

# Primary Frequency Response Compensation

PFRSTF

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# Obligations and Level Playing Field

- **Provision of PFR should be required of all resources subject to an interconnection agreement**
  - **Manual 14D**
- **Applies to new and existing resources**
  - **Exceptions for technical reasons, not economic**
  - **No size restrictions based on metering requirements under current rules/eligibility to provide or displace capacity**

# Compensation for PFR

- **Obligations should be universal (old/new/large/small) to avoid discrimination/cross subsidies/inefficiency across resources**
  - **Requirements for participation are not “barriers to entry” but the cost of doing business and good utility practice.**
  - **More efficient resources should have an advantage relative to less efficient resources.**

# Compensation for PFR

- **Capacity Market provides compensation for frequency response related equipment costs and going forward avoidable costs for new and existing resources**
  - **CONE unit includes cost of equipment/software and going forward avoidable costs.**
    - If not included, needs to be included given requirements
  - **Units that have been providing frequency control have included costs in offers.**

# Compensation for PFR

- **Energy Market provides allows recovery of incremental costs associated with providing frequency response**
- **Heat rate loss of being capable included in heat rate (settings), included in cost offer and price offer (Heat rate effects on fuel, chemicals, emissions)**

# Head Room?

- **Requirement is to be capable and provide service when head room exists/service is needed**
- **If a redispatch?**

# Appendix



# Obligations and Level Playing Field

- **Data Requirement from Manual 14-D:**
- **From PJM Members to PJM**
  - Data needed for PJM Control Programs
  - (AGC tie-line MW, TREG, CREG, UNITREG, LOADBP, Locally Sampled Frequencies)
  - Fast Scan Rate (2 seconds)



# Obligations and Level Playing Field

## Manual 14D:

- **The following exhibit shows PJM precision requirements for real-time and revenue metering information.**
- **Refer to PJM Manual M-01, Control Center and Data Exchange Requirements for additional details.**
- **Real Time Instantaneous Data Sent To PJM**
  - **Frequency 1/1000th of HZ (i.e. 60.001 Hz)**
- **PJM will accept greater precision if available**

# Obligations and Level Playing Field

Manual 14D Criteria	Real Time Telemetry Requirements
Generators participating in the PJM market as capacity resources	Real and reactive power
Generators 10 MW (Maximum Facility Output) or larger	Real and reactive power
Generators greater than 1 MW (Maximum Facility Output) and connected at a bus operating at 50 kV or greater	Real and reactive power
Solar parks 3 MW (Maximum Facility Output) or greater	Real and reactive power
Distributed generators (such as, the treatment of many units dispersed over a wide area as one aggregated unit) modeled less than 10 MW (Maximum Facility Output)	Real and reactive data at the BES injection point of accuracy within 10% of hourly MWh settlements data (revenue meter or accumulator data)

# Obligations and Level Playing Field

## Manual 14D 5.3.4 eDART

- **The Dispatcher Application and Reporting Tool (eDART) provides communication with PJM for generation operators regarding unit outage and reduction requests, updates to reactive capability curves (D-curves), Automatic Voltage Regulator status, Power System Stabilizer status, Governor status, MVAR tests, Supplementary Status Reports (SSRs), Instantaneous Reserve Checks (IRCs), Minimum Generation Reports, and Gen Checkout.**

# Obligations and Level Playing Field

## Manual 14D:

- **The Member Company must comply with these PJM naming and telemetry conventions (if applicable to the installation):**
  - **Transmission line MW and MVAR**
  - **Transformer MW and MVAR**
  - **Generating unit MW and MVAR**
  - **Station kV**
  - **Frequency**
  - **Transformer taps**
  - **6.1.4 Offline Test**
- **Frequency**
- **PJM will change scheduled frequency (e.g., 59.98 Hz). Member Company will verify the change.**

# Obligations and Level Playing Field

## Manual 14D:

- **6.3 Coordination with Dispatch**
  - **6.3.1 Operation**
    - **Every Generator interconnected with and synchronized to the transmission system must at all times coordinate operation with PJM and the Transmission Owner, providing all necessary and requested information and equipment status, to assure that the electrical system can be operated in a safe and reliable manner.**
    - **This coordination includes, but is not limited to:**
      - Supplying generator net-MW and MVAR output.
      - **Supplying frequency** and voltage levels.

