

BAL-001-TRE-01 Draft Standard

Frequently Asked Questions (FAQs)

Why wasn't the existing Protocol Revision Process to address any regional needs?

The current waiver was granted to ERCOT based on the ERCOT Protocols being more stringent than the existing NERC standard. FERC Order 693 directs that the regional difference that ERCOT currently has (Protocol Section 5.9) be put in the form of a standard and Texas RE has been delegated the authority to facilitate the development of this regional standard. Additionally in FERC Order 693, FERC states, "As with other new regional differences, the Commission expects that the ERCOT regional difference will include Requirements, Measures, and Levels of Non-Compliance sections".

Isn't the standard drafting team expanding the current applicability of BAL-001-0 R2 to the GO?

No. Section 5.9 of the ERCOT Protocols applies directly to GOs by requiring generating units/generating facilities to have Governors in service and the combined response of all Generation Resources interconnected in ERCOT to measurable events shall be a minimum of 420 MW/0.1 Hz.

Why does the standard not have a minimum interconnection frequency response requirement?

If the individual generating units/generating facilities achieve their required performance, the interconnection frequency response will be managed by the BA maintaining adequate frequency-responsive spinning reserve. The interconnection frequency response will be evaluated and used to determine the interconnection bias setting in the ACE equation and meet the requirements of NERC standard BAL-003.

There are many different boiler/turbine arrangements and without additional research, is it possible at this time to determine if this draft standard works for all units? Shouldn't a larger sample of equipment be tested before passing this standard?

The members of the ERCOT Performance Disturbance Compliance Working Group (PDCWG) have tested this Governor droop implementation on varying types of units with success. The team continues to encourage all market participants to test the Governor implementation of this standard on their resources. Documentation has been supplied with this draft in order to encourage such testing by the industry. Results of such testing could be supplied in future comments on this standard or directly to the ERCOT PDCWG.

It appears that this draft standard may be inequitable in that a segment of generating units/generating facilities will be expected to provide Primary Frequency Response when nuclear has no obligation to provide any Primary Frequency Response. Is this the case?

The nuclear generating units/generating facilities were contacted by the standard drafting team to question their ability to provide Primary Frequency Response. The responses from both existing nuclear facilities within ERCOT stated that existing Nuclear Regulatory Commission rules do not allow them to provide Primary Frequency Response. Reactor power will not change to support frequency response of the turbine of the nuclear resources. The nuclear units will respond to excessive high-frequency to protect the turbine from damage.

Why are the deadbands for mechanical Governors greater than deadbands for electronic or digital Governors?

Mechanical Governor deadbands are a function of gear lash and linkage clearance between the Governor and the steam control valve. The industry standard maximum deadband for mechanical Governors has been +/- 0.036 Hz. Mechanical Governors can and will perform at a lower deadband than this maximum if properly maintained. However, due to wear during normal operation, mechanical Governors cannot be consistently maintained at the lower levels.

Why are we requiring electronic or digital Governors to be set at +/- 0.01666 Hz deadband instead of +/- 0.036 Hz?

The +/- 0.036 Hz maximum deadband of a mechanical Governor represents the worst-case performance of a mechanical Governor. A properly-maintained mechanical Governor can easily respond to frequency deviations as low as +/- 0.01666 Hz or lower. To set an industry standard to perform at the worst-case level reduces reliability.

Why is there a straight-line proportional droop curve as opposed to expected performance of 5% droop?

In conjunction with the lower deadband, the proportional droop curve was also changed to a straight-line curve from the deadband to the droop curve end point. This change is vital to reliability in that it eliminates the step response of turbines as they were previously expected to perform at 5% droop from the deadband. This implementation minimizes the risk of frequency instability during islanding events and provides stability to generation units/generation facilities and the interconnection during normal interconnected operations.

How does this standard improve reliability?

This change improves reliability of the grid through response to smaller frequency deviations. The tighter deadband provides more resistance to frequency change, thereby limiting the total frequency change to a much smaller deviation for the same generation-to-load imbalance. As an added benefit, each generation unit/generation facility will have moved fewer MWs since the frequency change is smaller. With the reduced magnitude of frequency deviations and the proportional droop response, generating units/generating facilities should experience less stress when responding to frequency since frequency will stabilize at a value closer to 60 Hz. More information is available in the white paper titled "Reduced Governor Dead Band Improves Generator Operation While Enhancing Grid Reliability" by Tony Grasso, PE, MBA, Sydney Niemeyer and Pamela Zdenek.

Why are the droop settings for combustion turbines in the combined-cycle configuration different?

Steam turbines in the combined-cycle configuration operate with the control valves wide open and therefore will not provide immediate frequency response. To compensate for this, the combustion turbines that are part of the same combined-cycle configuration are set at 4% droop instead of 5%.

Where did the 8-event minimum come from?

The team wanted a large enough sample size to get a valid measure of the unit's performance and still allow for some performance problems during an event. These units are still required to have their Governor in service while online and have proper implementation of the Governor.

