



PJM Interconnection operates the world's largest wholesale electricity market as the regional transmission organization for the area that encompasses all or parts of Delaware, Illinois, Indiana, Kentucky, Maryland, Michigan, New Jersey, North Carolina, Ohio, Pennsylvania, Tennessee, Virginia, West Virginia and the District of Columbia.

PJM's competitive wholesale electricity market began operating in 1997. Based on its success, PJM and its stakeholders since then have expanded the number and kinds of markets available to its more than 990 members.

PJM employs a collaborative process to establish systems and rules that ensure that its markets operate fairly and efficiently.

Using sophisticated information technology, PJM offers a variety of online resources and tools to assist market participants in conducting business. The independent external market monitor evaluates PJM's operations and markets to detect design flaws in the operating rules, standards and practices or structural problems in the markets that may need to be addressed.

The following is a summary of the markets PJM operates:

### **Energy**

PJM coordinates the continuous buying, selling and delivery of wholesale electricity through the Energy Market. As the market operator, PJM balances the needs of buyers, sellers and other market participants and monitors market activities to ensure open, fair and equitable access.

The PJM Energy Market operates much like a stock exchange, with market participants establishing a price for electricity by matching supply and demand. The market uses locational marginal pricing that reflects the value of the energy at the specific location and time it is delivered. If the lowest-priced electricity can reach all locations, prices are the same across the entire grid. When there is transmission congestion, energy cannot flow freely to certain locations. In that

case, more-expensive electricity is called on to meet the demand. As a result, the locational marginal price is higher in those locations.

The Energy Market consists of Day-Ahead and Real-Time markets. The Day-Ahead Market is a forward market in which hourly prices are calculated for the next operating day based on generation offers, demand bids and scheduled bilateral transactions.

The Real-Time Market is a spot market in which current locational marginal prices are calculated at five-minute intervals based on actual grid operating conditions and are published on the PJM website. PJM settles transactions hourly and issues invoices to market participants weekly.

PJM also operates a Day-Ahead Scheduling Reserve Market. It obtains supplemental, 30-minute reserves that may be needed to deal with unanticipated system conditions during the actual operating day.

### **Capacity**

To ensure the future availability of the generating capacity and other resources that will be needed to keep the regional power grid operating reliably for consumers, PJM developed a new method of pricing capacity called the Reliability Pricing Model. It was implemented in 2007.

Capacity represents the need to have adequate resources to ensure that the demand for electricity can be met at all times. In PJM's case, that means that a utility or other electricity supplier is required to have the resources to meet its customers' demand plus a reserve. Suppliers can meet that requirement with generating capacity they own, with capacity purchased from others under contract or with capacity obtained through PJM capacity-market auctions.



The RPM system includes requirements and incentives designed to stimulate investment both in maintaining existing generation and in encouraging the development of new sources of capacity – not just generating plants, but demand response and energy-efficiency programs as well. It works in conjunction with PJM's regional planning process to ensure the future reliability of the system.

The essential elements of the RPM capacity market are procurement of capacity three years before it is needed through a competitive auction; locational pricing for capacity that varies to reflect limitations on the transmission system and to account for the differing need for capacity in various areas of PJM; and a variable resource requirement to help set the price for capacity.

The capacity auctions under the RPM obtain the remaining capacity that is needed after market participants have committed the resources they will supply themselves or provide through bilateral contracts.

### **Financial Transmission Rights**

PJM also operates a market for financial transmission rights to assist market participants in hedging price risk when delivering energy on the grid.

FTRs are financial instruments that entitle the holder to a stream of revenues (or charges) based on the hourly energy-price differences across a transmission path in the Day-Ahead Market.

The FTRs provide a hedging mechanism that can be traded separately from transmission service. This gives all market participants the ability to gain better price certainty when delivering energy across PJM.

Market participants can obtain FTRs in four ways:

- They can bid for them in the long-term auction, in which FTRs are available for periods from one to three years.
- They can bid for them in the annual auction, in which FTRs for the entire transmission capability of the PJM system are available.
- They can bid for them in the monthly auctions at which leftover FTRs are sold.
- They can buy them in the secondary market in a transaction with another market participant.

### **Ancillary Services**

Ancillary services support the reliable operation of the transmission system as it moves electricity from generating sources to retail customers.

PJM currently operates three markets for ancillary services – regulation, synchronized reserve and non-synchronized reserve.

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.

Synchronized reserve and non-synchronized reserve services supply 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, while units providing non-synchronized reserve can be brought online quickly, to supply the needed energy to balance supply and demand.

Load-serving entities can meet their obligations to provide regulation or synchronized reserve to the grid by using their own generation, by purchasing the required regulation or synchronized reserve under contract with another party or by buying them in the Regulation or Synchronized Reserve markets.

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