

BAL-003-2 Performance Update

&

Manual 12 Primary Frequency Response (PFR) Review

Ilyana Dropkin

Engineer II, Performance Compliance

March 11, 2021

Operating Committee

BAL-003-2 Frequency Response & Frequency Bias Setting

- **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

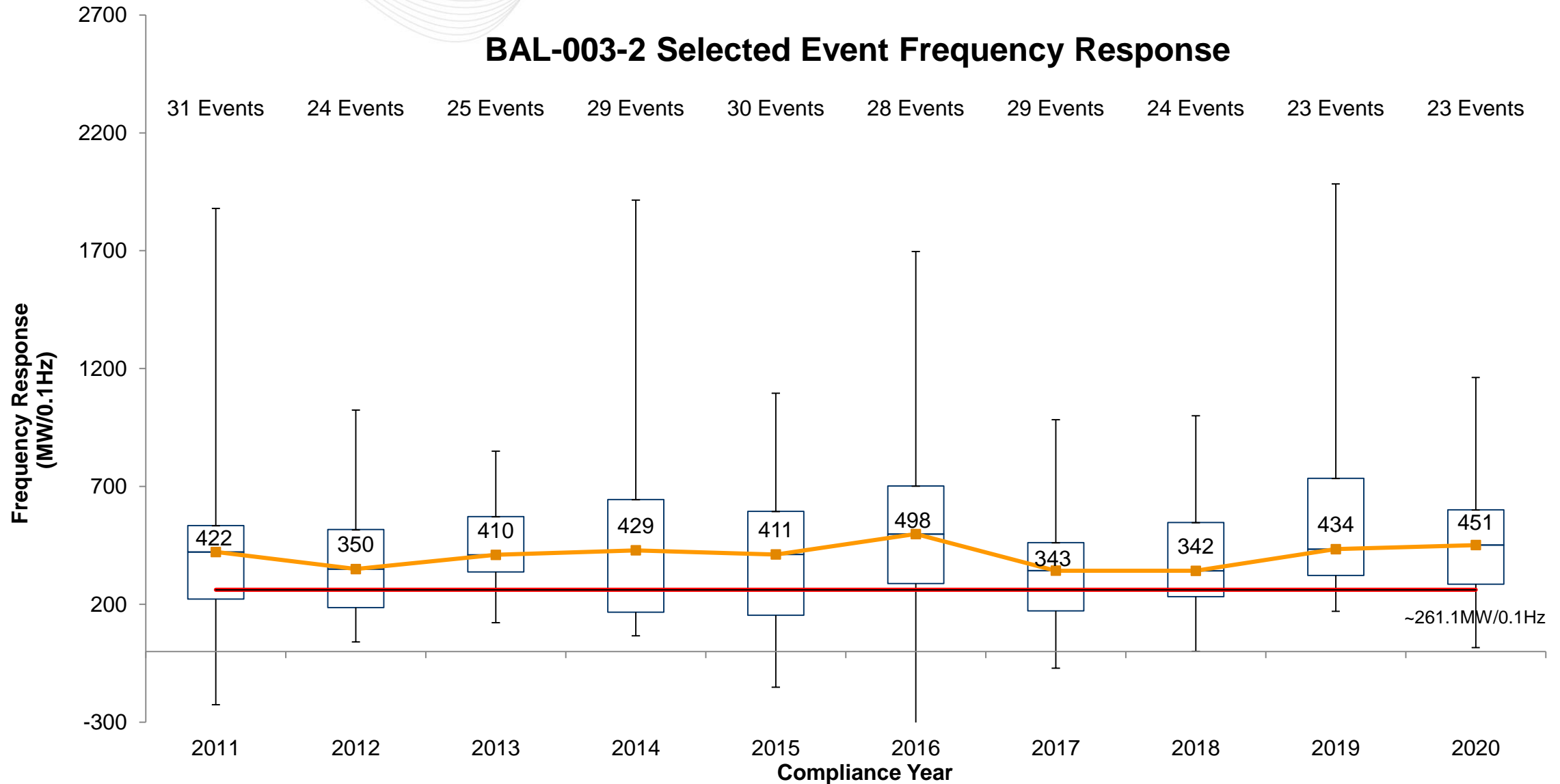
- R1:** Each Frequency Response Sharing Group (FRSG) or Balancing Authority (BA) that is not a member of a FRSG shall achieve an annual Frequency Response Measure (FRM) (as calculated and reported in accordance with Attachment A) that is equal to or more negative than its Frequency Response Obligation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

