



BAL-003-2 Performance Update

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Manual 12 Primary Frequency Response (PFR) Review

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Engineer II, Performance Compliance

December 2, 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:** 12/1/2020

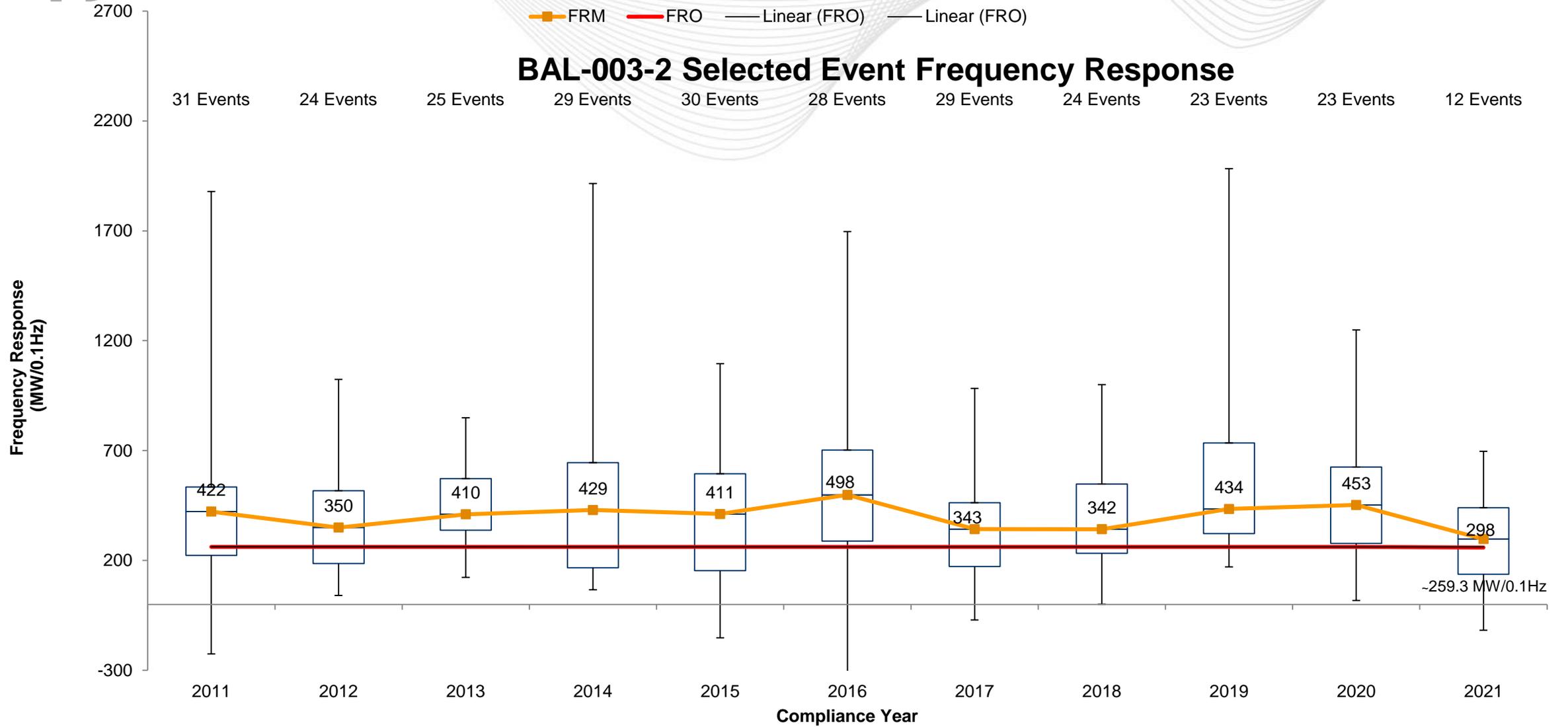
- R1:** Each Frequency Response Sharing Group (FRSG) or Balancing Authority (BA) that is not a member of a FRSG shall achieve an annual Frequency Response Measure (FRM) (as calculated and reported in accordance with Attachment A) that is equal to or more negative than its Frequency Response Obligation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

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

– 2021 Operating Year (OY) runs from December 2020 until November 2021

- FRO_{PJM} for 2021 OY = $IFRO_{PJM} \times \text{Pro-rate Share}_{PJM}$
 = $(-1,015 \text{ MW}/0.1\text{Hz}) \times (25.55\%) = -259.3 \text{ MW}/0.1 \text{ Hz}$

