



BAL-003-2 Performance Update

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Manual 12 Primary Frequency Response (PFR) Review

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June 10, 2021

Operating Committee

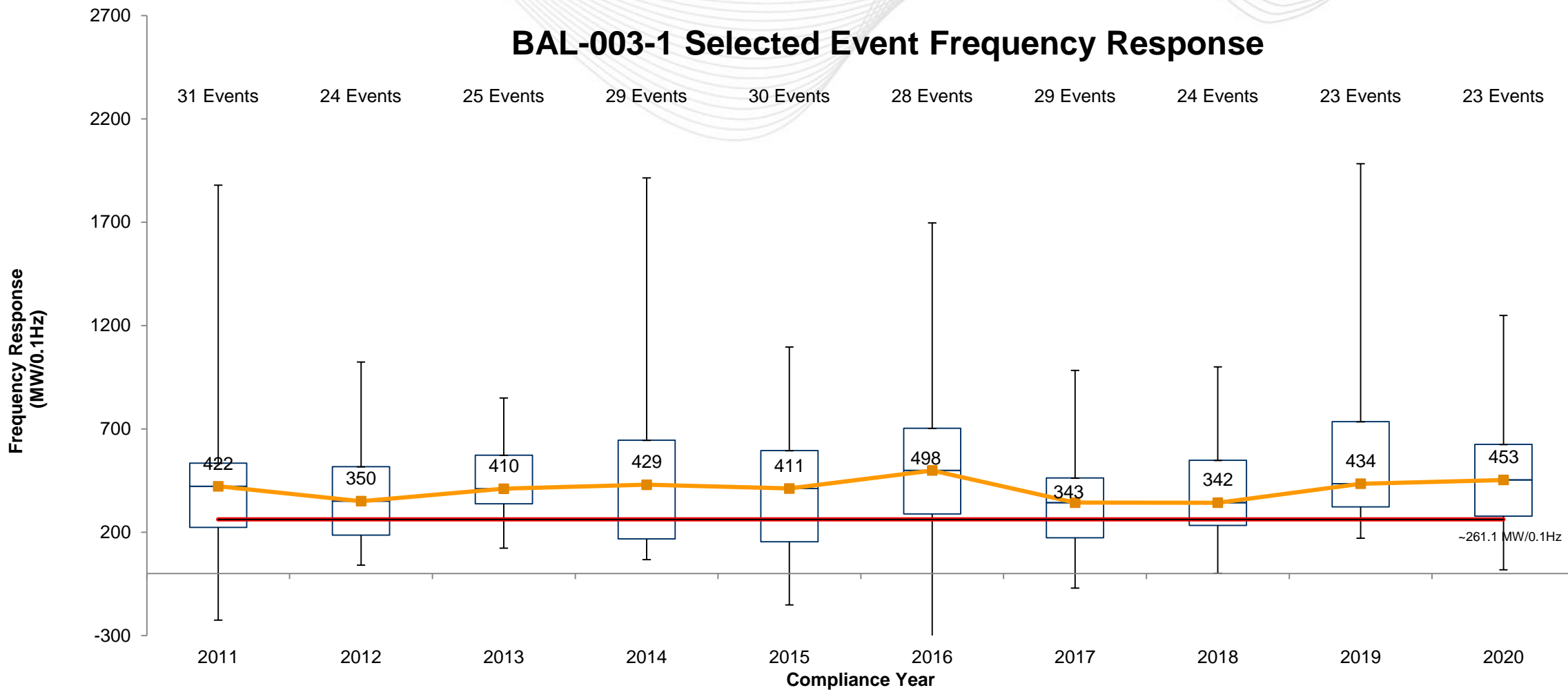
- **Purpose:** To require sufficient Frequency Response from the Balancing Authority (BA) to maintain Interconnection Frequency within predefined bounds by arresting frequency deviations and supporting frequency until the frequency is restored to its scheduled value. To provide consistent methods for measuring Frequency Response and determining the Frequency Bias Setting (FBS).
- **Applicability:** PJM is a Balancing Authority. PJM is not a member of Frequency Response Sharing Group (FRSG).
- **Effective Date:** 12/01/2020

