

Synchrophasor Research Enables Renewables and Improves Grid Reliability

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Fact Sheet

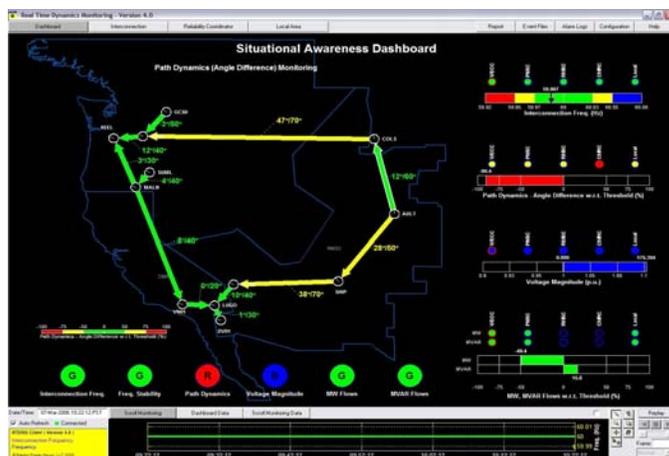
The Issue

Increasing amounts of fluctuating, and often remotely located, renewable electricity pose a challenge to power grid reliability. Until PIER research put synchrophasor applications in the control room, grid operators and engineers lacked the clear and comprehensive power grid monitoring technology needed to meet the challenge. Synchrophasor systems now provide a new tool for power system operation by providing real-time, accurate, time-stamped measurements from across the system.

Project Description

Since 1998, the California Energy Commission's Public Interest Energy Research Program (PIER) has funded research to develop and demonstrate applications—including synchrophasor technologies—for the California grid. Synchrophasors are a completely new method of electrical wave measurements, taken at two or more places on the grid to determine stability. (They measure phase angles.) Synchrophasors promise to revolutionize the analysis of comparative power flow throughout an electrical grid. They can be used to take action rapidly in a changing grid system.

PIER has developed synchrophasor applications to monitor power attributes and present the information to grid operators in ways that enable them to take corrective actions long before potential problems develop. Using these applications sharply reduces the risk of major blackouts. In addition, they will lower the cost of electricity by enabling grid operators to reliably use renewable and transmission resources more efficiently.



RTDMS Situational Awareness Dashboard
Courtesy of the Consortium for Electric Reliability Technology Solutions

Synchrophasors in the Grid Control Room — PIER funded the development of the Real Time Dynamics Monitoring System (RTDMS) used by the California Independent System Operator. RTDMS is the first commercially available software tool to let operators visualize (and take actions based on) high quality information from synchrophasors about system operations across the entire West in real time.

"PIER's research program has resulted in the CAISO installing the most advanced synchrophasor application in the country relative to phase angle detection and oscillation detection. This is the most significant improvement in control room technology in my career."

*Jim McIntosh, Director of Grid Operations,
California Independent System Operator (CAISO)*

Intelligent Grid Protection Systems — Current PIER funded research is enabling automatic feedback and system correction where appropriate to reduce the chances and impacts of outages.

Synchrophasor applications “will provide the capability, someday soon, to arrest oscillations thereby providing for a safer and more capable operation of the system... This will provide better utilization of the existing system and in some cases avoid building of new major transmission.”

*Jim Detmers, Power Systems Resources,
former Vice President of Operations at CAISO*

PIER Program Objectives and Anticipated Benefits for California

PIER develops and directly funds critical projects to ensure research occurs in a timely manner and is tailored to California’s needs. As a result, much of the cutting edge research on synchrophasors has taken place in California and received additional funding from outside sources.

As the year 2020 approaches with a 33 percent renewable energy requirement, synchrophasor technology benefits are significant:

Technological Benefits

- Improved monitoring of the power system status to increase reliability.
- Automated feedback and system correction.
- Increased transmission capacity and successful integration of renewable energy.

Economic Benefits

- Avoided outage costs ranging from \$210 million to \$360 million dollars annually by 2020.
- Small businesses and manufacturers benefit the most since they face the highest costs for each kilowatt-hour not delivered due to power interruptions.

- \$90 million annually in expected savings for ratepayers by 2020 through lower electricity costs.

Benefits are expected to exceed three times the annual budget for PIER electric research, development, and demonstration. These substantial benefits will result from improved reliability and lower outage risks throughout California. Reliability concerns keep transmission lines and renewable power sources from being used to their full potential.

“We can stand on the shoulders of utility, government, and academic visionaries involved in the PIER program whose research and development will guide us in the implementation of a better, more flexible, and more resilient grid... The industry is benefitting today from PIER’s imagination of a better future.”

Vickie Van Zandt,

*Synchrophasor Program Manager of the Western
Electricity Coordinating Council, and former
Senior Vice President for Transmission at
Bonneville Power Administration*

Project Specifics

Project Cost Total: \$11.4 million over 15 years

Application: Statewide

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