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BAL-003 Performance Update & M-12 Primary Frequency Response Review

Becky Davis
July 9, 2020
Operating Committee

BAL-003-1.1 Frequency Response & Frequency Bias Setting Requirement 1

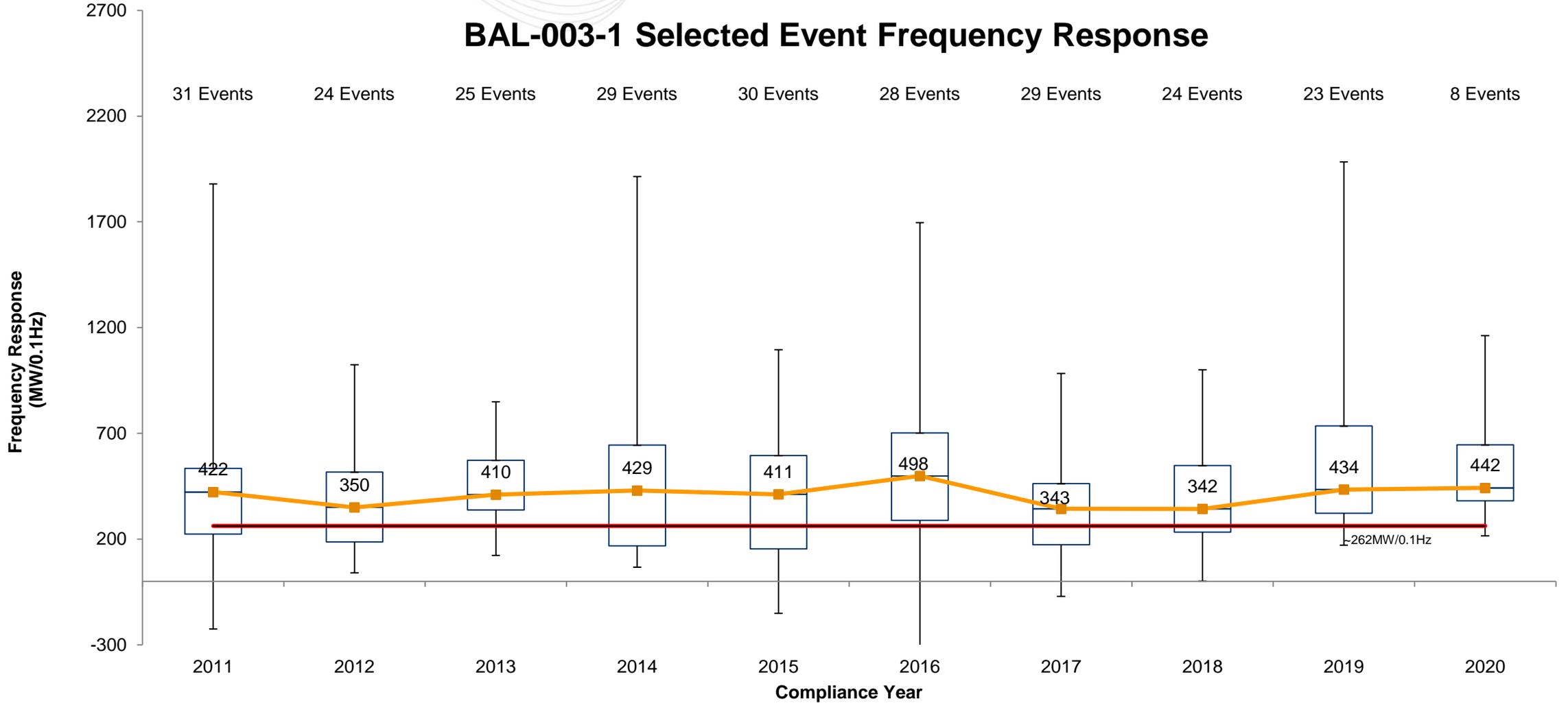
- **Requirement 1:** Each Balancing Authority shall achieve an annual Frequency Response Measure (FRM) that is equal to or more negative than its Frequency Response Obligation (FRO)...

