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POWER HUNGRY: REINVENTING THE U.S. ELECTRIC GRID

by Jeff Brady

An Aged Electric Grid Looks To A Brighter Future

“Smart grid is like taking us from the rotary dial phone, to the iPhone overnight.”

Sandy Simon, director of utility innovations and SmartGridCity at Xcel Energy

In a series of stories airing this week on Morning Edition and All Things Considered and published here on NPR.org, we examine the costs, the politics and other challenges of upgrading the country’s electricity grid.

Xcel Energy’s SmartGridCity is a \$100 million project to create a new kind of electricity grid that can monitor and manage itself. The silver box on the utility pole is about 12 inches by 15 inches, and it’s one of several thousand points where data is collected, then sent to computers that run the grid.



Jeff Brady/NPR



Jeff Brady/NPR

Ray Toumey of Boulder, Colo., volunteered to have sensors installed on his heating and air conditioning unit and on his clothes dryer. He can monitor how much electricity

he’s using from a computer. By using the sensor technology, he discovered his air conditioning unit was using a little bit of power, even though it was turned off. He stopped that by switching the breaker to the device.

Xcel Energy and GridPoint are installing batteries the size of a small refrigerator in customers’ homes in Boulder, Colo. The devices can store excess wind or solar energy, and then release it later when the customer or the utility needs it.

Morning Edition, April 27, 2009

The nation’s electricity grid is facing some huge challenges — it’s outdated and unprepared for increasing demand and a future that includes more renewable sources of energy. In a weeklong series, NPR is examining the state of the nation’s electricity infrastructure.



Jeff Brady/NPR

The economic stimulus bill passed in February includes \$11 billion to upgrade the country’s power grid, but that’s just a down payment on a massive undertaking. That’s because when it comes to electricity, not much has changed since Thomas Edison fired up the first commercial power grid in lower Manhattan on Sept. 4, 1882. The fundamentals he pioneered are still the basis for an electricity grid in the U.S. that is almost 100 percent reliable. But in recent years, that grid has started showing weakness.

On Aug. 14, 2003, a lot of people in the northeastern U.S. learned that they couldn’t take reliable electricity service for granted anymore. A utility in Ohio failed to trim a few trees, causing a surprise outage that rolled across the region. Eventually, it left 50 million people without power for about a day. The risk of blackouts still exists in just about every region of the country.

“At this point, I think we are most vulnerable in our inability to quickly build transmission lines where we have congestion,” says Arshad Mansoor, a vice president at the Electric Power Research Institute. Mansoor’s group predicts that without big changes, the grid will become increasingly unreliable within just a few years.

He says the vulnerabilities are most evident in parts of the country with a lot of people, like New Jersey, New York and

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Washington, D.C., and other areas of the Northeast, as well as West Coast cities like Los Angeles and San Diego.

Not Ready For The Future

The existing grid also is not ready for a future that includes more wind and solar power. That's because keeping a grid running is a delicate balancing act — to avoid outages, the amount of power you put in must equal the amount taken out.

So the electricity you're using right now was created just a few seconds ago — most likely at a coal or gas-fired plant that an operator can ramp up or down to meet demand. But renewable energy sources, like wind or solar power, don't work like that.

“On [some] days, you would be lucky to predict wind at 10 percent accuracy,” Mansoor says. With difficult-to-predict demand on one side and difficult-to-predict production on the other, it could be almost impossible to manage the grid manually in the future. That's where something called the smart grid comes in.

Digitizing The Grid

In its most basic form, the smart grid adds a computer cable to the electrical wire. With data points all along the system, computers can then manage the grid much faster and more efficiently than humans could.

Boulder, Colo., is set to become the first U.S. city with a smart grid. The local utility, Xcel Energy, has upgraded much of its network in the city and is in the process of installing new meters that also will give customers and the utility a lot more information about how and when energy is used.

Eventually, Boulder customers will be able to log onto a Web site at work and change settings for appliances and their heating system. And the utility will be able to tap into electricity stored in customers' plug-in electric hybrid cars during peak demand times.

The smart grid “is like taking us from the rotary dial phone to the iPhone overnight,” says Sandy Simon, director of utility innovations and SmartGridCity at Xcel Energy.

Not only that, but it's expensive — more than \$100 million just in this city of 100,000 people. Imagine every home, business, utility pole and substation in the country, and you start to get a sense of how much this undertaking will cost.