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

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

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

Historic PJM BAL-003-2 Performance



- The NERC Resource Subcommittee (RS)
 - <https://www.nerc.com/comm/OC/Pages/Resources-Subcommittee.aspx>
 - Hosted a webinar to go over the 2019 GO Survey results on December 2, 2020.
 - Published 2020 Frequency Response Annual Analysis in November 2020.
 - Updated a list of IFR Master Event List on January 28, 2021.

M-12 Primary Frequency Response

- 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

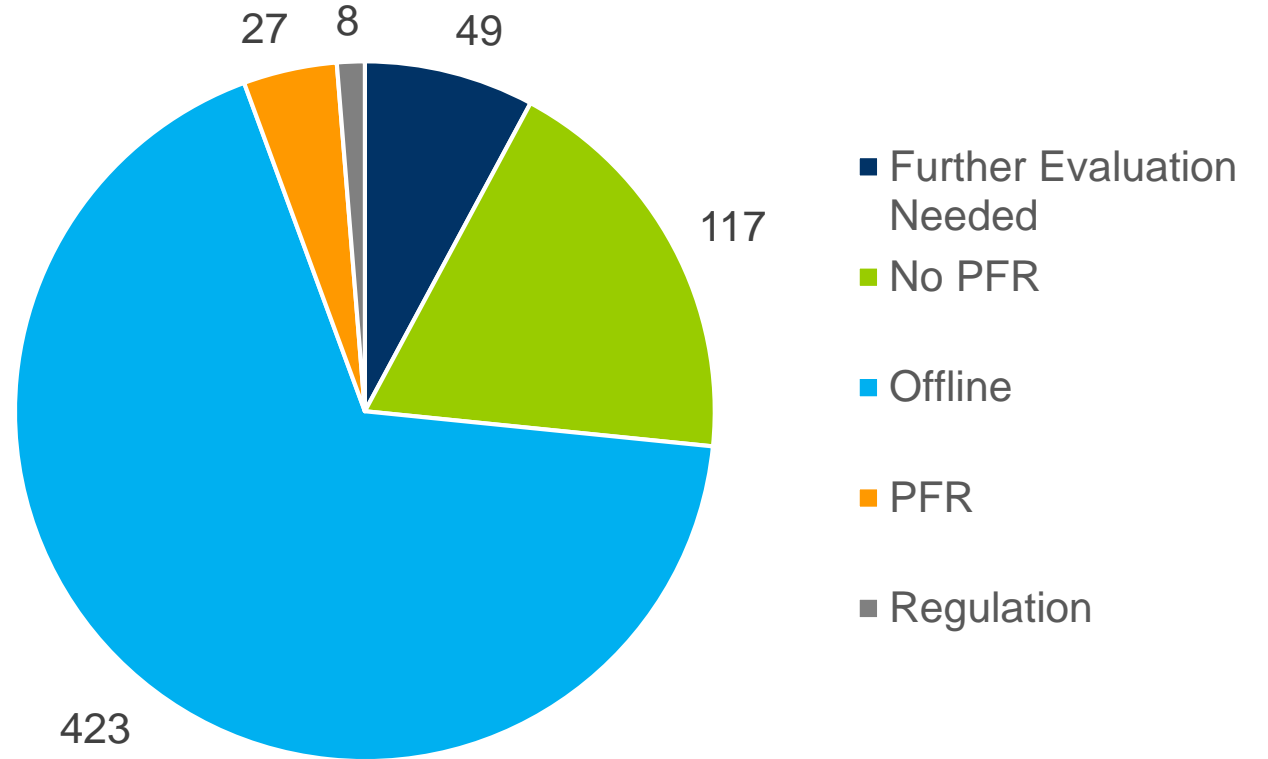
PJM Primary Frequency Response Review

- Evaluated maximum of 646 units (50MW and greater) for 4 events in the second half of 2020 and 2 events in January 2021
- Recent events included in today’s review:

