

Innovation

The Meter Is Running

EPRI Helps Utilities Tap the Potential of Advanced Metering Infrastructure

By Chris Warren

Twenty years ago, when Ed Beronet worked in the computer industry, he interviewed for a position at an electricity meter manufacturer doing embedded system programming.

“This job description struck me as odd. I looked at the meter on the side of my house, and it was a bunch of gears,” recalled Beronet, now an EPRI principal technical leader. “I wondered, ‘Why do we need an embedded system?’”

It was a reasonable question. At the time, electricity meters had changed little since the late 1800s, when Oliver Shallenberger invented the first polyphase meter for Westinghouse. That durable device used magnets, coils, and a spinning disk to measure the watt-hours consumed in residences and businesses. The answer to Beronet’s question during his job interview: A technological revolution in metering was about to make it cost-effective for utilities to replace millions of Westinghouse-style mechanical devices with electronic meters.

Today advanced metering infrastructure (AMI) is a major focus of policymakers, consumers, and an electricity industry intent on improving the power system’s efficiency, reliability, and flexibility. A recent EPRI survey of utility AMI purchases revealed that companies have spent between \$100 and \$500 on each meter and expect to devote between \$54 and \$275 per meter for operations and maintenance over the next 5 years. Transparency Market Research projects that the global market for smart meters will reach \$19.8 billion in 2018.

AMI presents many opportunities for utilities to enhance grid operations. For example, smart meter data can be used to optimize grid voltage, but EPRI research indicates that only about 10% of utilities use meter data for this purpose. AMI can also support recovery from storms and other events that interrupt service.

In 2015 EPRI launched an initiative to identify innovative uses of AMI data, develop robust standards that promote interoperability among AMI devices, and share best practices.

“Utilities need more awareness of grid conditions between the substation and the consumer, and AMI can help,” said Beronet.

Using AMI data, utilities can quickly identify and characterize the extent of power outages. AMI can also help manage sizable electric vehicle charging loads to benefit grid operations. For example, it could guide pricing to encourage charging when solar energy production is abundant, helping balance supply and demand.

Utilities’ ability to tap AMI’s potential is limited by proprietary technology and the lack of communications standards—challenges that EPRI is helping to address. “If all these devices ‘speak’ different communication protocols, there’s a lower probability that they will work together properly,” said EPRI Technical Executive Brian Seal. “Utilities end up with fewer choices of new devices and models that can be connected to AMI.”

The Wi-SUN Alliance™—a group of utilities, meter manufacturers, and other stakeholders developing common wireless communication standards for AMI and other applications—hosts events where vendors test interoperability of devices. EPRI is unique among participants in that it isn’t a buyer or seller of equipment.

“That gives us a unique role to help advance standards that do not favor a particular technology or cater to a particular utility need,” said Beroset.

To date EPRI is the only participant developing an open-source communications protocol to be [Wi-SUN CERTIFIED™](#). This can help drive new applications. “Users won’t have to go through the time and effort to translate the written standards and documents into code. They can build upon the open source code,” said Seal.

To help utilities make the best use of AMI, EPRI in 2014 created the AMI Industry Status Database. It includes 75 utilities operating 80 million meters and information on equipment deployed and applications supported. Utilities can log in at any time and update their AMI data and are using the database to determine how others are applying AMI.

“The vision is that it becomes a comprehensive guide on how to help optimize the value of your AMI,” said Seal.

EPRI is compiling best practices for all aspects of AMI operation and management in a series of guidebooks. One shows, for example, how to evaluate meters and other AMI equipment to determine when they are nearing the end of their useful service lives.

“Meters are geographically dispersed, and it’s expensive and time-intensive to replace a million of them,” said Beroset. “You want to know when to replace them well before large numbers are failing so you have time to plan.”

EPRI also tests how well the devices function, which is particularly important as new designs are unveiled. “If there is a high voltage surge of a certain shape and duration, what does it do to the product? If it gets hot outside, does that shorten the product’s life or cause the display to turn gray?” said Seal. “We are performing testing in these and many other areas.”

Key EPRI Technical Experts

Ed Beroset, Brian Seal