

BACON'S REBELLION

The Op/Ed Page for Virginia's New Economy

Brainy Power

Dominion's proposed \$600 million investment in a "smart grid" is the first step toward an electric power system in which conservation and renewables have equal standing with coal and nukes.

By James A. Bacon

The \$600 million that Dominion Virginia Power wants to invest in creating the rudiments of a "smart grid" is a fraction of the \$1.8 billion the power company plans to spend on a new coal-fired power plant in Wise County -- and a drop in the bucket next to the multi-billions it will pay one day to build a third nuclear generator at its Lake Anna facility. But in the long run, that \$600 million will do more to change the way Virginians think about, and interact with, electricity than any power plant ever could.

In its early phases, Dominion's version of a "smart grid" will be visible mainly as a "smart meter" where the electric current comes into your home. That meter will allow Dominion to save a modest amount of electricity by fine-tuning the voltage it delivers through its distribution lines and will save a lot of labor spent reading the meters every month. You probably won't notice much difference in the way things work.

But the smart meters will do one other very important thing: They will make it practicable on a large scale to implement rate programs that reward households both for conserving energy and for deferring electric consumption, like running the clothes drier, to times of day when it's cheaper for the power

company to produce electricity. In the long run, the meter at your back door could become a nerve center for converting your residence into a "smart house" where your HVAC, refrigerator and other appliances collaborate to conserve energy.

"Today, the utility industry views the meter as an end point of the [electric distribution] system," says David Green, Dominion Virginia Power's senior vice president-customer service. As manufacturers increasingly embed consumer appliances with chips, they'll be able to communicate. "With a smart grid, the meter becomes a network node within the distribution system that can talk to appliances, pool pumps, water heaters and air conditioner units."

Imagine that: the smart grid as an electrical distribution system that extends into your house and interacts with your appliances to utilize electricity more efficiently. And that's just the beginning.

Saifur Rahman, an engineer with Virginia Tech's Advanced Research Institute in Arlington, says that it is a misnomer to describe Dominion's plan as a "smart grid." Smart meters, yes... But smart grid, no.

Rahman visualizes sensors and intelligent controllers installed at every point of the electric power system: generators, transmission lines, sub-stations, distribution lines and the home. Such a

system would be "self healing" -- capable of detecting disruptions and bypassing the affected area -- and it would integrate variable power sources such as wind and solar power into a smoothly functioning whole.

For anyone who wants to see Virginia move toward clean, renewable energy sources, that last point is critical. Wind turbines spin electricity only when the wind is blowing. Solar units generate power only when the sun is shining. It is Dominion Virginia Power's mandate to keep the lights on no matter what. It will take a highly sophisticated grid to ensure that conventional power sources kick in to supply juice where it's needed, when it's needed to back up the renewables.

But that's in future. For now, Dominion has presented a plan to the State Corporation Commission to take the first tentative step.

Green, the DVP official, says the smart meter will reap immediate efficiencies that will pay back \$1 billion over 15 years. He checks off the following:

- **Meter reading.** Currently, DVP dispatches meter readers to drive down streets and read meters by means of a short-range electronic signal. That's more efficient than the older method of inspecting meters visually, but moving to centrally monitored smart meters is more efficient still.
- **Remote turn-on.** When people move in and out of their residences, DVP can turn service on and off from

the office without the need to dispatch someone to do it manually.

- **Voltage conservation.** By delivering a more precise voltage to the home, DVP can save energy. To maintain uninterrupted service against the background of burps, hiccoughs and other fluctuations in demand, DVP typically supplies marginally more electricity than customers actually consume. By gauging changes in demand with more precision, the smart meters will reduce the voltage cushion needed to ensure reliable service. That will translate directly into less electricity generated and fuel consumed.

Smart meters also will improve service when storms knock out service. DVP already has sensors that detect when large outages occur, but they can't tell when individual houses are affected. The smart meters will supply that information.

The full impact of smart meters won't be felt, however, until DVP implements "demand-response" programs on a wide scale. Dominion has already embarked upon a pilot program to equip homes with monitors that show customers how much electricity they're consuming at any point in time. But the holy grail of demand-management programs is variable pricing -- charging different rates depending on what it costs DVP to supply power at any given point in time. The goal is to incentivize customers to conserve or to shift electric consumption to off-peak periods when the cost of power generation is only one third or one quarter of the cost during peak periods.

Savings from the smart meters and a clutch of other energy

conservation measures -- incentives for EnergyStar appliances, carbon fluorescent lights, energy audits and the like -- could reach 2.6 million megawatt-hours annually by 2013, the company says. That's enough to power 216,000 typical homes.

DVP's energy conservation initiatives will eliminate the need for two small power stations in the future and delay the need to build two others, Green says. Those plants haven't been announced, but they are part of DVP's 15-year integrated resource plan.

Longer-range, DVP is preparing for the advent of hybrid plug-in vehicles, which will transform the economics of electric power generation. Says Green: "Most manufacturers are expecting plug-in hybrids to be available on a widespread basis in the 2010-2011 time frame. ... We were in Detroit just a couple of weeks ago. The mass production is coming from all of the major manufacturers in two or three years. We have to anticipate it. If we don't, it will exacerbate our peak. ... We want to be at the table with General Motors."

What concerns DVP is the prospect of hundreds of thousands of commuters returning home from work after 5 p.m., when summer air conditioning is already stressing the system, and plugging in their cars to recharge their batteries. On the positive side, variable pricing will encourage customers to defer the re-charge until later in the evening, or possibly to let their hybrid cars feed the grid with electricity from their batteries during peak periods and recharge when demand slacks off. "The ability to send pricing signals is instrumental to this," says Green.

The SCC has been following the dialog over smart grid technol-

ogy, says SCC spokesman Ken Schrad, and the staff sees potential to use price signals to encourage customers to shift electricity demand to off-peak periods. However, a number of regulatory issues need to be worked out. Summarizes Schrad:

- What is the best method for determining if a given conservation program is fair, cost effective and efficient?
- How should power companies be allowed to recover the costs of such programs? Should demand response/energy efficiency programs be put on an equal footing with building new generation and transmission facilities?
- How should rate schedules be structured to send the right price signals to customers to take full advantage of smart grid technologies and shift demand to desired times of the day?

Given the political imperatives of ensuring reliable electric supply and protecting consumers from rate hikes, Virginia is likely to proceed one step at a time, testing and piloting each new initiative carefully. But over the next 10 years, the "smart grid" should make our current system look very much like a dim bulb indeed.

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