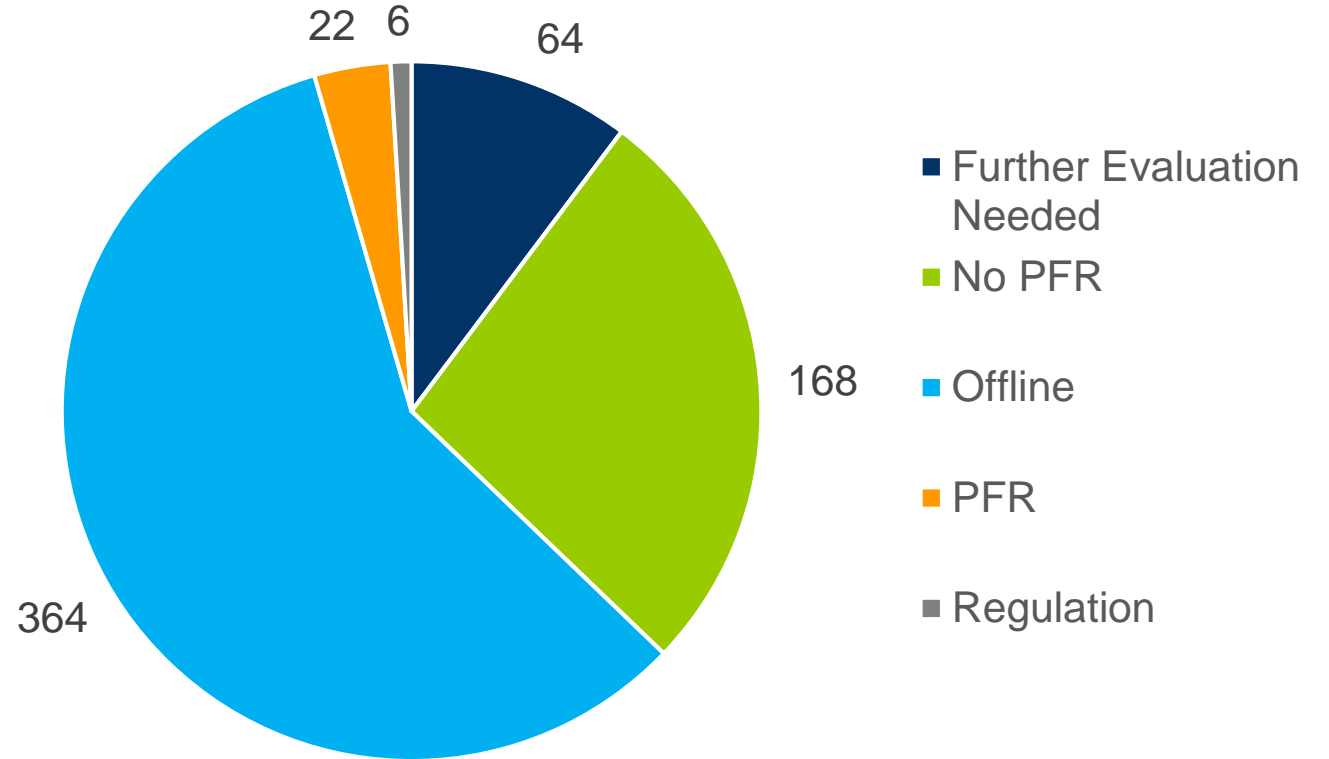
Date / Time
9/27/2020 3:03:40
10/10/2020 14:51:52
11/12/2020 17:32:23
12/11/2020 13:05:49
1/20/2021 18:22:33
1/24/2021 18:22:33

