



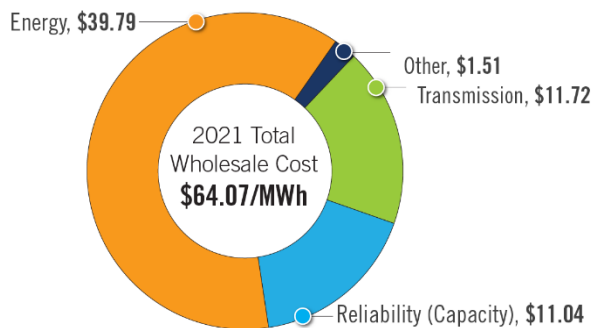
PJM Interconnection operates several types of competitive wholesale markets through which large volumes of electricity are bought and sold across 13 states and the District of Columbia. The markets underpin PJM's mission of reliability at the lowest-possible cost by giving financial incentives and encouraging competition to provide electricity when it's needed to the 65 million people that PJM serves. Each market serves a separate function, but they work in tandem.

## Energy Market

The largest of the PJM markets is the Energy Market, making up the majority of wholesale electricity costs (62% in 2021). The Energy Market operates much like a stock exchange. PJM matches the demand for electricity with offers to provide it. As the market operator, PJM's role is to balance the needs of buyers, sellers and other market participants while monitoring market activities to ensure open, fair and equitable access.

The Energy Market is divided into the Day-Ahead and Real-Time markets. Both markets match offers from power suppliers with bids from power consumers to ensure that suppliers are ready to deliver at the right time and place.

### Relative Size of Components of Wholesale Cost (2021)



## Day-Ahead Market

The Day-Ahead Market is a "forward" market, which means prices are set for energy that will be delivered in the future – in this case, the next day. Hourly prices are calculated based on generator offers, bids from power consumers such as utility companies, and market-related financial transactions.

PJM matches offers from the lowest- to highest-priced seller until it meets the bid-in demand for electricity, plus some reserves. This is called "clearing" the market. All cleared bids and offers establish a financial position in the Day-Ahead Market. Any deviations from cleared quantities in the Day-Ahead Market are settled in the Real-Time Market.

### Energy Market

- **Function:** Secures electricity to meet consumer demand in real time and the next day
- **Includes:** Day-Ahead and Real-Time markets
- **Portion of wholesale electricity cost:** 62% (2021)

### Capacity Market

- **Function:** Ensures the future availability of power supplies three years in advance
- **Portion of wholesale electricity cost:** 17% (2021)

### Ancillary Services Markets

- **Function:** Helps balance the system as it moves electricity from generating resources to consumers
- **Includes:** Regulation and reserve markets
- **Portion of wholesale electricity cost:** 2% (2021)





## **Real-Time Market**

The Real-Time Market serves electricity needs in real time (which always differs, at least a little, from the day-ahead forecast). The Real-Time Market is a spot market, meaning electricity is procured for immediate delivery. Supply and demand are paired. Prices are calculated every five minutes for more than 10,000 different pricing points according to actual grid operating conditions.

PJM continuously follows fluctuations in generation, demand and transmission, sending an electronic signal every five minutes to let suppliers know what their electricity output should be. If PJM commits a supplier to run and the supplier follows dispatch instructions, it will be compensated. Suppliers are paid the day-ahead price for their scheduled output and the real-time price for any generation that exceeds PJM's scheduled amount. If a supplier deviates from PJM's instructions, it may be allocated a portion of the cost associated with that deviation.

## **Capacity Market**

A smaller portion of the wholesale cost – 17% in 2021 – is represented by PJM's capacity market (also known as the Reliability Pricing Model, or RPM). While the Energy Market addresses near-term electricity needs, the capacity market prepares for future demand. PJM's capacity market secures enough power supplies, three-years ahead, to ensure sufficient supply for peak demand.

Each year, PJM holds a competitive auction to obtain these future power supplies at the lowest reasonable price. Capacity is the commitment by resources to deliver electricity or to lower consumption when needed, particularly in an emergency.

Future generation capacity sold at auction is said to “clear” the auction. Cleared generation resources are required to offer power into the Energy Market during the year in which they are committed. More importantly, generators are also required to serve PJM's emergency needs whenever called upon in this time period – even in the most extreme conditions.

The capacity market thus ensures reliable power in the future for the PJM region. In return, the capacity market provides a dependable flow of income to power resources. In all, the capacity market helps generators maintain existing capability, attracts investment in new resources, and encourages companies to develop new technologies and sources of electric power.

## **Ancillary Services Markets**

Because electricity must be produced and consumed the instant it is needed, PJM dispatchers must continuously match the electricity flowing on the grid with customers' demand for it.

Key elements of this delicate balancing act are regulation resources and reserves, which are called ancillary services – a small but vital part of the electricity markets.

Regulation is a reliability product that corrects short-term, unforeseen fluctuations in electricity use and supply that could affect the stability of the power system. Regulation providers are resources that have the ability to adjust output or consumption in response to an automated signal.

Reserves are generation resources that can come online (or end-use consumers that can reduce consumption) within 10 or 30 minutes in the event of an unexpected loss in generation. These operating reserves also help balance the system in emergency situations.

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