- R1:** Each Frequency Response Sharing Group (FRSG) or Balancing Authority (BA) that is not a member of a FRSG shall achieve an annual Frequency Response Measure (FRM) (as calculated and reported in accordance with Attachment A) that is equal to or more negative than its Frequency Response Obligation (FRO) to ensure that sufficient Frequency Response is provided by each FRSG or BA that is not a member of a FRSG to maintain Interconnection Frequency Response equal to or more negative than the Interconnection Frequency Response Obligation (IFRO).

$$FRO_{BA} = IFRO \times \frac{\text{Annual Gen}_{BA} + \text{Annual Load}_{BA}}{\text{Annual Gen}_{Int} + \text{Annual Load}_{Int}}$$

– 2020 Operating Year (OY) runs from December 2019 until November 2020

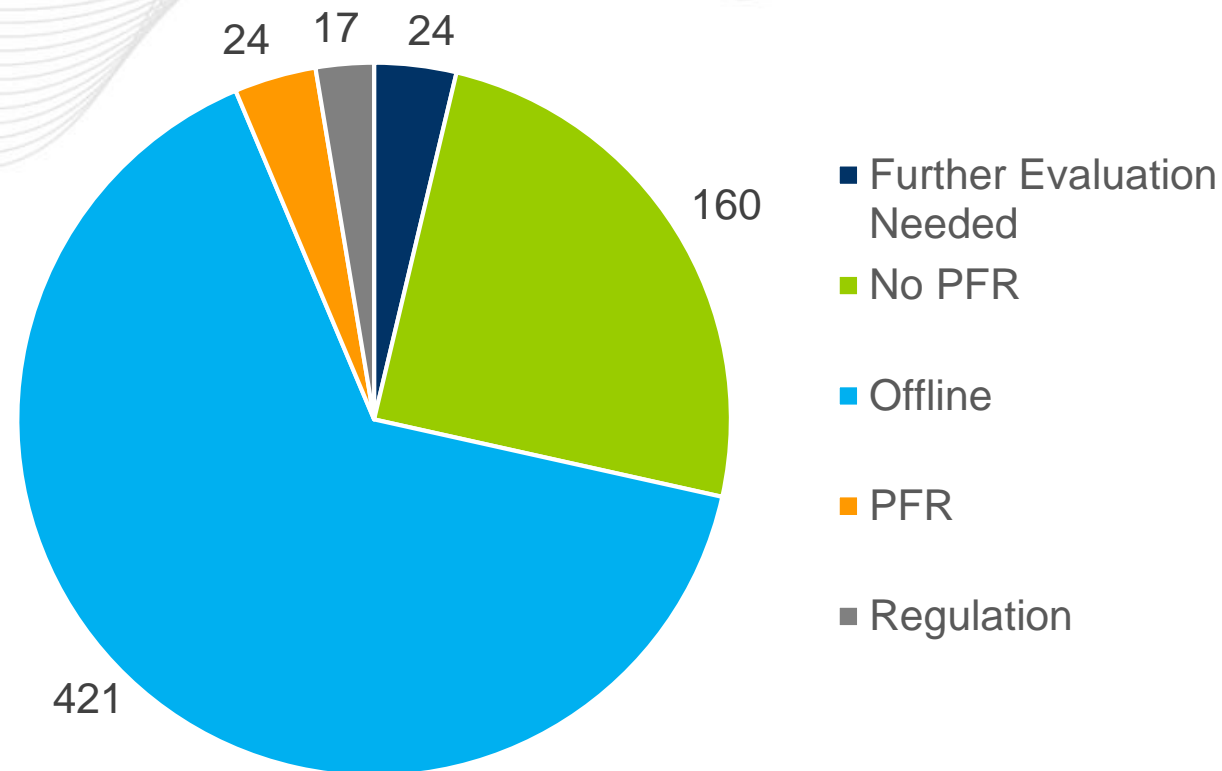
- FRO_{PJM} for 2020 OY = $IFRO_{PJM} \times \text{Pro-rate Share}_{PJM}$
 $= (-1,015 \text{ MW}/0.1\text{Hz}) \times (25.72\%) = -261.1 \text{ MW}/0.1 \text{ Hz}$