Selected as BAL-003
Event June-Nov 2020

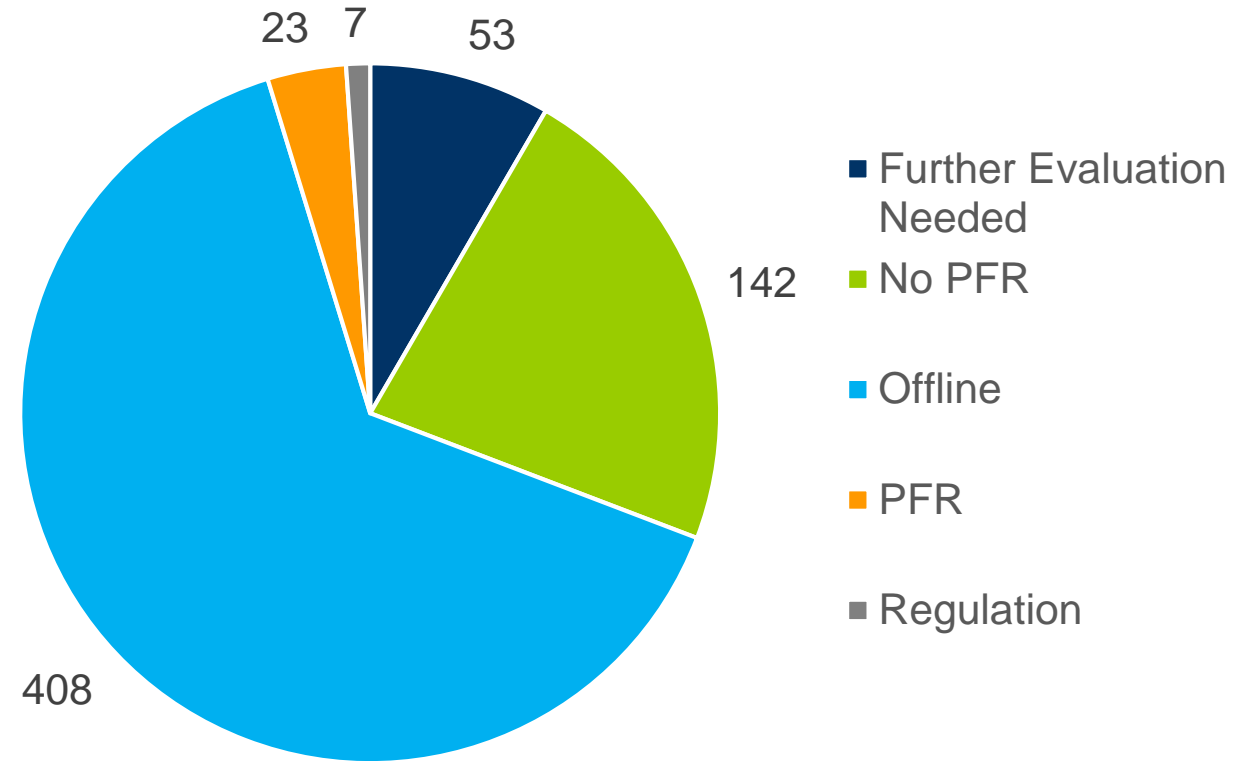
Fuel Type	# of Units evaluated
Coal	180
Hydro	24
Natural Gas	273
Oil	40
Solar	18
Wind	82
Other	7
Total	624