BAL-003-2 Selected Event Frequency Response



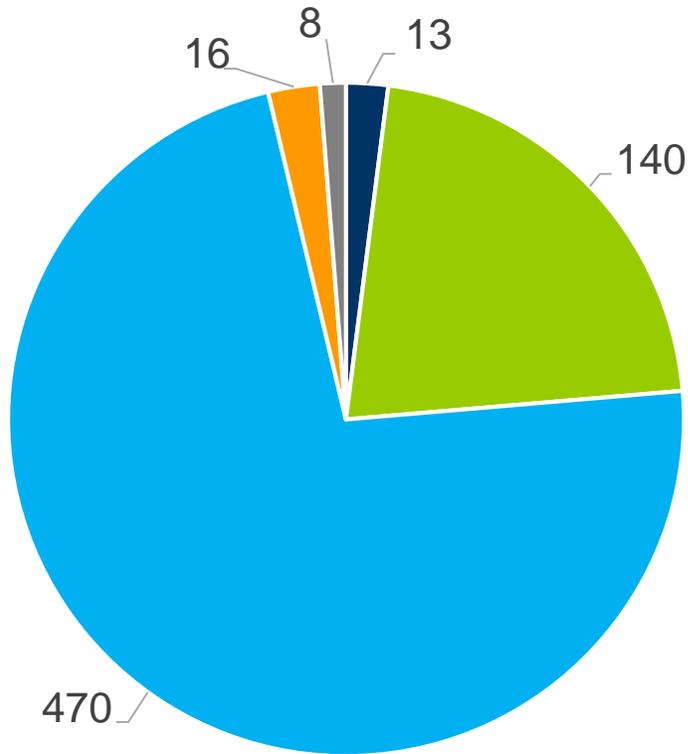
- The NERC Resource Subcommittee (RS)
 - Is currently working on next revision of BAL-003, Phase II.
 - <https://www.nerc.com/comm/OC/Pages/Resources-Subcommittee.aspx>
- Phase II (currently under development)
 - Review alternate methodologies in determining Frequency Response and make allocation as 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)

- 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

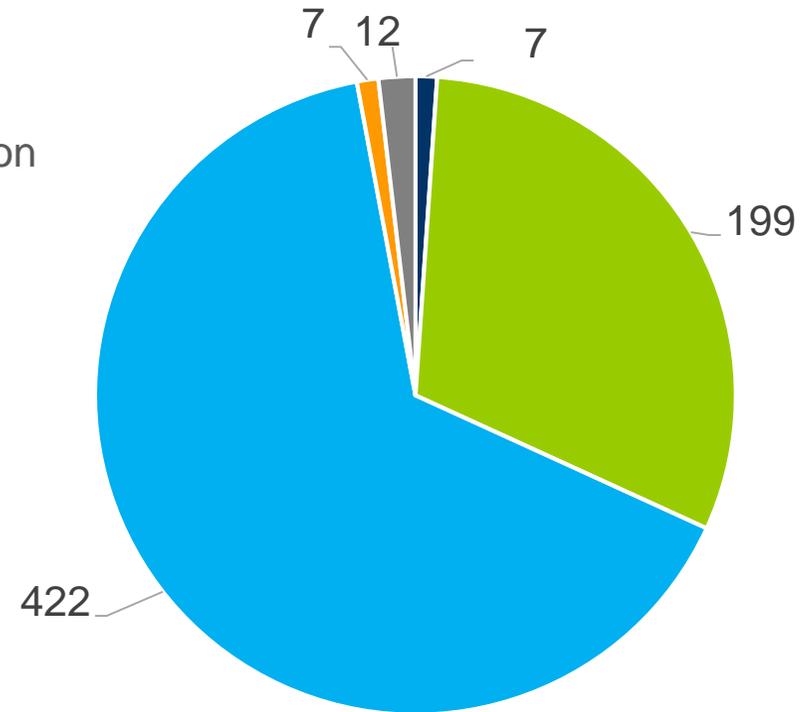
- Today's review included
 - Low Frequency Events
 - 10/08/2021 00:59:23
 - 10/13/2021 22:01:43
 - 10/14/2021 23:06:57
 - 10/19/2021 22:09:47
 - 10/21/2021 14:23:19
 - 10/29/2021 13:01:46
 - High Frequency Event
 - 10/20/2021 20:56:50

