

A Smarter Grid

by Mike Lynch

TECHNOLOGY. IT CAN BE CHALLENGING, entertaining and even life changing.

From the computers we use for home and business, to the cars we drive, to the cell phones we are so attached to, as a society we often desire technology to make our lives easier, safer and more reliable. This is precisely what the Smart Grid hopes to achieve.

Though the term “Smart Grid” is becoming ever-increasingly recognizable, the understanding of its history, current implementation and outlook for the future remain somewhat cloudy. Defined, it is “the use of technologies that meet consumers’ needs reliably and affordably by more effectively monitoring consumer demand and system conditions on a near real-time basis.”

The U.S. Department of Energy lists seven functions of a smart grid: enabling informed participation by consumers; accommodating all generation and storage options; enabling new products, services and markets; providing power quality for the range of needs in the 21st century; optimizing asset utilization and operating efficiency; addressing disturbances-automated prevention, containment and restoration; and operating resiliently against physical and cyber attacks and natural disasters.

While most people may think Smart Grid originated only within the last few years, certain aspects of these technologies have been utilized for quite some time. In fact, East River Electric Power Cooperative, headquartered in Madison, S.D., has implemented Smart Grid techniques approaching 30 years.

In the early 1980s, East River Electric launched a system-wide demand response, or load management program. This energy efficiency initiative reduces power consumption by controlling when electricity gets used and reduces both power supply costs and costs for the end consumer. Since its inception, East River has saved its member owners more than \$115 million and currently controls 53,000 devices including water heaters, irrigation pumps, air conditioners and customer-owned standby generators.

Another example of existing Smart Grid applications is East River Electric and Rushmore Electric’s jointly owned Supervisory Control

and Data Acquisition (SCADA) system, which monitors the transmission system and controls devices out from the electric system.

“The cooperative’s ability to correct or isolate problems remotely using motor operated switches, faulted circuit indicators and computer-based protective relays allows us to restore power much more quickly,” said Jim Edwards, East River Electric assistant general manager-operations.

Channeling this information requires a dedicated telecommunications network, which includes fiber optic and microwave technology. This intelligent, self-diagnostic system is jointly owned by East River, Western Area Power Administration and Basin Electric.

Devices such as computer-based meters provide the ability to monitor the status of substations. Besides measuring electric usage, these state-of-the-art meters measure power quality, outages, disturbances and energy trending. Fulfillment of communications links into the substations also allows for the installation of advanced metering infrastructure, or AMI.

With AMI, there is a two-way communications link between the co-op and the end consumer’s electrical meter. AMI gives co-ops the ability to remotely read the meter to determine electrical usage and lessen electrical system demands by notifying customers when peak demand periods exist.

Sioux Valley Energy, based in Colman, S.D., was selected as one of the recipients of a grant made possible by the American Recovery and Reinvestment Act. The grant awarded Sioux Valley Energy \$4 million and includes installation of 23,000 smart meters. The project is expected to be completed within three years.

“The federal stimulus grant comes at a great time. A majority of our meters operate using older, more antiquated technology and have surpassed their projected service life,” said Don Marker, Sioux Valley Energy general manager. “The \$4 million grant helps ease some of the burden of replacing those meters.”

According to the Federal Energy Regulatory Commission (FERC), cooperatives’ advanced metering penetration increased from 3.8 percent in 2006 to 16.4 percent in 2008 – well above

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the industry as a whole. End consumers should see these constantly evolving technologies becoming more prevalent in their homes over the next several years.

Maurice Martin, program manager for the National Rural Electric Cooperative Association's (NRECA) Cooperative Research Network (CRN) in Arlington, Va., says that because Smart Grid is not a uniform, nationwide effort, different pieces of the Smart Grid will be deployed in different areas and at different rates.

Depending where consumers are located, they may see an in-home display (IHD) to find out when the cost of electricity has hit a peak period. "They then have the option to save money by turning off appliances until the peak has passed," Martin said.

