Boulder Boosts Smart Grid

CONTROLLING THE POWER NETWORK

BY KEN WILSON

AS A MEMBER OF THE Boulder City Council and as an electrical engineer deeply concerned about climate change, I am excited that Xcel Energy has chosen Boulder, Colo., as its “Smart Grid City” partner. I have seen Xcel change over the past four years from a power company opposed to renewable energy and energy conservation to a company that is a dedicated leader in wind power and a partner with environmental groups. Several months ago Xcel announced that it was in the process of deciding which medium-sized city in its service area would serve as its smart grid test bed. Recently, Xcel announced that the city would be Boulder with its population of 100,000 environmentally conscious citizens.

The term smart grid refers to an intelligent electric power distribution network that brings all aspects of the power network into conscious control by the power company and its customers. Xcel’s vision of a smart grid city is a fully network-connected distribution system from the smart substation to a smart meter at each home and business. The fundamental nature of the nation’s power grid and distribution networks has not changed much in the past hundred years. The question for years has been how to bring the power network into the 21st century with the help of high-speed computers and digital communications networks. If we can bring high-speed Internet capabilities to grade school children, why can’t we bring network computing to every element of the power system? The need for real-time control of power use and distribution is growing with the availability of intermittent renewable energy sources such as wind and solar. The advantages we can gain in demand-side management with a smart grid are less obvious, but no less intriguing.

Smart grid benefits include significant reductions in residential peak demand energy consumption through real-time price and environmental information and advanced in-home technologies; ability to use distributed generation technologies; as much as a 30 percent reduction in distribution losses from optimal power factor performance and system balancing; increased conservation options; reductions in outage time through prevention and faster response; deferral of capital expenditure for distribution and transmission based on improved load estimates and reduction in peak load; enhanced demand management; and cost savings from remote and automated disconnects and reconnects.

The elements of a smart grid include powerful meters for two-way communication; intelligent homes and smart appliances; demand side management and distributed generation; automatic correction for voltage, frequency and power factor issues; affordable energy storage devices; smart substations; smart distribution elements; and high-speed data links to connect all the elements. Xcel says that together with its partners it will invest about $100 million in the next few years developing and installing the technology and elements for the smart grid.

In renewable energy circles we have talked for years about the advantages of plug-in electric cars that could charge batteries at night when power is cheap to generate and discharge some of that stored power back into the grid during the peak load periods in late afternoon and early evening. To effectively accomplish this, we need a smart grid that can work with the customer to allocate stored power to the grid or save it because the family plans to drive to an evening party. We have always blithely assumed that the car’s batteries would be available to serve the grid, not acknowledging that the car’s owner might have some say in how much charge their car battery has at any time. The smart grid can help turn the advantages of plug-in cars into reality. Boulder should be a good location for this type of experiment as our climate-conscious citizens are traditionally early adapters of new energy-saving technology — witness the hundreds of Toyota Prius hybrids running around town.

There are other reasons why Boulder will make an excellent smart grid city test bed. We have the University of Colorado, which will be part of the smart grid, with its many renewable energy and energy conservation programs. We have not-for-profit organizations such as Western Resource Advocates and the Southwest Energy Efficiency Project in town. We have an active governor’s energy office that is eager to work with Boulder and Xcel. And we have a city council and city staff that are eager to partner with Xcel on this exciting journey.

Ken Wilson is a member of the Boulder, Colo. city council and an electrical engineer. He has worked at Bell Labs.
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