Fuel Type	# of Units evaluated
Coal	177
Hydro	25
Natural Gas	278
Oil	39
Solar	34
Wind	87
Other	7
Total	647

10/8/2021 00:59:23



10/13/2021 22:01:43

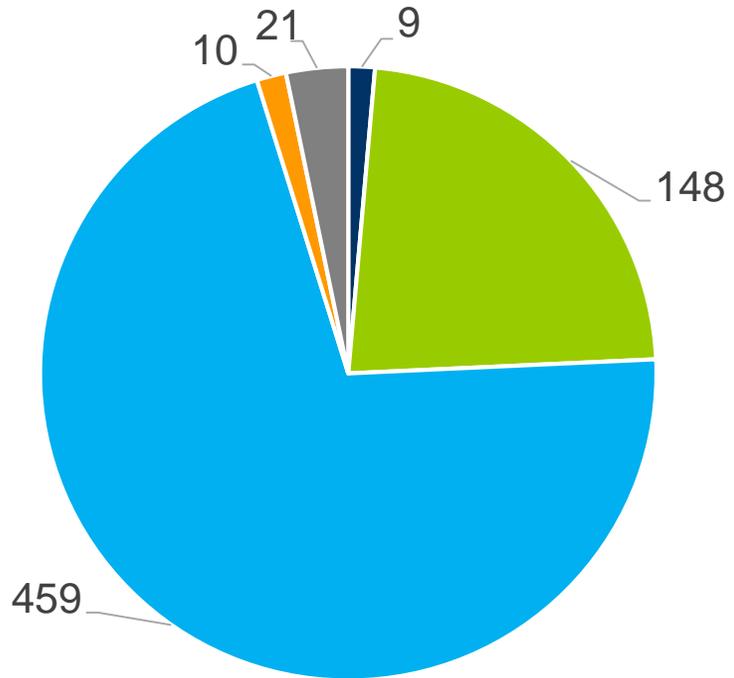


- Further Evaluation Needed
- No PFR
- Offline
- PFR
- Regulation

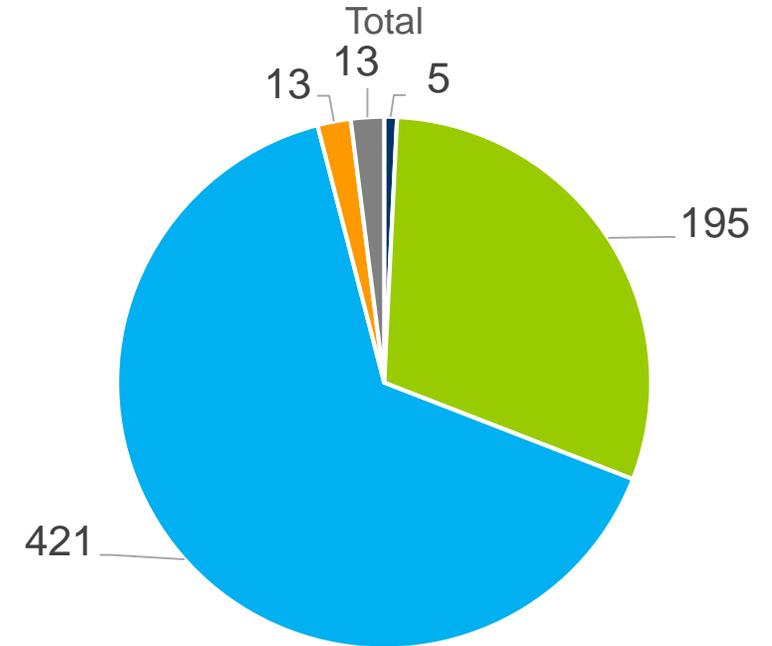