Interconnection Frequency Response Obligation X Balancing Authority Pro-rata Share

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

PJM FRO for 2020 operating year = (-1015 MW/0.1 Hz) x (25.72%) = -261.1 MW/0.1Hz
2020 Operating Year : December 2019 – November 2020

Field trial data prior to Operating Year 2017



- PJM is actively participating in NERC activities around Primary Frequency Response
- The Standard Drafting Team is working on Phase II of BAL-003 proposed changes (reference document: [BAL-003 Standards Authorization Request](#)). Current working items:
 - Whitepaper for industry review on path forward on PFR
 - Potential changes to BAL-003 requirements
- NERC 2019 Generator Operator Survey
 - NERC and NERC Resources Subcommittee conducted a voluntary survey for Generator Operators to submit Primary Frequency Response data for their resources
 - Results pending

- PFRSTF work had started in July 2017
- FERC Order 842 (2/18) requires PFR capability for new resources
- Unable to get stakeholder consensus on solution package
- PFRSTF has been on hiatus since January 2019
 - In January, 2020, MRC endorsed PFRSTF to continue hiatus for 6 months
- PJM continues to monitor unit PFR performance using criteria described in PFRSTF and documented in PJM Manual 12
- PFRSTF sunset at MRC June 18, 2020 meeting

- Event Selection

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

Recent events included
in today's review:

Date / Time
9/23/19 12:06:07
2/7/20 22:42:13
2/10/20 13:31:13
2/10/20 15:14:14
4/1/20 16:24:47
4/4/20 2:16:51
5/29/20 14:03:49

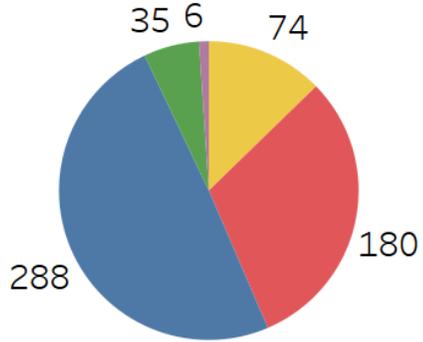
Selected as BAL-003
Events through Feb.
2020

- Evaluated 583 units (50MW and greater) for 10 events in 2019 and 6 events in first half of 2020

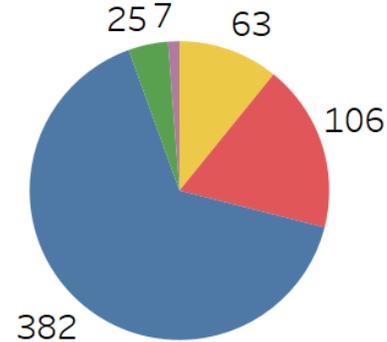
Fuel Type	# of Units Evaluated
Coal	197
Hydro	16
Municipal Waste	4
Natural Gas	246
Oil	40
Solar	9
Wind	71
Total	583

