

## Primary Frequency Response (PFR) Requirement

### Problem / Opportunity Statement

Primary Frequency Response (PFR) is an essential reliability product and is needed to ensure system reliability and stability in both real-time operations and also during system restoration events. PFR is the first stage of frequency control, provided automatically through the response of generator governors to arrest locally detected changes in frequency, typically in response to the loss of a large generating resource, or a loss of load. PFR is not controlled by any centralized system, and begins within seconds after the frequency changes, rather than minutes. PFR is the first line of defense for preventing system disturbances and is critical to the system restoration process.

NERC, through much industry engagement, has identified that a large number of units in the Eastern Interconnection are not providing any PFR. In the Frequency Response Initiative Report published by NERC in 2012, NERC concluded that only 30% of units on-line provide primary frequency response, and only 10% of units online sustain primary frequency response.

The reasons for diminished or absent PFR have been identified through interaction of NERC and generating resources throughout the Eastern Interconnection. The reasons include: 1) closed-loop load controls that squelch PFR, 2) lack of coordination between the outer loop controls and the plant Distributed Control System (DCS), 3) digital governors with large dead band settings, and 4) units operating in MW coordinated control (economic set point control) that does not incorporate system frequency as an input to the logic.

PJM has been evaluating frequency response against the requirements in BAL-003-1 since 2011. Through this analysis PJM has observed the Frequency Response Measures (FRM) has always been greater than the Frequency Response Obligation (FRO), which is the compliance measurement. Taking a closer look at each individual frequency event, it is observed there is some variability in the PFR on an event-to-event basis, and some events measure below the set FRO. This uncertainty on an event-by-event basis raises concerns whether other resources beyond the black start units (e.g. critical load units) that will be involved in the system restoration process will be capable of providing frequency response, which may pose additional challenges to the restoration process.

Since the mix of resources operating varies throughout the day and the year based on economics, and would vary greatly in a system restoration event, PJM believes that all resources should be configured to provide Primary Frequency Response, to minimize risks to system reliability and stability.