propagated within an interconnection such that all generating units can detect and react after some short time delay
 - The postulated over frequency and its consequences within an interconnection after the activation of the first step of UFLS on an interconnection-wide basis for other than UFLS postulated conditions¹
 - The modeling and physical factors needed to avoid the above consequences
- Questions from Staff

¹ Final Report on the August 14, 2003 Blackout at 99 (2004).

1:00 Lunch

2:00 Session 2 – Frequency Response Resolutions

This session will explore approaches used by various interconnections (domestic and international) to determine and measure the magnitude and sources of frequency response and other proposed methods panelists might wish to bring to staff's attention. This session will discuss technologies and information currently available to entities that could be used to accomplish an equally effective and efficient solution. The solutions will be discussed for feasibility, necessary data, and potential implementation time frames.

- Panelists should be prepared to discuss historical initiatives that have been taken to address frequency response requirements and the possible functional entities who arrange or implement the requirements
 - ERCOT RCOT frequency response initiative²
 - European frequency response requirements on generators³
 - WECC frequency responsive reserve initiative (such as the information filled by WECC in the BAL-002 docket)
 - WECC modeling initiative
- Questions from Staff
- Other potential approaches that could be taken to define the minimum frequency response at all times
 - System conditions that affect system frequency, including the threshold frequency that could be reached without resulting in cascading outages (for example under-frequency load shedding set-points)
 - Historical (or potential) outage/contingencies on an interconnection that could be expected to determine the minimum amount of frequency response needed for an interconnection.
 - How could requirements for entities be developed and implemented? (see the current draft BAL-003 standard)
 - Analysis of how the systems have performed over time (historical frequency response on the interconnections)
 - Quality of the data and accuracy of the modeling when compared to actual events?
 - How these amounts of frequency response can impact operations of each interconnection for the most limiting contingencies?

² Third Draft of the BAL-001-TRE-1

³ https://www.entsoe.eu/fileadmin/user_upload/library/publications/ce/oh/Policy1_final.pdf

- Does this amount result in a reliable system? If so, could this amount be used as a starting point for the requirements for frequency response expected by entities?
 - Any other solutions recommended by panelists?
- Questions from Staff
- Of the potential solutions discussed, what would the appropriate implementation time for each?
 - What data would be needed to implement each solution?
 - What tools and technologies would be needed to implement each solution?
 - What costs would be required of entities to implement each different solution?
 - What would be an appropriate timeline for NERC to complete the frequency response standard?
- Questions from Staff
- Questions from the public

3:45 Concluding Remarks