



Working to Perfect the Flow of Energy

PJM Manual 11:

**Energy & Ancillary Services
Market Operations**

Revision: 67

Effective Date: ~~June 1, 2014~~

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Section 3: Overview of the PJM Regulation Market

3.2 PJM Regulation Market Business Rules

3.2.1 Regulation Market Eligibility

Regulation offers may be submitted only for those resources electrically within the PJM RTO.

To regulate, a resource must meet the following criteria:

- Generation resources must be able to provide 0.1 MW of Regulation Capability in order to participate in the Regulation Market. Demand Resources must be able to provide 0.1 MW of Regulation Capability in order to participate in the Regulation Market.
- Generation resources must have a governor capable of AGC control.
- Resources must be able to receive an AGC signal. Resources MW output must be telemetered to the PJM control center in a manner determined to be acceptable by PJM.
- New resources must pass an initial performance tests (minimum 75% compliance required). Current resources that are qualified on the date of implementation of regulation market changes do not need to re-qualify for the signal that they currently follow. However, initial qualification does not preclude a resource from being disqualified from the regulation market for non-performance.
- Resources must demonstrate minimum performance standards, as set forth in the PJM Manual 12: Balancing Operations, Section 4: Providing Ancillary Services.
- Resources should give priority to the regulation signal by not allowing the sum of the regulating ramp rate and energy ramp rate to exceed the economic ramp rate. Only after a regulating resource has accounted for the regulation capability, may a generator use net of the economic base point and the regulation ramp rate to follow the energy signal.
- Demand Resources must complete initial and continuing training on Regulation and Synchronized Reserve Market as documented in Manual 40: Certification and Training Requirements, Section 2.6: Training Requirements for Demand Response Resources Supplying Regulation and Synchronized Reserve.
- When a Demand Resource that is eligible for the Regulation Market is called for a mandatory Emergency or Pre-Emergency Load Management Event, it will be de-assigned from Regulation for any intervals that overlap with the Load Management Event, starting from the notice time of the Load Management Event. PJM will not assign the resource to Regulation for the remainder of the mandatory portion of the Load Management Event.

The following information must be supplied through the eMKT System:

- Resource Regulating Status (available, unavailable, self-scheduled)

- Regulation Capability (above and below regulation midpoint, MW)
- Regulation Maximum and Minimum values, considering any necessary offsets (MW)
- Regulation Signal Type – RegA or RegD
- Cost-Based Regulation Offer (\$/MWh): This value will be validated using the unit-specific operating parameters submitted with the regulation offer and the applicable \$12/MWh regulation margin adder. The portions of the cost based offer are split into:
 - Regulation Capability portion capturing the Fuel Cost Increase and Unit Specific Heat Rate Degradation due to Operating at Lower Loads. The margin adder may only be added to the Regulation Capability portion; and,
 - Regulation Performance portion representing Cost Increase due to Heat Rate Increase during non-steady state operation and Cost Increase in VOM.
 - The \$/MW value determined in this step will be converted to \$/ΔMW by multiplying the value by the ratio of ΔMW/MW for the applicable signal for that offer.
- Price-Based Regulation Offer (\$/MWh, optional): This value is capped at \$100/MWh, and its submission is optional on the part of the market participant. The portions of the cost based offer are split into:
 - Regulation Capability portion the capturing the resource owner's price to reserve MWs for regulation in \$/MW; and,
 - Regulation Performance portion capturing the resource owner's price to provide regulation movement in \$/ΔMW.

The \$/MW value determined in this step will be converted to \$/ΔMW by multiplying the value by the ratio of ΔMW/MW for the applicable signal for that offer. In addition to the cost-based regulation offer price, each market participant may also submit additional information to support the cost-based offer price. Using the calculations in Manual M-15: Cost Development Guidelines, PJM will validate the cost-based regulation offer price to ensure that it does not exceed actual regulating cost as determined by this manual, plus the applicable regulation margin adder. Any cost-based offer prices that exceed this value will be rejected by the eMKT System. An example of this calculation is available on the PJM website at <http://www.pjm.com/markets-and-operations/ancillary-services/mkt-based-regulation.aspx>.

If a market participant does not submit a cost-based regulation offer price they will not be permitted to participate in the PJM Regulation Market until such offer has been validated. Any participants that do not submit any of the supporting parameters below will have their cost-based regulation offer price capped at the margin adder of \$12/MWh.

The following optional parameters may be submitted in the eMKT System to support the cost-based regulation offer price. If any of these parameters are not submitted they will default to zero.

- **Heat Rate @ EcoMax [BTU/kWh]:** The heat rate at the default economic maximum for a resource. The economic maximum that will correspond to this rate value will be the default economic maximum that is shown on both the Daily Regulation Offers and Unit Details pages.
- **Heat Rate @ RegMin [BTU/kWh]:** The heat rate at the default regulation minimum for a resource. The regulation minimum that will correspond to this rate value will be the default regulation minimum that is shown on both the Daily Regulation Offers and Unit Details pages.
- **VOM Rate [\$/MWh of Regulation]:** The increase in VOM resulting from operating the regulating resource at a higher heat rate than is otherwise economic for the purpose of providing regulation.
- **Fuel Cost [\$/MBTU]:** The fixed fuel costs of the resource. This value will be used to determine the heat rate adjustments during steady-state and non steady-state operation for the purpose of providing regulation.

Section 4: Overview of the PJM Synchronized Reserve Market

4.2.8 Demand Resources

- Demand resources providing Synchronized Reserve are required to provide metering information at no less than a one minute scan surrounding a synchronized reserve event.
- Metering information for demand resources is not required to be sent to PJM in real time. Load data for all Synchronized Reserve events must be submitted two business days following the event day.
- Members that offer into the Synchronized Reserve market and do not provide complete, accurate and timely load data for all Synchronized Reserve events may be suspended from participating in the Synchronized Reserve Market until corrective measures are implemented and may be referred to the PJM Market Monitor and/or the FERC Office of Enforcement for further investigation as necessary.
- Demand resources are limited to providing 33% of the Synchronized Reserve requirement.
- Demand resources that are considered to be “batch load” resources are limited to providing 20% of the Synchronized Reserve requirement. If PJM determines that satisfying 20 percent of the Synchronized Reserve requirement from Batch Load demand resources is causing or may cause a reliability degradation, PJM may reduce the percentage of the requirement that may be satisfied by Batch Load demand resources in any hour to as low as 10 percent.
- Demand resources must complete initial and continuing training on Regulation and Synchronized Reserve Markets as documented in Manual 40: Certification and Training Requirements, Section 2.6: Training Requirements for demand response Resources Supplying Regulation and Synchronized Reserve.
- When a Demand Resource that is eligible for the Synchronized Reserve Market is called for a mandatory Emergency or Pre-Emergency Load Management Event, it will be de-assigned from Synchronized Reserves for any intervals that overlap with the Load Management Event, starting from the notice time of the Load Management Event. PJM will not assign the resource to Synchronized Reserves for the remainder of the mandatory portion of the Load Management Event.