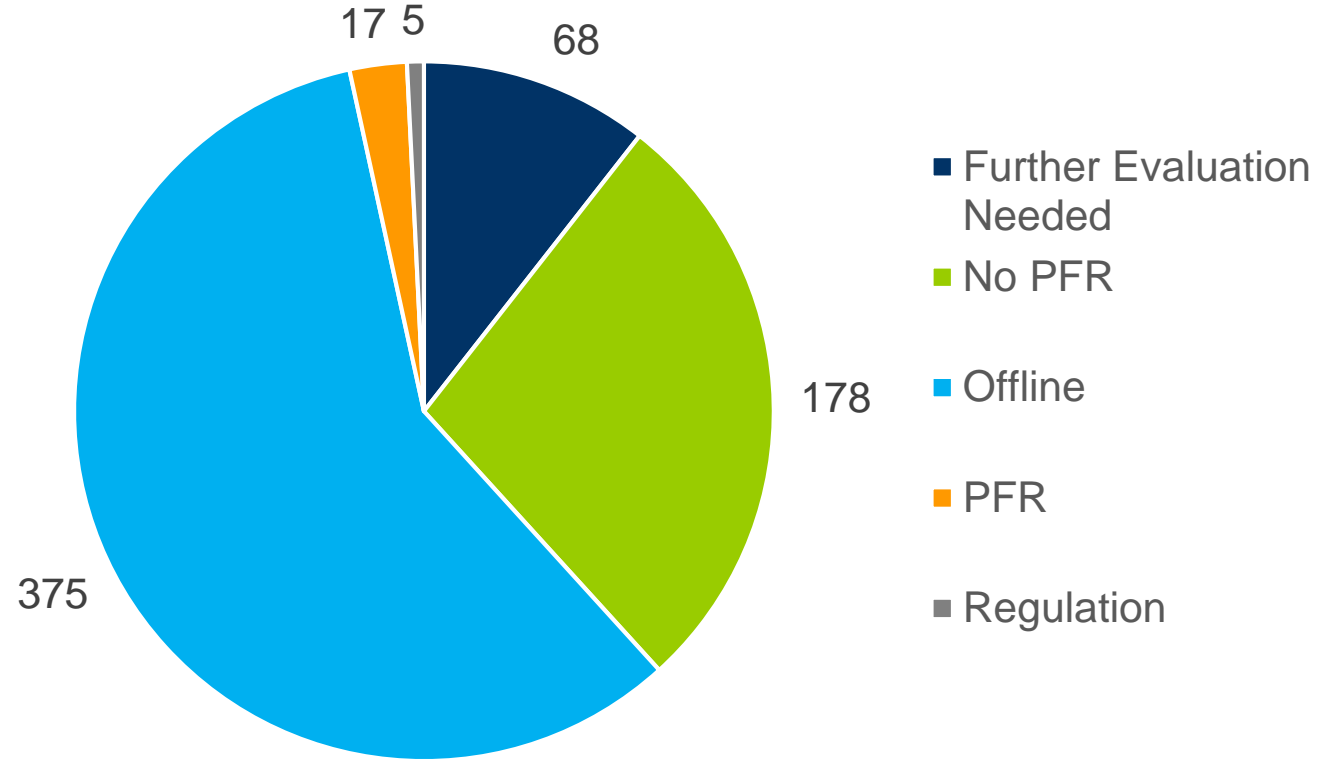
Fuel Type	# of Units evaluated
Coal	180
Hydro	24
Natural Gas	273
Oil	40
Solar	18
Wind	82
Other	7
Total	624



