



Phasors Offer Grid Reliability

BENEFITING FROM PRECISE INFORMATION

BY SALVATORE SALAMONE

▶ **NAMED LIKE SOMETHING** from Star Trek, phasor technology is being deployed and tested as a possible way to make the electric grid more reliable.

"Phasor represents the best opportunity we have for improved visibility of the power system over wide areas," said Richard Sergel, president and chief executive officer of the North American Electric Reliability Corp. (NERC).

Today's supervisory control and data acquisition (SCADA) and emergency management systems (EMS) typically take analog power flow measurements and are well suited for the management of a particular site.

Phasor measurement devices provide precise measurements of voltages and currents, and of phase angles between voltages and currents. Additionally, phasor measurement devices offer a number of enhancements and improvements over SCADA/EMS systems for understanding the relationships among events at different sites.

First, although SCADA equipment takes about one measurement every three seconds, phasor equipment can take 60 measurements per second; thus, small-scale fluctuations, which can be precursors to a potential problem, can more easily be detected. "This means phasor systems are far more sensitive to changes," said Stan Johnson, manager of situation awareness and infrastructure security at NERC. Some say SCADA/EMS combinations provide the equivalent of an X-ray, whereas phasors are akin to magnetic resonance imaging that provides more granular detail about situations as they develop.

Second, information collected from geographically dispersed phasors can be synchronized. Synchronization is possible because each phasor measurement device time-stamps the data it collects using Universal Coordinated Time obtained from the global positioning system. Aggregating information collected simultaneously from many locations allows an operator to see conditions across an entire grid or grid segment to better understand conditions.

The ability to see conditions in real-time at multiple locations over a wide area helps an operator spot problems in the making and allows the operator to take steps to address the problem before it hits his facility. For instance, if the operator sees that stations are being overwhelmed along the grid due to a cascading power demand, he may opt to isolate or protect his equipment in some manner or bring up additional sources of electricity.

OBSTACLES DISAPPEARING

Interest in phasor systems has grown since the August 2003 blackout. The U.S.-Canada Power System Outage Task Force on the blackout noted that information was not efficiently shared among the organizations involved. Specifically, the task force noted there was "no consistent means across the Eastern Interconnection to provide an understanding of the status of the power grid outside of a control area."

For phasor technology to be used in a practical way, several enabling technologies need to be in place.

For one, there has to be an infrastructure that lets operators and sites share information collected by phasor measurement devices. Fortunately, some organizations have fiber-optic networks already installed, giving them a way to share information from various locations.

A second factor making phasor systems more practical is the availability of computing power to analyze information collected by phasor devices. "The more powerful computer systems that are available now let you make use of the information," said Johnson. The computing power is needed for both analysis and visualization of the data.

A third technical obstacle is interoperability. NERC is both an advocate and facilitator of the adoption and use of phasor technology. One of its roles is to make sure phasor technology works across interconnects and borders. "This is an international technology. We are seeing it being implemented around the world," said Johnson.

Much of the phasor work is being funded by the U.S. Department of Energy. Several major phasor programs are under way, including the Eastern Interconnection Phasor Project Plan and the Western Electricity Coordinating Council Phasor Network project.

As more phasor devices are installed and the technology becomes more common, "it will allow more information to be available to the operators," Sergel said. With this real-time information, the operators will then be able to make decisions that will help protect their systems, thus making the grid more reliable.



Richard Sergel
SOURCE: AP PHOTO / ROBIN NOWACKI