

PJM Ancillary Services Presentation to Kosovo Delegation

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Ancillary Services Defined

Ancillary Services support the reliable operation of the transmission system as it moves energy from generators to customers.

PJM currently operates two markets for ancillary services:

**Synchronized Reserve
Regulation**

PJM also requires that certain facilities maintain Black Start capability which provides electricity for system restoration in the event the entire grid loses power

Regulation Ancillary Service

Regulation service corrects for short-term changes in electricity use that might affect the stability of the power system. It helps match generation and load and adjusts generation output to maintain the desired frequency.

Satisfaction of Regulation Requirement

Load-serving entities can meet their obligation to provide regulation to the grid by using their own generation, by purchasing the required regulation under contract with another party or by buying it on the Regulation Market.

Regulation Requirement Determined

The Regulation Requirement is determined by PJM in whole MW units for the on-peak (0500 – 2259) and off-peak (0000 – 0459, 2300 - 2359) periods of the day

The PJM RTO on-peak Regulation Requirement is equal to 1% of the forecast peak load for the PJM RTO for the day. The PJM RTO off-peak Regulation Requirement is equal to 1% of the forecast valley load for the PJM RTO for the day.

Regulation Market

Regulation Offers may only be submitted by resources physically located within the PJM RTO

Specific resources supporting Regulation offers must meet specific technical criteria

Specific resources supporting Regulation offers must pass specific tests establishing ability to operate within certain parameters

Specific resources supporting Regulation offers are under the control of PJM during the period(s) stated in the accepted Regulation offers

Regulation Market Operation

Resource owners wishing to make offers into the Regulation market must submit a cost-based offer price by 1800 on the day prior to operation

PJM clears the Regulation market simultaneously with the synchronized reserve market. Results are posted no later than 30 minutes prior to the operating hour

Regulation Operation

PJM Operator maintains total system regulation within specified bandwidths

In the event of a regulation excess, the PJM dispatcher deselects resources, beginning with the highest cost resource currently providing regulation service and moves downward

In the event of a regulation deficiency, the PJM dispatcher selects resources to provide regulation beginning with the lowest cost resource not currently providing regulation and moving upward

Synchronized Reserve

Synchronized Reserve service supplies electricity if the grid has an unexpected need for more power on short notice. The power output of generating units supplying synchronized reserve can be increased quickly to supply the needed energy to balance supply and demand; demand resources also can bid to supply synchronized reserve by reducing their energy use on short notice.

Satisfaction of Requirement

Load-serving entities can meet their obligation to provide synchronized reserve to the grid by using their own generation, by purchasing it under contract with another party or by buying it on the Synchronized Reserve Market

Synchronized Reserve Requirement

PJM is organized into two separate synchronized reserve zones. PJM will select resources in each separate zone based on an analysis of energy, regulation and synchronized reserve. Those resources must be capable of providing sufficient reserve which must be synchronized to the grid for a sufficient amount of time to enable quick-start resources to come on-line. The timelines differ for each zone.

Synchronized Reserve Resources

Tier 1 Resources: All resources currently online following economic dispatch and able to ramp up in response to a synchronized reserve event, or demand resources capable of reducing load within 10 minutes

Tier 2 Resources: Additional capacity that is synchronized to the grid and operating at a point that deviates from economic dispatch to provide additional spinning synchronized reserve not available from Tier 1; and resources capable of dropping load in response to a PJM signal

Synchronized Reserve Market

1800 Day-ahead: offer prices for Tier 2 resources locked in

Operating Day: PJM clears the synchronized reserve market on an hourly basis

90 minutes before hour: PJM posts estimates of Tier 1 synchronized reserve available

60 minutes before hour: Resource owners that self-scheduled synchronized reserve must post committed resources and quantities

30 minutes before hour: PJM locks in Tier 1 amounts, clears regulation and synchronized reserve market prices and makes Tier 2 assignments

Synchronized Reserve Market Operation

If sufficient Tier 1 resources are available, no Tier 2 resource bids clear and their offers are set to zero

If sufficient Tier 1 and self-scheduled Tier 2 resources are available, the Tier 2 clearing price is zero (self-scheduled Tier 2 resources are committed to respond)

In the event insufficient Tier 1 and self-scheduled Tier 2 resources are available, the clearing price is set equal to the merit price of the highest cost Tier 2 resource necessary to meet the requirement.