Why is a 75% rolling average passing rate considered passing?

The performance measures used in this standard allow the GO to account for conditions within their generating unit/generating facility to be modeled within the measure to account for known physical limitations. This should result in generating unit/generating facility performance levels to be near 1.0 p.u. on average. The 0.75 p.u. minimum performance level was chosen to allow for unforeseen unit limitations.

How is the initial Primary Frequency Response measured?

The difference between the pre-event and post-event average frequency is calculated and compared to the difference between the pre-event and post-event average megawatt output of the generating unit/generating facility. Based on Governor deadband and droop curve implementation and limited by known limiting factors of the generating unit/generating facility, an expected Primary Frequency Response performance level is derived. The actual performance of the generating unit/generating facility is compared with this derived expected Primary Frequency Response to measure performance.

The expected Primary Frequency Response may be modified based on the following three scenarios.

- Ramping before and during the frequency recovery period remains flat: No adjustment is made to the expected Primary Frequency Response.
- Ramping before and during the frequency recovery period continues in the same direction: The megawatt change during the 45 seconds before the Frequency Measurable Event is calculated and the megawatt ramp is added to the derived expected Primary Frequency Response.
- Ramping before and during the frequency recovery period reverses: The megawatt change during the 45 seconds before the Frequency Measurable Event is calculated and the megawatt ramp is added to the derived expected Primary Frequency Response.

How is sustained Primary Frequency Response measured?

In order to measure sustained Primary Frequency Response, the generating unit/generating facility must have provided at least a 0.15 p.u. performance during the initial Primary Frequency Response measure. If the generating unit/generating facility did not provide at least 0.15 p.u. performance, no evaluation of sustained Primary Frequency Response is performed.

If the measured initial Primary Frequency Response performance is greater than 1.0 p.u., the sustained Primary Frequency Response target is limited to 1.0 p.u. of the expected Primary Frequency Response. In other words, if the unit over-performs, it is not expected to sustain the over-performance.

For each 2-second scan during the frequency recovery period, an expected Primary Frequency Response value is calculated. This value is derived from the droop setting, deadband and limiting factor of the generating unit/generating facility. A time filter is used to emulate the time-delay of delivery of Primary Frequency Response of the generating unit/generating facility. This time filter can be tuned for each generating unit/generating facility. This value becomes the final expected Primary Frequency Response target delivery during the recovery period.

The frequency recovery period is determined by the BA and occurs when frequency returns to schedule or pre-event value. Once this period is identified, the difference between the generating unit/generating facility's pre-event megawatt value and the megawatt value at the time of the frequency recovery is calculated. This difference determines the ramp magnitude and direction of the generating unit/generating facility during the recovery period.

From this megawatt ramp magnitude, a 2-second ramp rate is calculated and becomes the ramp target of the generating unit/generating facility during the recovery period. The ramp target is then added to the expected Primary Frequency Response target to develop the final target megawatt value of the generating unit/generating facility. The performance measure then calculates the p.u. delivery of sustained Primary Frequency Response by dividing the actual megawatt value by the target megawatt value.

- Ramping before and during the frequency recovery period remains flat: The ramp target will be equal to zero and the final target megawatt value will be equal to the expected Primary Frequency Response target.
- Ramping before and during the frequency recovery period continues in the same direction: The ramp target is added to the expected Primary Frequency Response target to develop a final target megawatt value of the generating unit/generating facility.

- Ramping before and during the frequency recovery period reverses: The pre-event ramp is added to the frequency recovery period ramp to provide one-minute turnaround time. This algebraic sum of the two ramp periods is then added to the expected Primary Frequency Response target to develop a final target megawatt value of the generating unit/generating facility.

Who is responsible/owner for maintaining the spreadsheet?

The BA will be expected to own and maintain the spreadsheet. However, GOs can use the spreadsheet to track the performance of their generating units/generating facilities.

How does a GO know an event has occurred?

The BA is responsible for reporting measurable events and each unit's performance to the Compliance Enforcement Authority (CEA). The standard drafting team suggests that ERCOT as the BA notify all registered entities when a Frequency Measurable Event has actually occurred.

How does a GO know they've failed an event?

Monthly reports are provided by the BA to CEA. It is up to each GO to conduct its own internal review of performance after being notified by the BA that a Frequency Measurable Event has occurred.

When is the monthly report going to be provided by the BA?

The BA will forward the report to the CEA within 30 days of the end of the previous month for a rolling 12-month average through the end of the previous month.

What is the process for contesting an alleged violation?

This process will follow the Texas RE and NERC Rules of Procedure. Per the proposed measures, events may be excluded where there is a valid documented reason the unit did not provide sustained Primary Frequency Response.

If a GO fails an event, will that information be made public?

Failing the standard is based on a rolling average, not any single event. Any allegation of noncompliance would follow the standard NERC procedures for confidentiality and/or disclosure.

