Synchrophasor technology enables high-speed measurements of grid conditions, capturing real-time, detailed data across the transmission system that allow operators to detect and prevent potential problems and maintain reliability.

Precise System Monitoring

A synchrophasor is a data point that reflects various characteristics of electricity, including voltage and current, frequency, and other important features of the underlying electrical waves.

Phasor measurement units (PMUs) are monitoring devices that collect synchrophasor data and can reveal subtle differences and changes in these characteristics across the bulk electric system. These changes may be undetectable through the traditional supervisory control and data acquisition (SCADA) technology that PJM uses to monitor and control the grid.

Synchrophasor technology compiles data much faster and at a higher resolution than SCADA technology, painting a clearer picture of the grid at any given moment – and over time. This will allow system operators to identify and respond more quickly to potential instability.

At a Glance

- Synchrophasor technology can provide system operators with a clearer state of grid conditions at all times, enabling them to detect and prevent problems.
- PMUs compile data 30 times per second, which is much faster than traditional data-collection models.
- New generating facilities of 100 MW or more are required to have a PMU installed to stream data to PJM.

PMUs Create Comprehensive, Granular View

While SCADA systems generally take measurements every 2 to 10 seconds, synchrophasor devices typically record measurements 30 times per second. These snapshots of voltage, current phase angles and frequency are time-stamped with clocks that are precision-aligned from GPS satellite signals, allowing the information to be synchronized and combined for a comprehensive, granular view of the transmission system.

PJM Interconnection launched its synchrophasor program in 2011 with a $14 million stimulus grant from the U.S. Department of Energy. As of 2026, members are providing PJM with data from about 719 synchrophasor devices located in 488 substations. Federally approved updates to the PJM Open Access Transmission Tariff require all new generating facilities of 100 MW or greater to have a PMU installed and the ability to stream data to PJM.

Developing Advanced Monitoring and Modeling

PJM is working with members and leading industry organizations to support the research and deployment of synchrophasor technology, which is providing system operators with new insights into the dynamics of the grid. PJM is developing advanced applications of the technology to improve the efficiency, reliability and resilience of the bulk electric system.

Model validation is a key and novel application of synchrophasor technology. Planning, operations and markets rely heavily on models of the bulk electric system. Ensuring that these models accurately represent the physical behavior of the system is critical. PJM is combining synchrophasor technology with advanced analytical software to support better wide-area monitoring, power-system planning and analysis of grid disturbances.

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