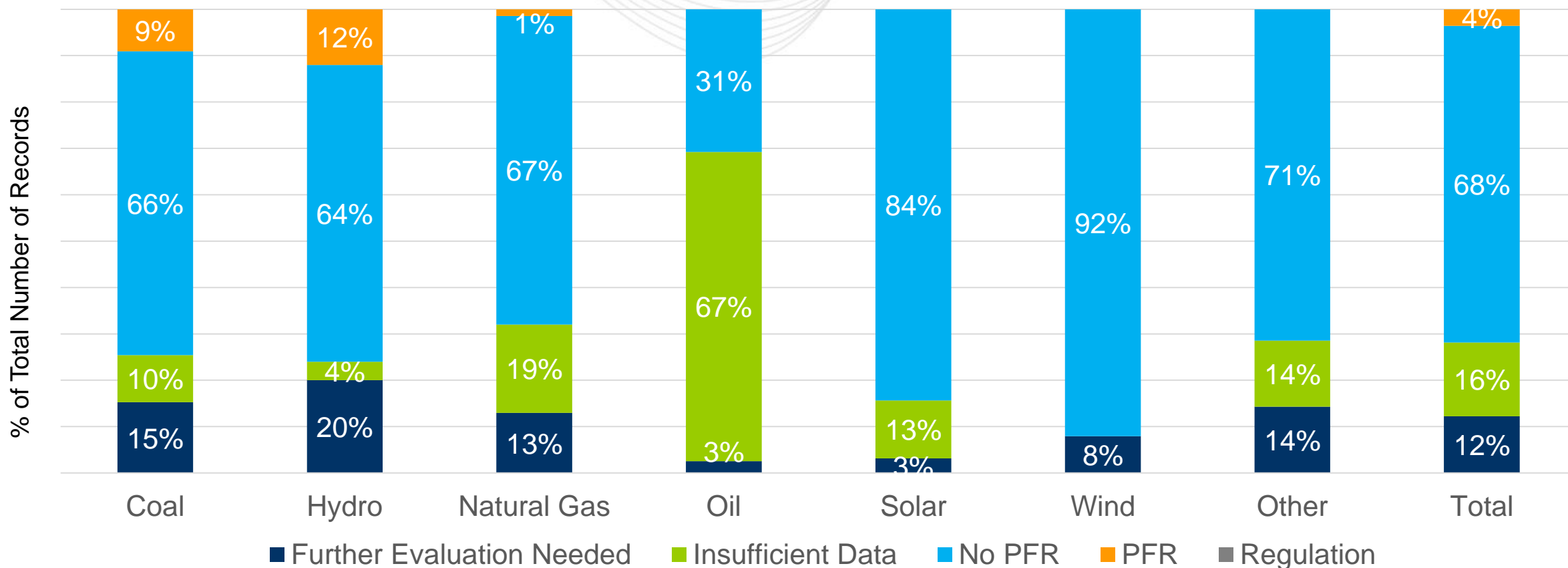
- The NERC Resource Subcommittee (RS)
 - Posted 2021 Frequency Bias Settings and L10 values
 - <https://www.nerc.com/comm/OC/Pages/Resources-Subcommittee.aspx>
- PJM updated Frequency Bias Setting and L10 value in EMS and applicable systems on June 1, 2021.

