



Locational Marginal Pricing sets the price of electricity in real time at points across the regional high-voltage transmission system. This pricing is fundamental to competitive wholesale power market transactions.

An Instantaneous Benchmark

Locational Marginal Pricing, or LMP, reflects the price of electricity and the cost of congestion and losses at points across the grid. These prices serve as instantaneous, ever-changing benchmark signals used by buyers and sellers in wholesale electricity markets. LMP trends inform infrastructure investment decisions and aid PJM's mission of providing competitive markets for the most economic and reliable sources of power.

Showing the Cost of Electricity in Real Time

LMP represents the cost of producing and delivering electricity. These values are calculated one day ahead and in real time and applied to thousands of points across PJM's grid, known as pricing nodes. Dynamic LMP values incorporate three main factors:

- The cost of electricity from the producer, known as generation cost
- The added cost of maintaining service to wholesale customers who, because of limits on the transmission system, don't have access to the lowest-priced available power – this is known as congestion cost
- The cost of electricity lost during transmission

The Cost of Generation

The cost of producing electricity by any given generator changes based upon a variety of factors, particularly the cost of fuel, which may fluctuate greatly over time. Generators offer their output into the market at prices that incorporate these and other production costs. PJM then calls on the most economic generation available at any given moment to maintain safe, reliable service.

The Cost of Congestion

When demand is low, electricity generally flows unconstrained from point-to-point across the grid. As demand rises, however, the physical constraints of the transmission system may restrict how much power can flow safely through lines and substations. In addition, some lines or equipment may be out of service for maintenance or repair. To maintain reliable transmission system operations in these situations, PJM may need to operate higher-cost generators. These higher costs are factored into the LMP as congestion.

Key Points

- LMP represents the cost of making and delivering electricity at each location on the bulk power system.
- Market participants benefit from transparent, energy price data to make decisions about investment, resulting in greater grid reliability, innovation, efficiency and market liquidity.
- LMP incorporates system congestion conditions – information that can reflect PJM operator actions to ensure the safe, reliable and economic dispatch of power.
- Introduced at PJM in 1998, LMP has since become a global standard for energy markets and operations.





Transmission Losses

The physical limits of the transmission system result in an estimated average loss of about 5% of electricity distributed in the U.S. Some energy is lost to the air as heat, for example, when power lines carry significant amounts of electricity. To produce the most accurate data possible for PJM's wholesale energy markets, LMP accounts for these slight system losses.

LMP Is the Building Block for Markets and Grid Reliability

LMP data is the output of PJM's Energy Market, constantly alerting market participants to ever-changing energy prices across the grid.

For PJM's Day-Ahead Market, LMP is calculated using demand bids by Load Serving Entities (such as local utilities) and financial market participants. PJM produces LMP data every five minutes in real time, and hourly on a day-ahead basis. This helps market participants look ahead and offer into the market.

Market-Based Solutions Encourage Prudent Investment & Economic Growth

Serving as a mirror of the cost of energy by geographic location across the grid, PJM's LMP patterns over time encourage new economic development and investment by generators, transmission system operators and customers.

- LMP signals new generation sources to consider locating in areas where they may receive higher prices.
- LMP trends provide important market signals to help guide new customers to locate where they can buy power at the least cost.
- LMP also encourages the construction of new transmission facilities where they are needed for the most economical delivery of power to historically congested areas, serving as a catalyst for grid upgrades.

Pioneering Industry Standard

PJM's LMP model was introduced in 1998. The model is based on an algorithm that takes into account the operating conditions on the transmission system to accurately reflect the price of electricity at different locations across the grid in real time. In the decades since, PJM's LMP model has been adopted by energy markets around the globe for the value of its ability to translate complex power system conditions into prices that are easy to understand.

PJM calculates and posts LMP every five minutes to illustrate system congestion in real time. To view these system conditions at a glance, visit [PJM.com](https://www.pjm.com) or download the [PJM Now app](#).

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