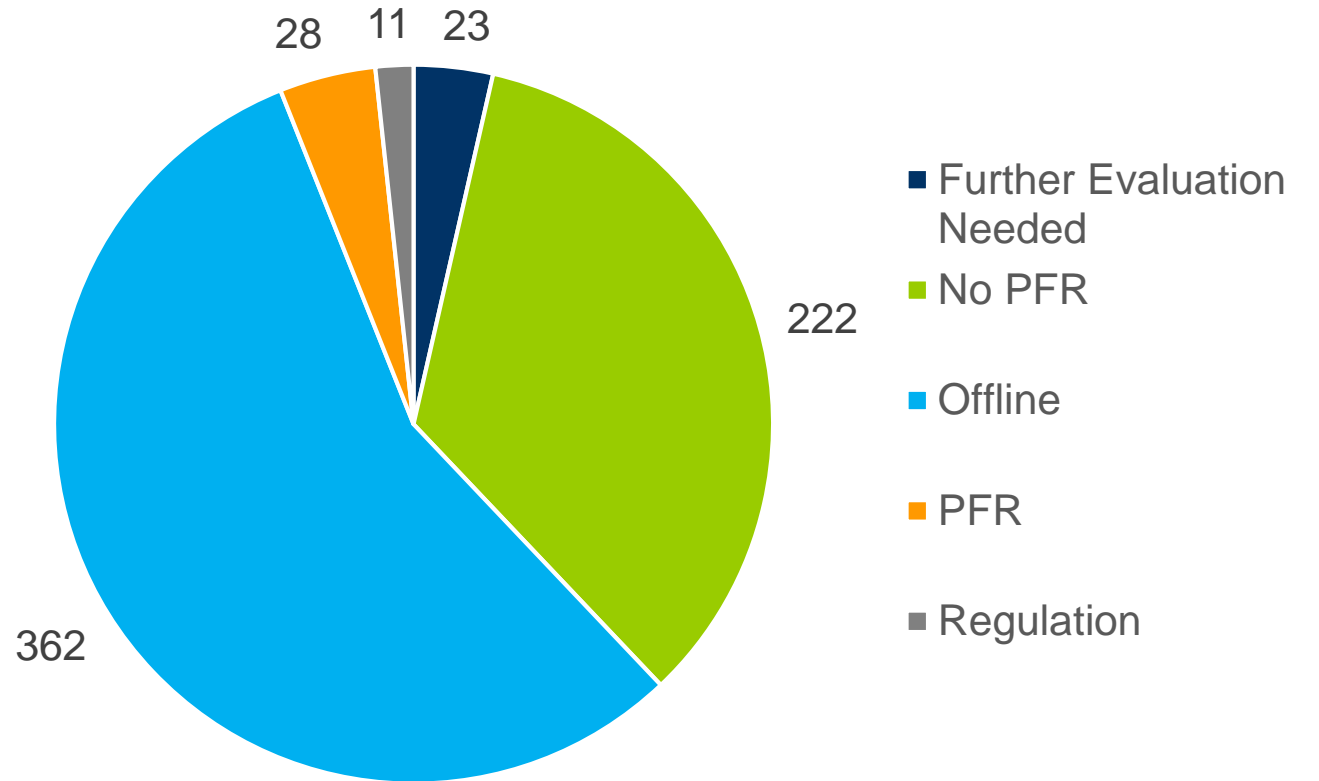
Fuel Type	# of Units evaluated
Coal	177
Hydro	24
Natural Gas	273
Oil	40
Solar	27
Wind	85
Other	7
Total	633