M-12 PFR Unit Performance Results

10/14/2021 23:06:57

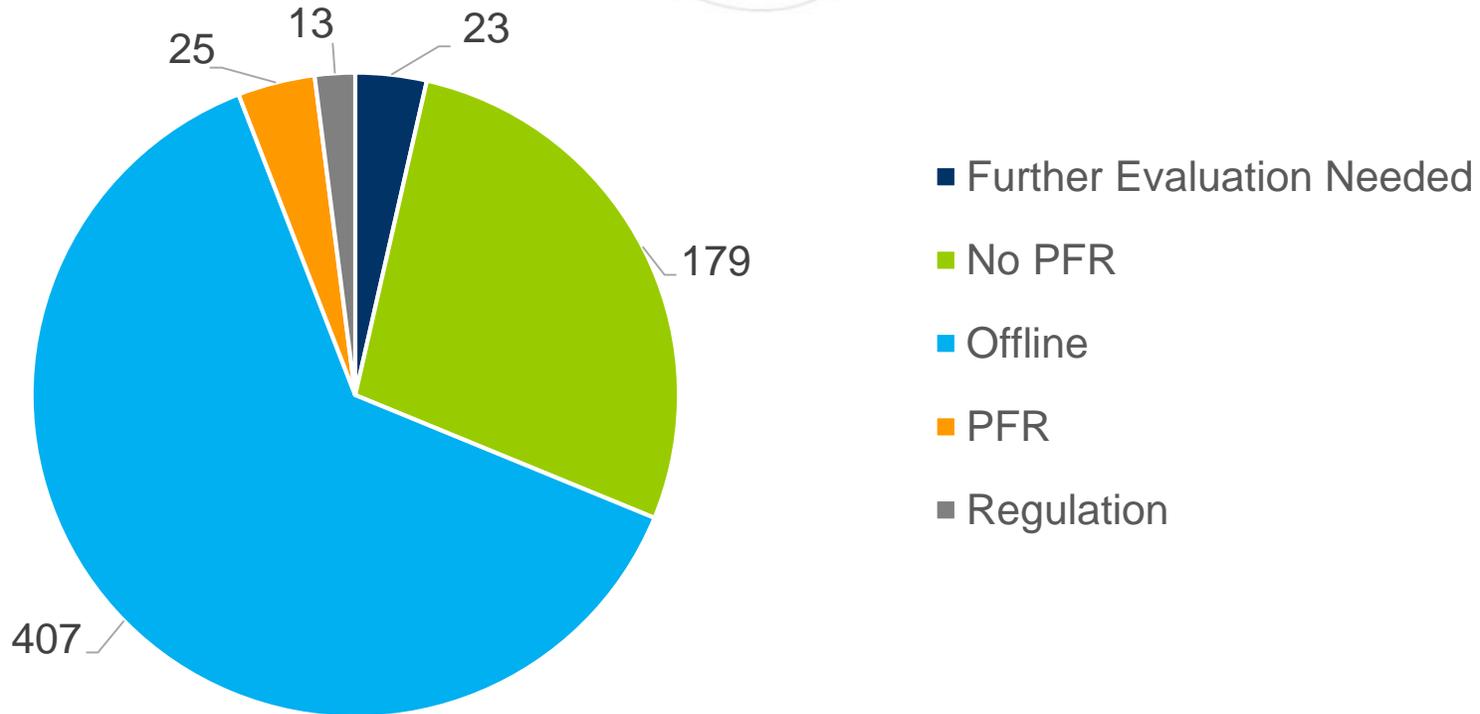
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- Further Evaluation Needed
- No PFR
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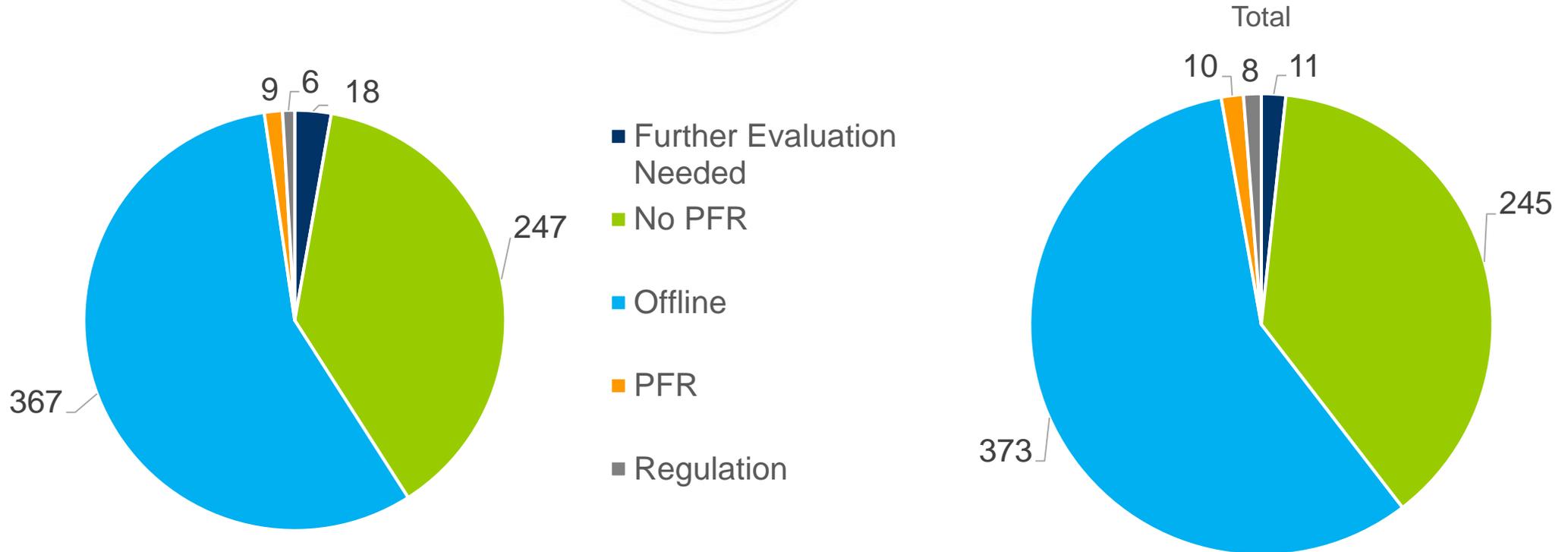