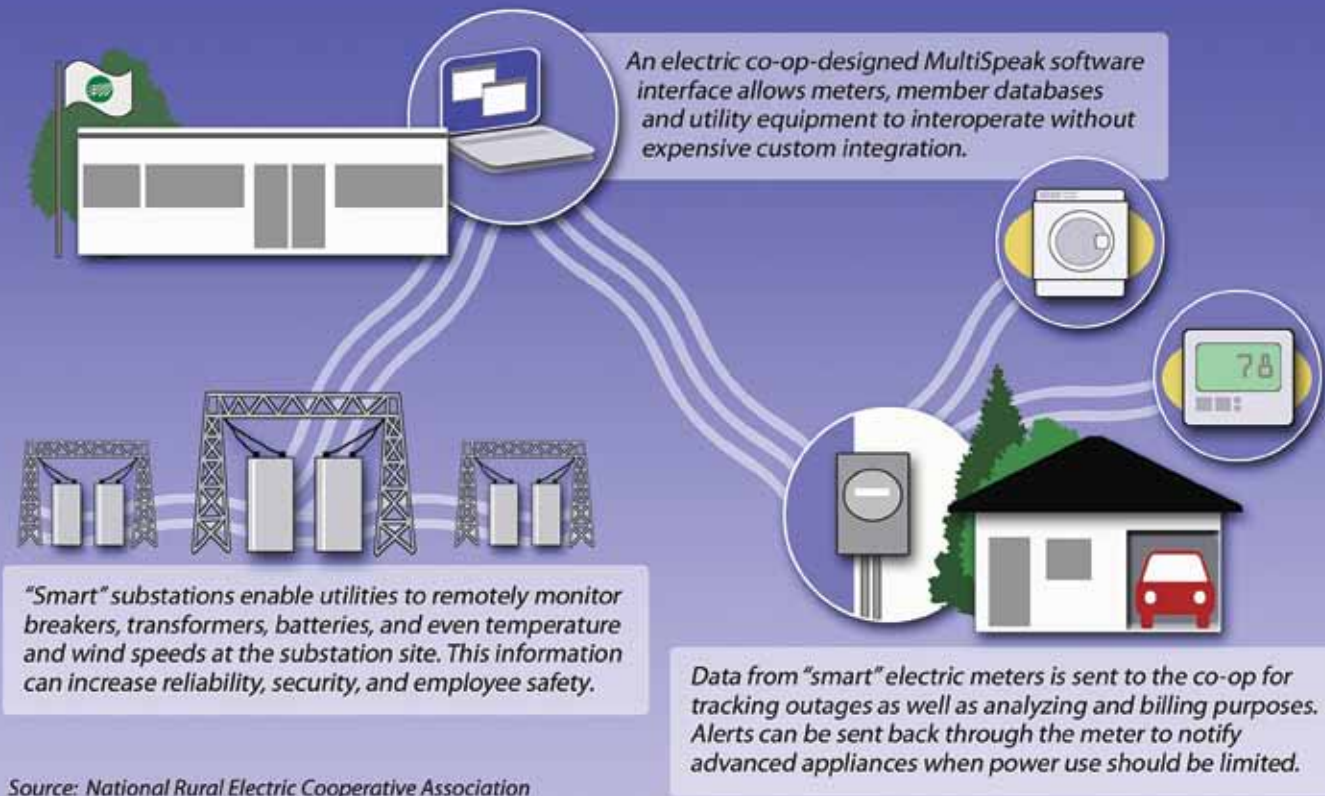
Adding another element to their smart meter project,

Sioux Valley Energy also plans to incorporate a pilot project which utilizes critical peak pricing and time of use rates. These rates would reflect actual cost at the time of use. Consumers will then have the option of delaying energy use during peak demand periods until rates are lower. In the future, "smart" appliances will be programmed to complement varying prices for electricity.

Though Smart Grid can be complex and potentially misunderstood, the cooperative perspective on this movement is unwavering according to Glenn English, NRECA CEO. "Electric cooperatives are proud to be included in the Administration's smart grid initiative and look forward not only to deploying new technologies, but also to advancing how to best extend the smart grid to rural America," he said.

The Smart Grid

By enabling both new and existing electric grid components to communicate with each other, electric cooperatives can better monitor conditions, collect information, and remotely control devices over a distribution network. Often called the *Smart Grid*, this system can use various technologies, as shown here.



Source: National Rural Electric Cooperative Association