- PJM continues to monitor unit PFR performance using criteria described in PFRSTF and documented in PJM Manual 12.
 - <https://www.pjm.com/library/manual>
- Event Selection
 - Frequency goes outside +/- 40mHz deadband
 - Frequency stays outside +/- 40mHz deadband for 60 continuous seconds
 - Minimum/maximum frequency reaches +/- 53mHz
- Event from 4/7/2021 21:00:54 included in today's review
 - Evaluated maximum of 646 units (~50MW and greater)

Fuel Type	# of Units evaluated
Coal	177
Hydro	25
Natural Gas	278
Oil	39
Solar	32
Wind	88
Other	7
Total	646



M-12 PFR by Fuel Type For Units > 50 MW



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Frequency Response

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Member Hotline

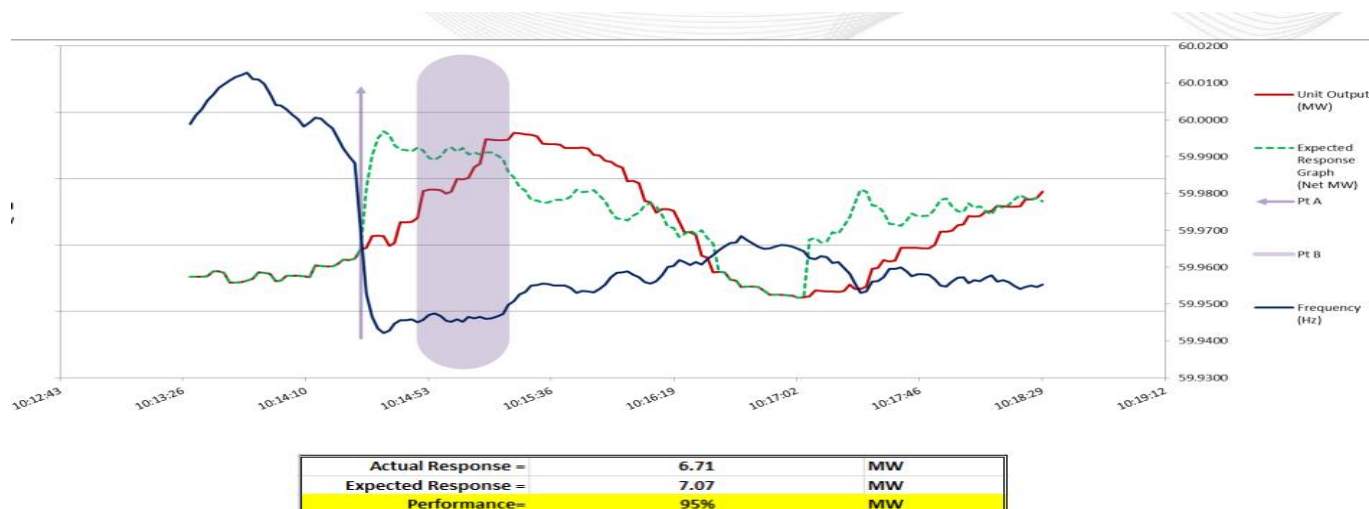
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Appendix

- Interactive tool for members to use to assist with understanding unit performance
 - <https://www.pjm.com/-/media/committees-groups/task-forces/pfrstf/20181127/20181127-fr-performance-events.ashx>



- Phase I – completed and BAL-003-2 became effective on December 1, 2020
- Implementation Updates:
 - Interconnection Frequency Response
 - Eastern Interconnection Resource Contingency Protection Criteria
 - Frequency of nadir point limitations
 - Clarifying language related to Frequency Response Sharing Groups (FRSG)
 - Procedure for ERO Support of Frequency Response and Frequency Bias Setting Standard

- Phase II (currently under development)
 - Review alternate methodologies in determining Frequency Response and make allocation as equitable as possible
 - Review if additional reliability entities should be added
 - Review the measurement methodology of Frequency Response
 - Review Phase I changes and address changes (if needed)

Standard Drafting Team working on Whitepaper for Industry Review with possible survey questions to support future Standard revisions. Timeline is TBD.