NERC Standard BAL-003-1
Frequency Response & Frequency Bias Setting

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Operating Committee

Agenda Summary

- NERC Reliability Standard BAL-003-1
- Frequency Response Obligation & Field Trial Performance
- PJM Forward Strategy

Order No. 794 approved by the FERC on January 16, 2014

BAL-003-1 Frequency Response & Frequency Bias Setting

Requirement 1: Effective April 1, 2016

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

Balancing Authority FRO Allocation:

Interconnection Frequency Response Obligation x Balancing Authority Pro-rata Share

Expected PJM FRO = (1014 MW/0.1 Hz) x (Approx. 25%) ≈ 254 MW/0.1Hz

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

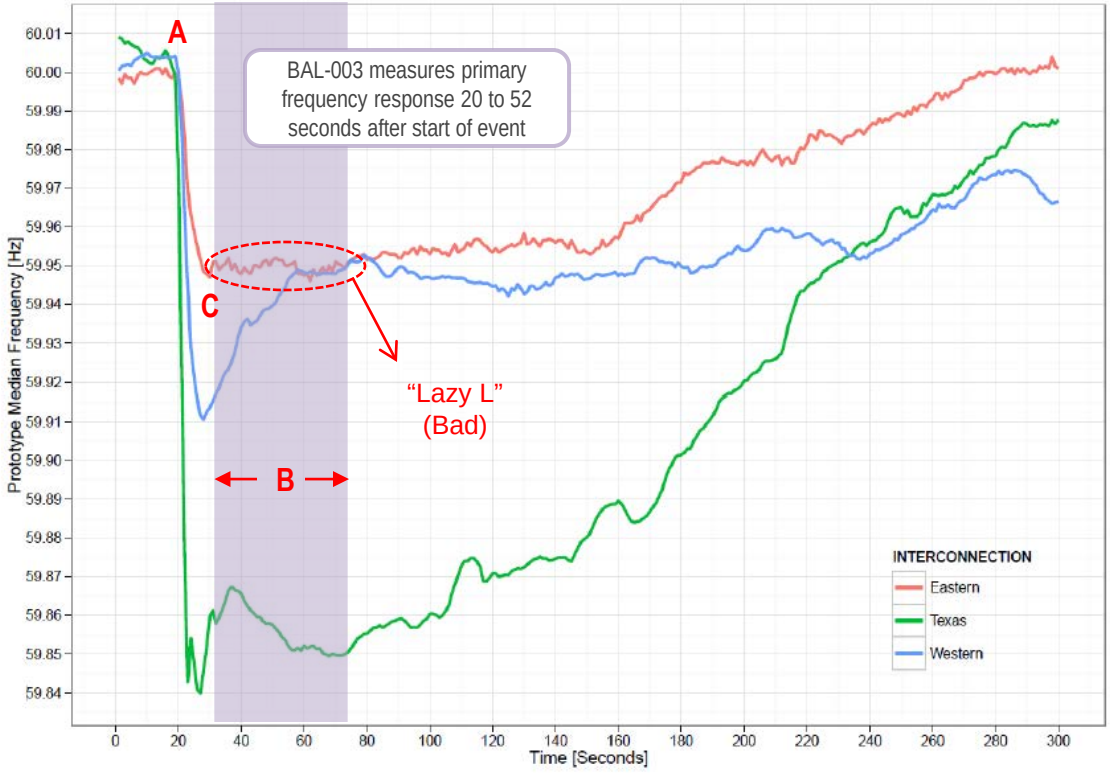
Primary frequency response is the first stage of frequency control and is the response of generator governors and loads to arrest locally detected changes in frequency.

Primary frequency response is automatic, is not driven by any centralized system, and begins within seconds after the frequency changes, rather than minutes.

Interconnection Frequency Response Characteristics

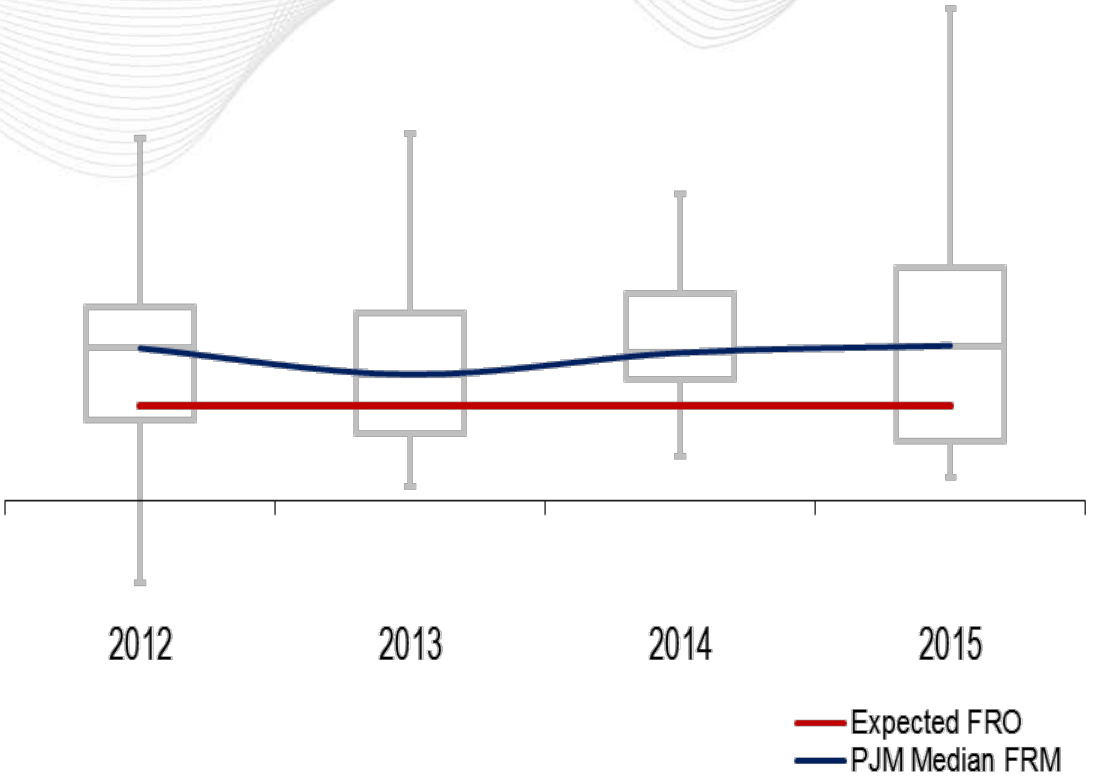
Primary Frequency Control comes from automatic generator governor response, load response (primarily motors), and other devices that provide an immediate response based on local control systems