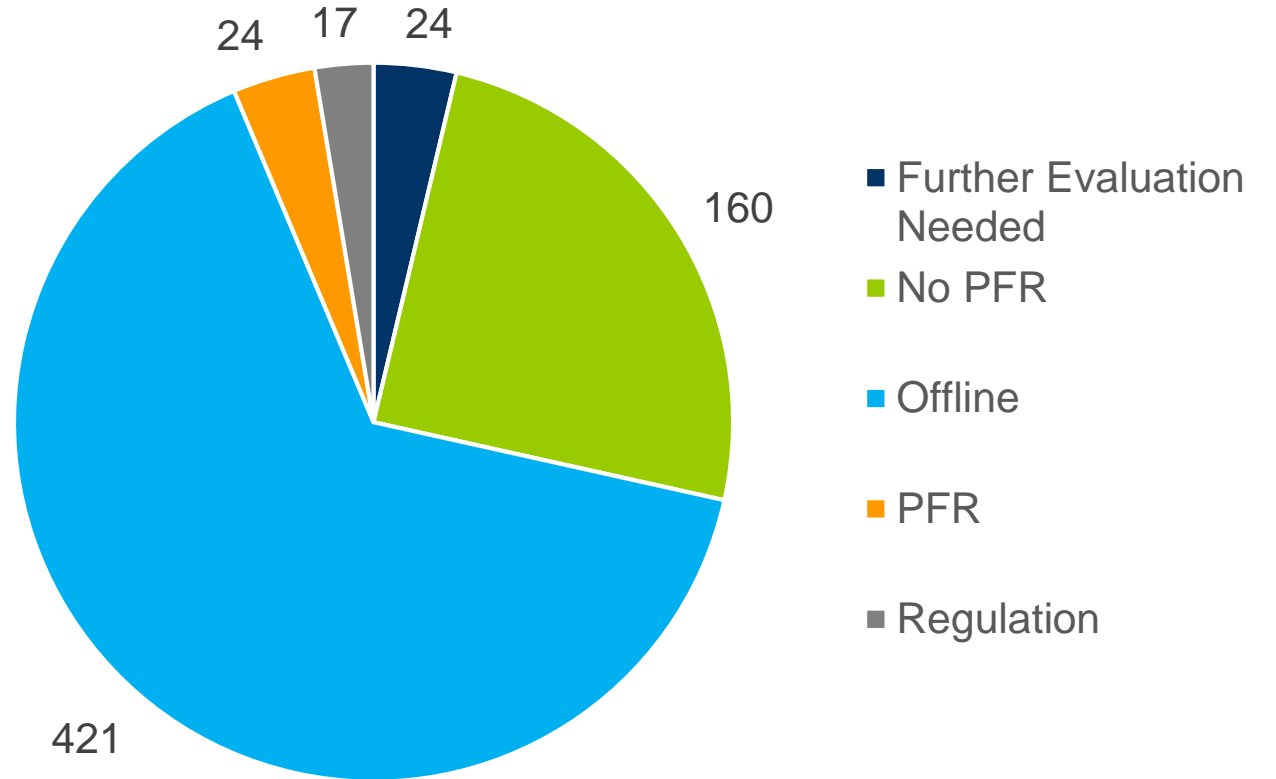
Fuel Type	# of Units evaluated
Coal	177
Hydro	25
Natural Gas	277
Oil	40
Solar	29
Wind	88
Other	7
Total	643