# Obligations and Level Playing Field

## Manual 14D. 6.3.4 Other Requirements:

- **Each Generator shall have and follow a voltage schedule provided to them by the local Transmission Owner or the PJM default voltage schedule as per PJM Manual M-3, Transmission Operations, Section 3.11.**
- **Conditions may be encountered on the PJM system, which require participation in remedial action. These include, but are not limited to: actual or contingency flow or voltage-limit violations, violation of synchronous stability limits, low or high frequency, voltage reductions, system blackouts, and maximum and minimum generation conditions.**

# Obligations and Level Playing Field

## Manual 14D. 7.1 Dispatching of generation:

- The Generator must deliver the electric energy generated by the facility to PJM at the point(s) of interconnection in the form of 3 phase, 60-Hertz alternating current at the nominal system voltage at the point of interconnection.
- Generators and their protective systems (relaying, V/Hz, etc.) should meet the frequency guidelines listed in PJM Manual M-36, System Restoration, section 2.3, to coordinate with system preservation under-frequency load shedding.

**Additionally, generators and their protective systems should be capable of operation at over-frequency up to 61.7 Hz for a limited duration.** Refer to NERC Reliability Standard PRC-024, Generator Frequency and Voltage Protective Relay Settings.

# Obligations and Level Playing Field

## Manual 14D. 7.1 Dispatching of generation:

- **All generators, including pseudo tied or dynamically scheduled generating resources, should operate on unrestricted governor (or equivalent electronic speed control device) control to assist in maintaining interconnection frequency, except for the period immediately before being removed from service and immediately after being placed in service.**
- **Governor outages during periods of operations must be kept to a minimum. If a governor or equivalent electronic speed control device for any unit, regardless of resource type, is out of service or unable to react to a change in system frequency, it must be immediately reported to PJM via eDART as a governor outage. When a generator governor is not available, the unit output should not fluctuate from pre-scheduled output unless otherwise directed.**



# Obligations and Level Playing Field

## Manual 14D. 7.1 Dispatching of generation

- **With exception of nuclear generators, all generating resources with gross plant / facility aggregate nameplate rating greater than 75 MVA are requested to ensure that, in the absence of technical or operational considerations, the generator governor (or equivalent electronic speed control device) and Distributed Control System (DCS) settings provide dead bands that do not exceed +/- 36 mHz, and droop settings that do not exceed 5%.**
- **Should a generating resource be unable to meet these criteria, the generating resource's actual settings and reasons for being unable to meet these criteria shall be forwarded to PJM. System conditions permitting,**

# Obligations and Level Playing Field

## Manual 14D.

- **Revision 34 (05/01/2015):**
- **Section 7.1.1, Generator Real-Power Control: Added generator governor and distributed control system dead band and droop setting requirements consistent with the February 5, 2015 NERC Advisory on Generator Governor Frequency Response.**

# OATT

- **4.8 Under- and Over-Frequency and Under- and Over-Frequency Voltage Conditions:**
- **The Generation Interconnection Customer shall ensure “frequency ride through” capability and “voltage ride through” capability of its Customer Facility. The Generation Interconnection Customer shall enable these capabilities such that its Customer Facility shall not disconnect automatically or instantaneously from the system or equipment of the Transmission Provider and any Affected Systems for a defined under-frequency or over-frequency condition, or an under voltage or over-voltage condition, as tested pursuant to Section 1.4.4 of Appendix 2 of this Interconnection Service Agreement. The defined conditions shall be in accordance with Good Utility Practice and consistent with any standards and guidelines that are applied to other generating facilities in the PJM Region on a comparable basis.**

# OATT

- **4.8 Under- and Over-Frequency and Under- and Over-Frequency Voltage Conditions:**
- **A Generation Interconnection Customer shall implement under-frequency and over-frequency relay set points for the Customer Facility as required by NERC and each Applicable Regional Entity to ensure “frequency ride through” capability of the Transmission System. The response of a Generation Interconnection Customer’s Customer Facility to frequency deviations of predetermined magnitudes, both under-frequency and over-frequency deviations shall be studied and coordinated with the Transmission Provider in accordance with Good Utility Practice.**

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