Evidence of frequency response withdrawal seen in the Eastern Interconnection



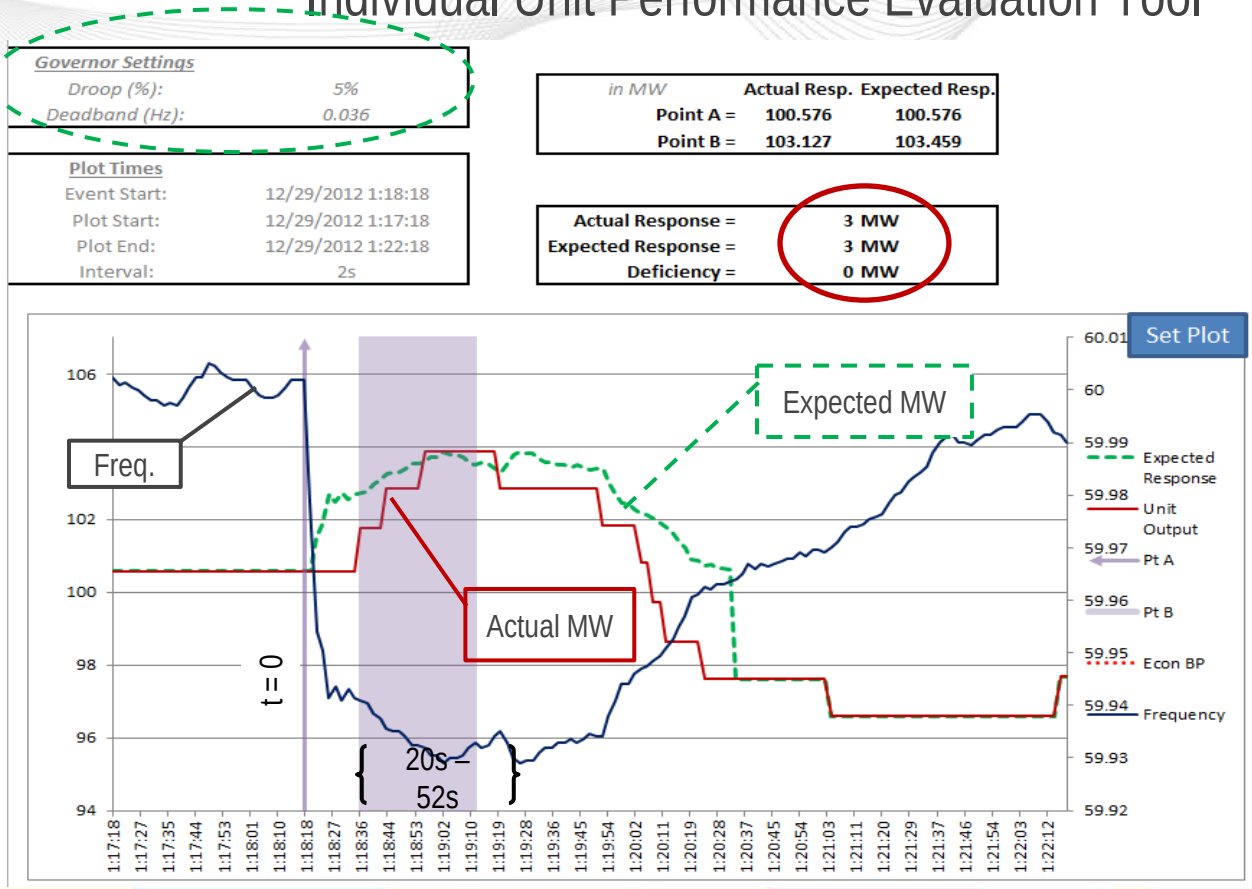
PJM BAL-003-1 Field Trial Performance

- Performance is measured as the median of all NERC selected events
- Frequency Response measured included generator governor response, & load response
- PJM Field Trial Performance exceeded expected FRO every year



Individual Unit Performance Evaluation Tool

- PJM Internal tool used to evaluate and measure individual unit performance
- Tool does not account for frequency response from load or other devices



- Monitor & evaluate future regulatory activity
  - NERC Standards development & FERC Orders
- Monitor performance changes due to:
  - Changes in M14d, fuel type changes, unit retirements
- Work with GO's & GOP's regarding governor setting coordination
- Continue to improve tools to measure individual unit performance