Predicting the demand for electricity for the next few days – and for the next few years – is an important task that PJM undertakes routinely. Load forecasting is a big part of maintaining the reliability and efficiency of the bulk electric system.

Gathering and Processing Data

To anticipate how much electricity consumers will use at any moment – and the necessary reserves for emergencies – PJM engineers study data from many sources. This helps in making short-term and long-term projections. The goal is to ensure an adequate supply of power for reliable service at the most reasonable cost.

Forecasting helps PJM make decisions about how to plan and operate the bulk electric system in a reliable manner, and how to effectively administer competitive power markets. PJM members can also use forecasts to make informed decisions when participating in the competitive markets in the near term and about investing in new power plants and transmission equipment over the long term.

Some factors in load forecasting are predictable. Large data centers, for example, are highly automated and have predictable usage patterns. Other factors, however, occasionally require forecasters to adjust their modeling to reflect unanticipated changes in human behavior, as with the reduction in demand caused by the coronavirus pandemic. Load forecasting is complex and, for short-term predictions, is one of the first areas where PJM has applied machine-learning technology to support continuous improvement.

Key Points

- Forecasting the demand for electricity across the region is an important part of PJM's mission.

- PJM's long-term forecast is used in planning the capacity market and the Regional Transmission Expansion Plan.

- PJM's short-term forecasts are regularly used in maintaining day-to-day reliability of the system and in power market activity.

- Many factors are considered in PJM's forecasts, including weather, economic activity and end-use trends.

- Short-term load forecasting is one of the first areas where PJM has applied machine-learning technology.

Long-Term Forecasting

Each year, usually in early January before the start of each planning period, PJM issues an updated long-term forecast model, providing a 15-year load projection. The model includes peak usage, net energy consumption, load management, and data on distributed solar generation and plug-in electric vehicles. The report provides forecasts for each PJM zone, locational deliverability area and the whole PJM region. The forecast supports some key activities:

- *Capacity Market:* The long-term load forecast is a major factor in PJM's Reliability Pricing Model (RPM), more commonly known as the capacity market. PJM uses RPM to secure electricity supplies – and commitments to curtail usage in emergencies – three years ahead of when they're needed. The forecast is factored into PJM's Variable Resource Requirement (VRR) curve, which PJM uses to determine the supply of electricity it will secure, including reserves, at various prices in the RPM.

- *Regional Transmission Expansion Plan:* Planners factor the long-term load forecast into PJM's Regional Transmission Expansion Plan (RTEP), which evaluates the needs of the high-voltage transmission system up to 15 years in the future. With the approval of PJM's Board of Managers, the RTEP authorizes improvement projects to meet those needs. The RTEP is issued early each year, usually in early March.

(866) 400-8980 | (610) 666-8980
PJM © 2024

Visit **learn.pjm.com**
for simple lessons on PJM and the grid.

Short-Term Forecasting

PJM regularly prepares a short-term projection of power consumption. Forecasters generally focus on the upcoming week, aiming to keep their projections to within 3% above or below actual usage. PJM prepares two primary short-term products:

- *Hourly Forecast:* An hourly forecast that looks seven days ahead. This forecast is often used by members in planning their bidding strategies in the Day-Ahead and Real-Time power markets.

- *Five-Minute Forecast:* A five-minute forecast that looks six hours ahead. This forecast is used by PJM's Security Constrained Economic Dispatch tool, which helps operators dispatch power plants from moment to moment in the most economic order across the region, as they continuously balance the supply of electricity with the ever-changing demand.

Key Factors

- *Weather:* Factors such as temperature, humidity, cloudiness and wind conditions are typically among the most significant components in setting the short-term load forecast. A summer heat wave will spur consumers to run their air conditioners more and drive up the demand for power. Similarly, a period of extreme cold in the winter will prompt consumers' heating equipment to run more frequently. This includes equipment such as electric heat pumps and blowers that circulate warm air throughout homes and businesses. Moderate weather in the spring and fall, on the other hand, tends to minimize the use of such equipment and reduces the demand for power.

- *Day of the Week:* The load forecast can differ significantly between a Monday, when many people are at work or school and electricity usage is high, and a Saturday when many businesses are closed and usage is typically lower. Holidays present a unique set of conditions.

- *Economic Trends:* In preparing the long-term forecast, planners will examine the state of the economy. The amount of electricity needed by commercial and industrial users is a major factor in overall demand. In a vigorous economy, manufacturers with electricity-intensive machinery will likely consume more power than when the economy is slack.

- *End-Use Trends:* PJM planners examine the volume and efficiency of electric-powered equipment that consumers have in service and that they plan to install. This includes central air conditioning, heat pumps, lighting and major appliances, including water heaters, refrigerators, freezers, washers and dryers.

- *Rooftop Solar:* Solar panels and other types of generation installed on the customer's side of the electric meter can reduce the amount of electricity a customer draws from the grid. Knowing this capacity helps PJM develop accurate forecasts.

- *Plug-In Electric Vehicles:* Charging a battery-powered car requires a significant amount of electricity, in some cases the equivalent of half the power needed for an entire home. As consumers increasingly buy plug-in electric vehicles, the bigger impact they have on the needs of the grid. As a result, PJM planners factor the proliferation of these vehicles into their forecasts.

Jan. 3, 2024

(866) 400-8980 | (610) 666-8980
PJM © 2024

Visit **learn.pjm.com**
for simple lessons on PJM and the grid.