M-12 Primary Frequency Response by Event

09/23/2019 12:06:07 Review



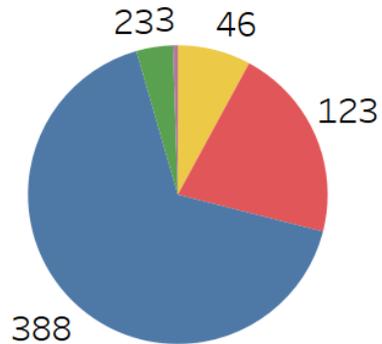
02/07/2020 12:06:07 Review



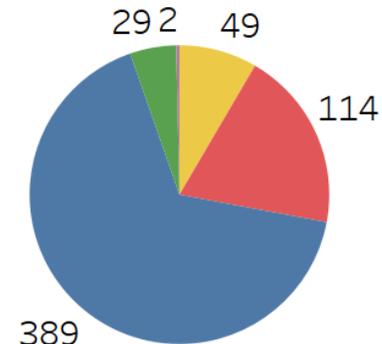
PFR Legend

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

2/10/2020 13:31:19 PM Review



2/10/2020 15:14:10 PM Review

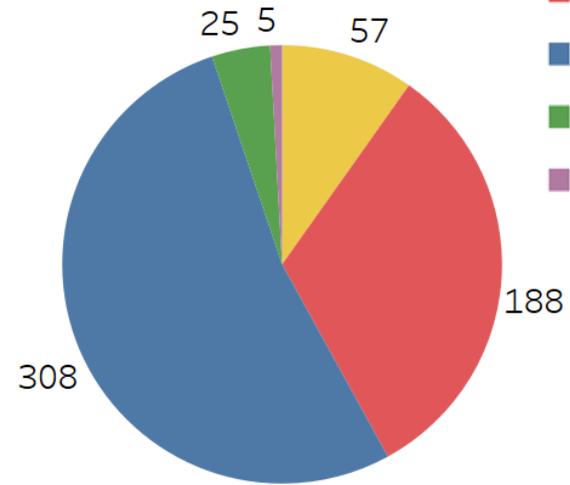
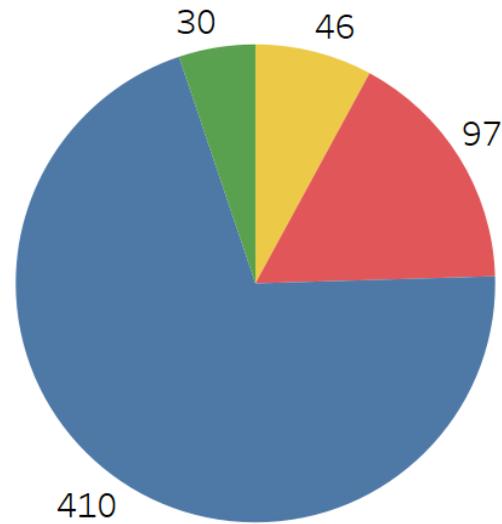
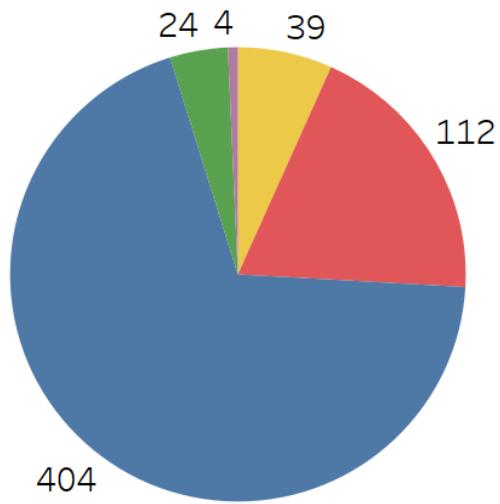


M-12 Primary Frequency Response by Event

4/01/2020 16:24:47 PM Review

04/04/2020 02:16:51 Review

5/29/2020 14:03:49 PM Review

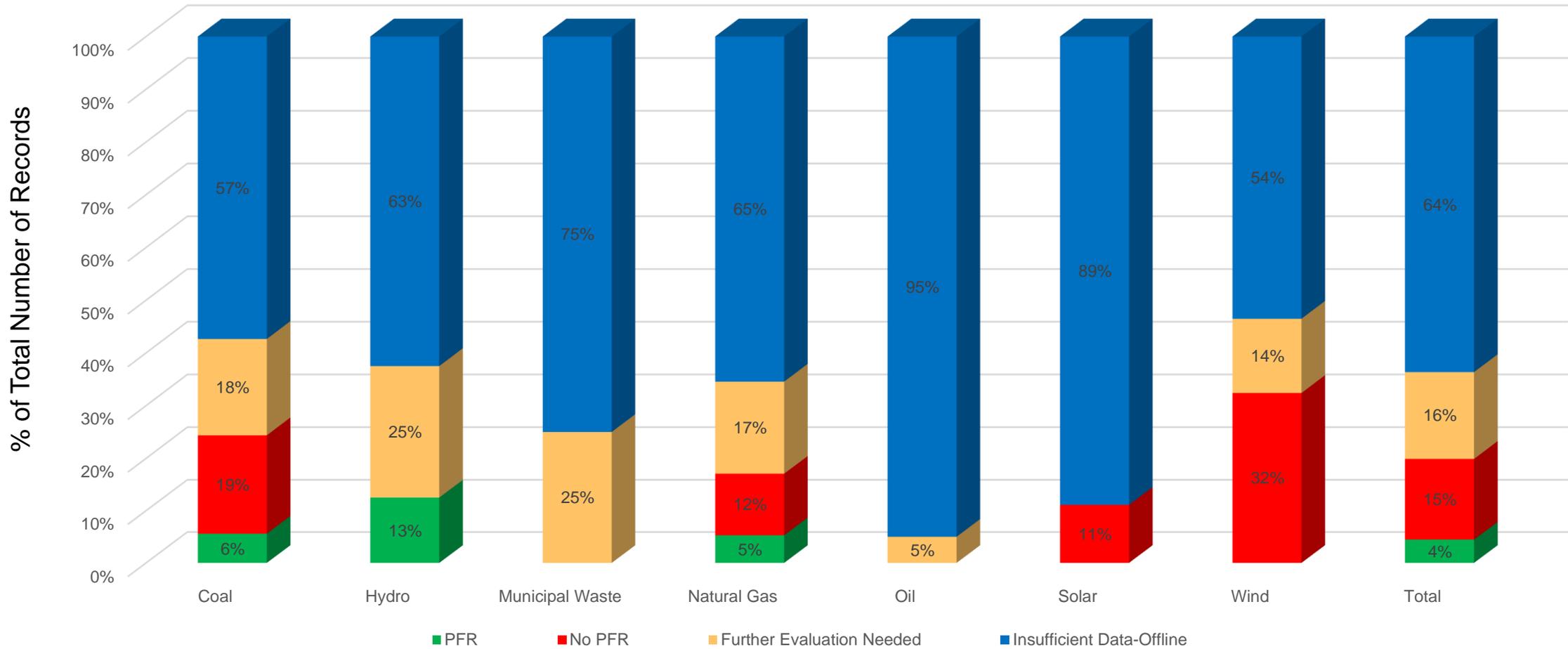


PFR Legend

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PJM Primary Frequency Response Review