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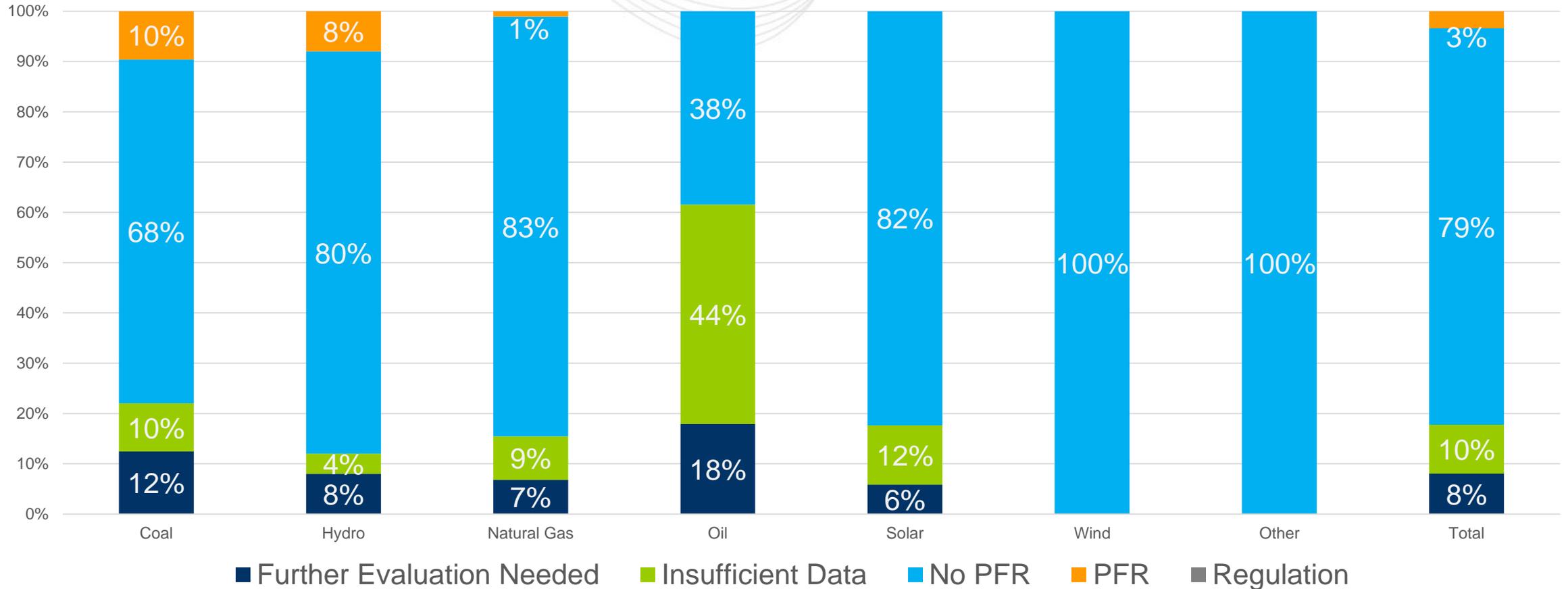


10/21/2021 14:23:19

10/29/2021 13:01:46



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



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Frequency Response

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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>

