SMART GRID 101

What it is, what it isn't, and what it means to co-ops

By Erin Huntimer

Buzz words and phrases have an uncanny ability to take on lives of their own. The latest buzz in the utility business is "Smart Grid," and it's making its way into the conversations of end-use consumers. For as much as the phrase is tossed around, it's not always clear what exactly it means.

It's time to tame the buzz by taking a step back and defining what the Smart Grid concept is, and what it means for co-ops and consumers.

What it is

The U.S. Department of Energy (DOE) commissioned a report in 2009 titled, "The Smart Grid: An Introduction." The report defines the Smart Grid concept by breaking it down into two components based on a timeline. The first, a "smarter grid," involves advancing technologies that are either already in place across the nation's electric power infrastructure, or will be ready to be deployed in the very near future. The smarter grid is more about harnessing efficiency gains in the short term.

The second, the Smart Grid itself, represents future technologies that will require wholesale changes in the way utilities do business and how consumers make energy choices. The report says to think of it as the Internet brought to the electric system.

Chad Reisenauer, Basin Electric key accounts/energy conservation coordinator, says some of Basin Electric's member cooperatives already have components of a smarter grid in place. "There are cooperatives out there that are certainly on the leading edge of technology. They've been operating complex communications infrastructure for quite some time, everything from SCADA systems, which is what we use to monitor and control our transmission lines, to the most advanced metering technology available today."

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>
> *Chad Reisenauer, Basin Electric*

These technologies include automatic meter reading, or AMR, primarily used to read the meters, and automated metering infrastructure, or AMI, which provides two-way communications that allows the cooperative to control electric equipment like water heaters and irrigation and grain drying motors. Reisenauer says the key to these smarter grid components is that they are all initiated by the utility.

The next step to a true Smart Grid will be technology that allows consumers to make energy choices that affect their way of life over the long term. According to the report, the Smart Grid will be an "automated, widely distributed energy delivery network characterized by the two-way flow of electricity and information, and will be capable of monitoring everything from power plants to customer preferences to individual appliances."

Future technology could allow the utility to directly send price signals to smart controllers on household appliances in a "prices to devices" arrangement, allowing consumers to operate appliances when the cost of electricity is lowest. "What it all boils down to is that it is going to empower consumers to become active participants in their energy choices to a degree never before possible," Reisenauer says.

But "smart meters" that enable this kind of exchange are only one piece of the Smart Grid concept. Other pieces include a wide array of technologies that enable the nation to integrate, interface with, and intelligently control things like large-scale energy storage, plug-in hybrid vehicles, renewable energy and more. Like the Smart Grid report says, think of it not as a "silver bullet," but rather "silver buckshot."

What it isn't

Sometimes it helps to define what something is by laying out what it is not. The term Smart Grid is not synonymous with National Transmission Grid. The two are different concepts. Mike Risan, Basin Electric senior vice president of Transmission, says the National Transmission Grid discussions encompass the bulk transmission grid

The Smart Grid will be characterized by a two-way flow of electricity and information and will be capable of monitoring everything from the power plants to customer preferences to individual appliances. Future technology could allow the utility to directly send price signals to smart controllers on household appliances, allowing consumers to operate appliances when the cost of electricity is lowest. (Source: "Smart Grid: An Introduction")

and enhancing its ability to deliver energy to load centers.

"The Smart Grid concept may affect the bulk transmission grid by ultimately lowering demand and affecting the generation you need, but it's more of a discussion on demand response rather than the wires themselves," Risan says.

Smart Grid also does not imply that the current transmission grid is necessarily dumb. On the contrary, Risan says it is already smart in its own right, in that it delivers power to where it's needed, and responds instantly to reroute power when some part of the system fails.

What's happening now

Electric cooperatives across the country are looking for ways they can implement Smart Grid programs and integrate new technologies into their current systems.

The American Recovery and Reinvestment Act of 2009 has funding opportunities for Smart Grid applications. From these stimulus funds, the DOE's Office of Electricity Delivery and Energy Reliability has issued a competitive Funding Opportunity Announcement for Smart Grid demonstrations.

Regionally unique demonstrations will be used to verify Smart Grid technology viability, quantify Smart Grid costs and benefits, and validate new Smart Grid business models at a scale that can be readily adapted and replicated around the country.

Several Basin Electric Class A member cooperatives are applying for these funds, including Tri-State Generation & Transmission Association, Westminster, CO; Rushmore Electric Power Cooperative, Rapid City, SD; and Powder River Energy Corporation, Sundance, WY.

Additionally, the Cooperative Research Network, or CRN, is working with the DOE and national laboratories. CRN is the research arm for the country's 900 electric cooperatives.

Chris Baumgartner, Basin Electric manager of member relations, is a member of the Energy Innovation Management Advisory Group for CRN. The group's mission is to evaluate consumer services and technologies that can improve energy efficiency, increase comfort and satisfaction, and lower costs. He says they're coordinating demonstration projects that could use stimulus funds to iron out the logistics of the Smart Grid. Some possible projects include:

- An end-to-end connectivity Smart Grid demonstration, where data acquired at any point in the G&T/distribution co-op system becomes available at any other point for the purpose of demand response;
- Utility-scale energy storage for grid and renewable support. This could help defer transmission and distribution system upgrades, reduce loads at congestion points, and reduce the impacts of integrating renewable energy.
- Plug-in hybrid vehicle demonstrations, where Smart Grid technology could best determine the time of day to charge the vehicle's batteries. The batteries could also be a source of generation during peak demand times.

Baumgartner says CRN is identifying cooperatives ideally situated to participate in such projects.

The CRN and DOE-funded demonstrations will also help identify concerns with the Smart Grid concept, such as national security, personal privacy, and how to deal with the massive amount of data generated by Smart Grid technology.

The Smart Grid report compares transforming the nation's electric power infrastructure into the Smart Grid of the future to the build-out of the interstate highway system or the development of the Internet: they required countless evolutionary steps. And so it is with the evolution of the Smart Grid.

Resources

"The Smart Grid: An Introduction," published by the U.S. Department of Energy, available at www.oe.energy.gov/smartgrid.htm

Cooperative Research Network, www.crn.cooperative.com (login required)