



Manual 12 Update

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- Cover-to-Cover review (no material changes)
- New Subsection added for Primary Frequency Response Performance Measurement
 - PJM discussed performance evaluations at length at the PFRSTF
 - Outcome of PFRSTF was for PJM to continue to monitor unit PFR performance during 2019 using criteria described in PFRSTF and document in PJM Manual 12

- In Section 3 and Attachment D removed version numbers from BAL-001 and BAL-002 references

- New Section 3.6 added to Manual 12 to address Primary Frequency Response (PFR) Performance Measurement
- Section 3.6.1 Generator Primary Frequency Response
 - Details frequency response calculation for high & low frequency events
 - Addresses when a resource will be evaluated for PFR and when a resource will not be evaluated
 - Details follow-up process for identified non-performance

- Section 3.6.2 Event Selection
 - Details event selection criteria for performance evaluation and quarterly review process

Appendix

A generating resources' expected performance will be calculated using the primary frequency control calculation, taking into account the droop, deadband, and operating requirements in Manual 14D, Section 7.1, Dispatching of Generation. Verification of droop and deadband settings should be performed by resource owner

Frequency below governor deadband

$$MW_{PrimaryControl} = \left[\frac{(HZ_{actual} - 60 + DB)}{(60 * Droop - DB)} \right] * (FrequencyResponsiveCapacity) * (-1)$$

Frequency above governor deadband

$$MW_{PrimaryControl} = \left[\frac{(HZ_{actual} - 60 - DB)}{(60 * Droop - DB)} \right] * (FrequencyResponsiveCapacity) * (-1)$$

Where Frequency Responsive Capacity represents the available operating capacity of the generating resource at the time of the event.

When resources are ramping prior to an event, response will be offset by that ramp rate. The ramp rate will be calculated for a resource 10 minutes prior to the event start and the expected response will be adjusted for this ramp as below:

$$Actual\ Response = (AvgMW_{20-52sec} - AvgMW_{-16-0sec}) - RampRate\ MW$$

All existing generating resources greater than 20MW, and all generating resources that enter PJM queue after 10/1/2018 will be evaluated for primary frequency response performance except for resources that are:

- nuclear generation
- offline during the event
- have no available headroom/footroom
- assigned regulation
- have an active eDART ticket for governor outage.

If PJM determines a unit is not providing primary frequency response based on the performance review, PJM will work with the Generation Owner and review additional variables, including but not limited to, telemetry, operating scenarios, generator hold points and non-functioning governor equipment.

PJM will evaluate generators during periods of large system frequency deviations. PJM targets 2-3 frequency events per month for evaluation, but no set number of events will be defined, since events are based on system conditions. Selected events and event selection criteria will be reviewed quarterly by the Operating Committee for continued performance and applicability. Individual generating resource data may be requested by resource owners.

The event criteria that needs to be met for event selection:

- Frequency goes outside +/- 40mHz deadband
- Frequency stays outside 40mHz deadband for 60 continuous seconds
- Minimum/Maximum frequency reaches +/- 53mHz

A quarterly review will look at an average performance over a 12 month window. PJM will require a minimum of 3 applicable events for a resource to perform the performance review (event selection will go back further than 12 months if needed in this case). Each event will be evaluated separately and the performance will be averaged for responsive/non-responsive determination. 50% or greater average performance will be considered frequency responsive