PFR by Fuel Type - Units > 50MWs



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Appendix

- **BAL-003 Event Selection:**

https://www.nerc.com/comm/OC/BAL0031_Supporting_Documents_2017_DL/IFR_Master_Event_List_REDACTED.xlsx

Events listed on NERC Resource Subcommittee Site

NERC
NORTH AMERICAN ELECTRIC RELIABILITY CORPORATION

Home > Committees > Operating Committee (OC) > Resources Subcommittee (RS)

Resources Subcommittee (RS)

Archived Related Files

The Resources Subcommittee assists the NERC Operating Committee (OC) in enhancing Bulk Electric System (BES) reliability by implementing the goals and objectives of the OC Strategic Plan with respect to issues in the areas of balancing resources and demand, interconnection frequency, and control performance. The RS's responsibilities include the following functions:

- Reviewing and assisting in the development of generation and load "balancing" standards. Which may include developing any necessary reference documents.
- Reviewing and assisting in the development of interconnection balancing standards to assure problems resulting from balancing do not adversely affect reliability.
- Providing oversight and guidance to working groups and task forces.
- Providing industry leadership and guidance on matters relating to balancing resources and demand issues as well as resulting issues related to interconnection frequency.
- Addressing the reliability aspects of inadvertent interchange creation, accounting, and payback.
- Review balancing authorities' control performance (e.g., CPS and DCS) on a periodic basis.
- Address technical issues on automatic generation control (AGC), time error correction, operating reserve, and frequency response.
- Provide oversight and guidance on aspects of interchange scheduling as it applies to impacts on balancing and inadvertent interchange.

Subcommittee Resources

- Agendas, Highlights, and Minutes
- Balancing Standards and Supporting Documents
- Resources Subcommittee Scope
- BASS User Manual
- 2019 Frequency Response Annual Analysis Report
- BAL-003 Frequency Bias Settings 08 Jan 20
- BA FRO Allocations for OY2020
- NERC Balancing Authority Areas

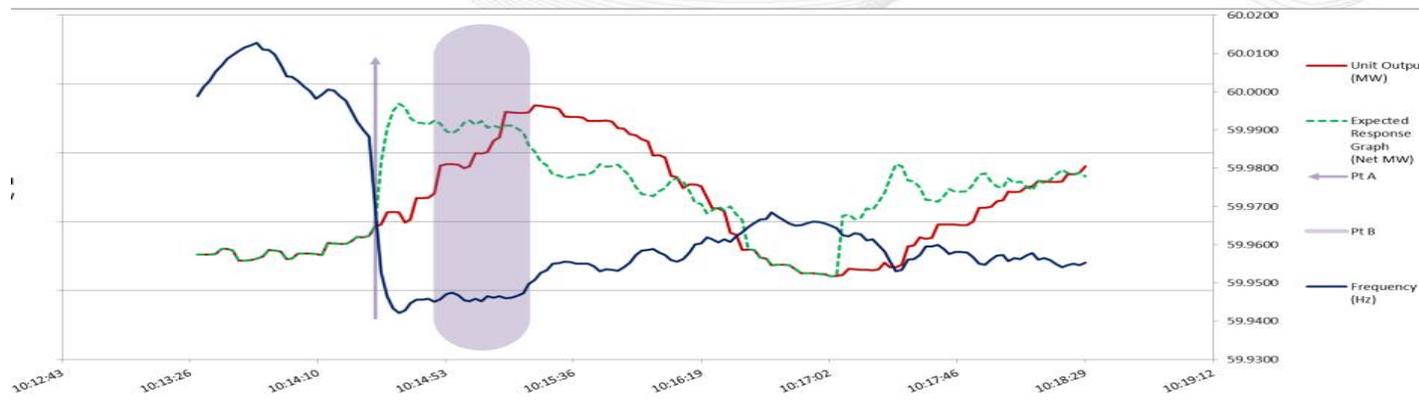
Support Technical Documents

- [2016 Frequency Response Annual Analysis Report](#)
- [2017 Frequency Response Annual Analysis Report](#)
- [2018 Frequency Response Annual Analysis Report](#)

BAL Standards Supporting Documents

Type	Title
⊞ BAL-001 (1)	
⊞ BAL-002 (2)	
⊞ 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>



Actual Response =	6.71	MW
Expected Response =	7.07	MW
Performance =	95%	MW

- Please reach out to FrequencyResponse@pjm.com with questions or to set up a call with PJM to discuss PFR.