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

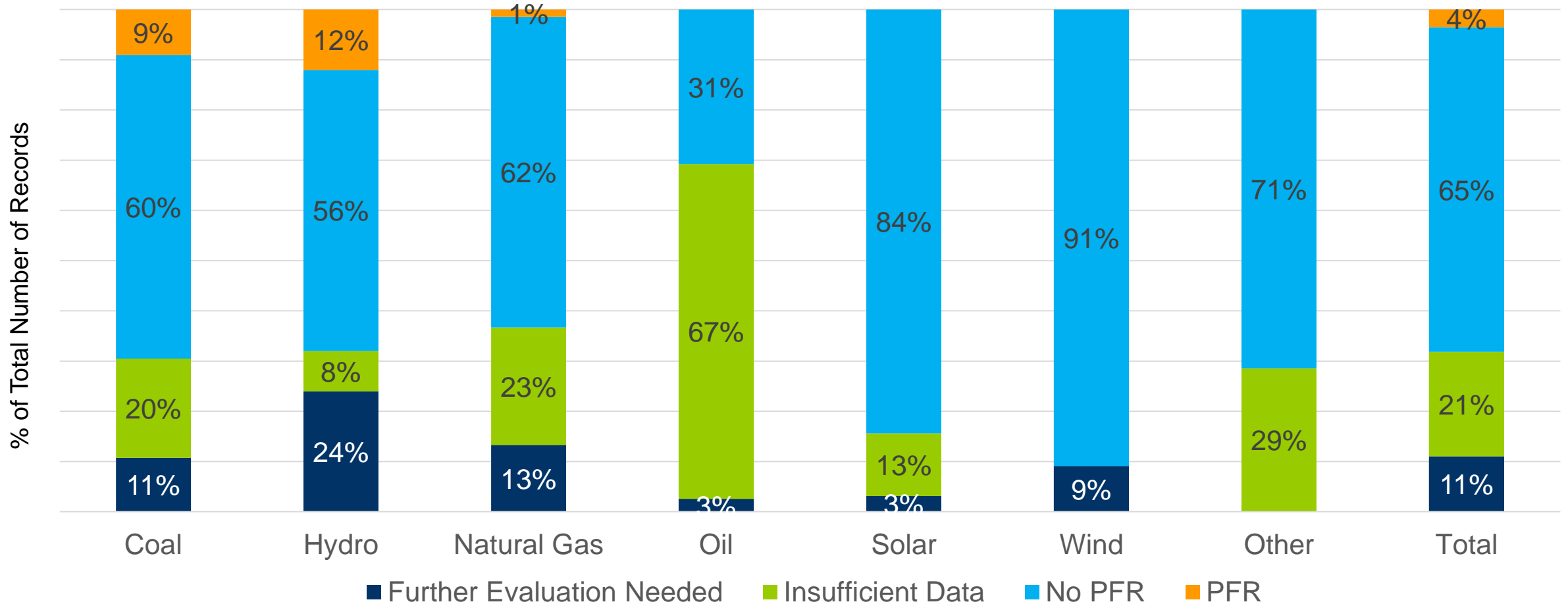


Fuel Type	# of Units evaluated
Coal	177
Hydro	25
Natural Gas	278
Oil	39
Solar	32
Wind	88
Other	7
Total	646



PJM Primary Frequency Response Review

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



Presenter:
Ilyana Dropkin

Ilyana.Dropkin@pjm.com

Frequency Response

FrequencyResponse@pjm.com



Member Hotline

(610) 666 – 8980

(866) 400 – 8980

custsvc@pjm.com

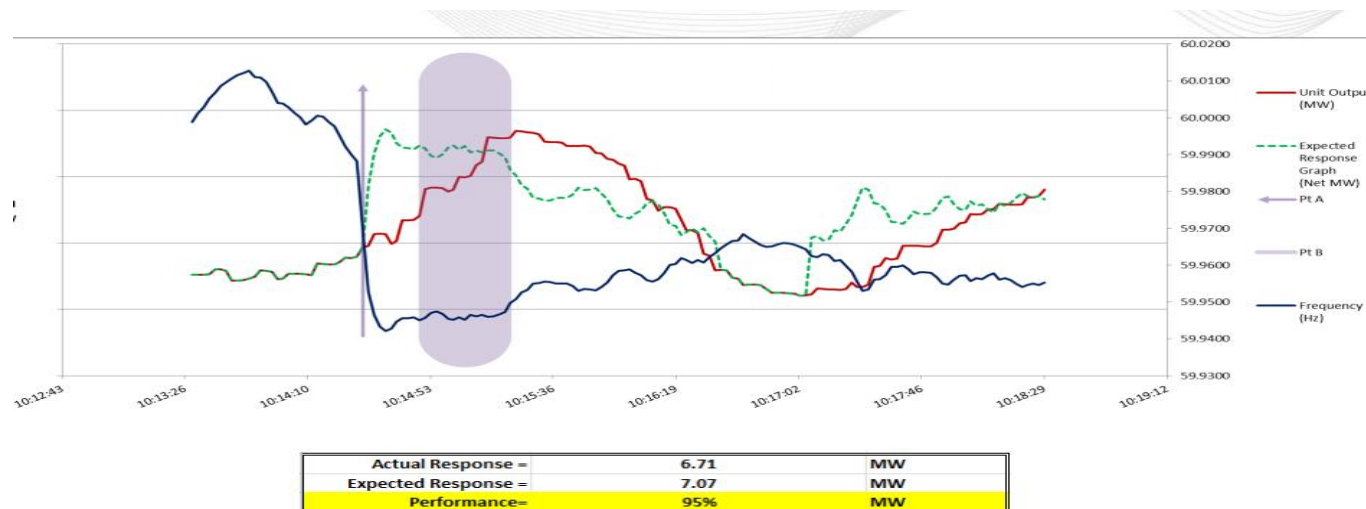
Appendix

- NERC Resources Subcommittee (RS)
 - <https://www.nerc.com/comm/OC/Pages/Resources-Subcommittee.aspx>
 - Useful PFR information
 - BAL-003 Frequency Events (IFR Master Event List)

BAL-003 (19)

- 1. Standard and Supporting Documents (5)
- 2. Frequency Events (1)
 - IFR Master Event List
- Additional Resources (13)

- 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.