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Making the Consumer an Active Participant in the Grid

By ERICA GIES

SAN FRANCISCO — The chairman of the Federal Energy Regulatory Commission, Jon Wellinghoff, is a lawyer and a public servant. But he is also a visionary, which makes him something of an oddity.

In his view, the energy future of the United States looks radically different from its past. Most notably, he sees consumers as active parts of the grid, providing energy via their own solar panels or wind turbines, a system called distributed generation; stabilizing the grid by adjusting demand through intelligent appliances or behavior modification, known as demand response; and storing energy for various grid tasks. He thinks consumers should get paid to provide these services.

While energy buffs have been trying to implement many of these ideas for some time, Mr. Wellinghoff, with his solid experience in renewable energy and efficiency, is now in a position to make it happen.

The commission is a regulatory agency, charged with setting wholesale electricity rates, among other energy policy chores. Its commissioners are appointed and can make sweeping policy changes with long-term effects. Mr. Wellinghoff was made commissioner by President George W. Bush and promoted to chairman by President Barack Obama. His term expires in 2013.

With a U.S. climate-change bill apparently dead and coming international climate talks in Cancún, Mexico, expected to go nowhere, this commission's stated commitment to integrating renewable energy into the electricity network, improving grid efficiency and transmission and other related policies could be one of the main ways for the United States to reduce its greenhouse gas emissions significantly.

Seemingly a true believer in the market, Mr. Wellinghoff said he saw no conflict between the commission's regulatory and promotional roles. "As long as we're promoting competition, which will ultimately ensure that consumers have lower prices over all, I don't see any conflict at all," he said. "I believe that for markets to be competitive, we need to have as many different types of resources in those markets as possible."

Additional transmission will be required to convey renewable energy from sun and wind belts to

population centers. The commission is evaluating barriers that hinder renewable energy developers from connecting to transmission wires. “One thing that we learned was that if you schedule the grid only every hour, you don’t take into account the variability of wind, for example,” Mr. Wellinghoff said. “So it makes more sense to schedule the grid, say, every 10 minutes or every 5 minutes.”

Of course, nobody wants large power lines in the backyard. For that reason, the choosing of sites for transmission posts often involves long legal battles. Lawyers have also been summoned to protect the fragile habitats of endangered and at-risk species, like the desert tortoise or the sage grouse, from large solar or wind developments.

Such conflicts generate calls for distributed generation: primarily rooftop solar and wind. Mr. Wellinghoff supports distributed generation as one of many energy resources that enhance competition.

“We’re doing what we can to the extent that we have jurisdiction to ensure that there are no barriers to distributed generation becoming part of wholesale markets,” he said. “One of the things that could be done is to put in place payments to distributed generators who have excess power. That recognizes the economic benefit that they provide to the grid.”

The agency, he said, could potentially order the wholesale markets to implement such tariffs, which would fluctuate with the market. Such a rule could extend to anybody with the ability to reach the wholesale market, even individual homeowners, Mr. Wellinghoff said.

Another potential income source for rate payers is demand response.

Demand response would help stabilize the grid by encouraging consumers to, say, run their dishwashers late at night when power is less expensive. It also requires improving appliance technology so that water heaters, air-conditioners, refrigerators and the like can incrementally regulate their demand, reducing the need for human intervention.

Mr. Wellinghoff said that establishing a federal framework to give demand response a way to tap wholesale markets would be the single most effective thing the commission could do to reduce U.S. greenhouse gas emissions.

“To the extent that you can put demand response in the system — that is, have consumers control their loads at times when the system is stressed — you can reduce substantially the amount of fossil fuel generators that are needed to relieve that stress,” he said.

That is because peak demand is currently met by ramping up fossil fuel plants, primarily natural gas.

“When those combustion turbines are running up and down to try to meet those loads, they’re

putting out emissions like a coal plant, not like a gas plant, because they're running very inefficiently," Mr. Wellinghoff said. "So you can take those inefficient units off the top of that stack and save a tremendous amount of emissions."

Some states, including those in the New England and the Mid-Atlantic regions, already have wholesale programs in which individual consumers and companies can participate in energy saving measures directly.

"It's very effective," Mr. Wellinghoff said. "They're reducing loads by 3, 4, 5 percent."

The commission has the authority to set rates in those markets and has proposed a rule that would mandate that consumers who are providing demand-response service to wholesale markets receive as much compensation as energy generators.

Mr. Wellinghoff goes even further, saying consumers should probably earn more because they have the potential to provide service to the grid faster than gas plant generators, which take a few minutes to respond.

"If a battery or a dishwasher or a water heater or an aluminum pot or a compressor in a Wal-Mart can respond on a microsecond basis," he said, "and it takes the generator a minute to respond, that faster response should be rewarded a higher payment because, in fact, it's providing a better service."

Electric-car owners could also earn payments while charging, an approach that Mr. Wellinghoff has dubbed the cash-back car.

"We've got seven cars at the University of Delaware that plug in every night that charge in a four- to six-hour period," he said. "And while they're doing that, they're providing regulation service back to the grid."

For that, he said, the owners were getting paid $7 to $10 dollars per day per car.

While some engineers say that plugging electric cars into the grid would quickly kill their battery, Mr. Wellinghoff contended that was not the case, because the battery was not going through a deep cycle.

Providing frequency regulation would not prevent the consumer from having a fully charged car and its economic dividend could potentially compensate for the higher cost of an electric car as compared with a standard car in four to seven years, he said.

Energy storage is another resource that will become more common in this new energy world. Grid-scale storage, which include things like pumped storage hydroelectricity, compressed air, flywheels and large batteries, can help operators better smooth out shifts in supply and demand,

whether it be minute by minute or by time of day, week and year. These services will become even more necessary with the widespread deployment of renewable energy.

For the moment, storage developers in most markets have no way of getting paid for these services because storage is not a recognized asset. That could change soon.

“We’re reviewing the economic benefits of storage and how storage should be compensated for the various services it can provide to the grid,” Mr. Wellinghoff said.

He said that beyond grid-scale energy storage, he was “starting to see more and more people who have very creative ideas of using distributed storage in ways that I think will become very economical.”

“For example, the electric cars, which are a kind of storage, benefit the grid because the device, the car, is being primarily used and bought for something else,” he said.

Thermal storage technologies, including ice and ceramic bricks, are also could have a wide effect because they are integrated into the grid and focus on off-peak power.

No energy discussion is complete without mentioning efficiency. Mr. Wellinghoff is working on measures to increase efficiency throughout the energy system, including end users. He said that he expects smart grid developments to increase consumer efficiency painlessly.

“I think we’re going to have a huge opportunity to drive down consumer usage by providing them with more information and more tools to control their loads and to understand how, by controlling those loads, they can also then make money in real time,” he said, “like they’re doing with these cars in the grid.”

Opower, an energy efficiency company based in Arlington, Virginia, is already doing this, he said. The company takes utility consumption data for residential consumers and matches it with census data, meteorological data and other information to find a group of similar homeowners. It pinpoints the people who fall out of the norm and then contacts them with tips for reducing energy usage.

It is essentially a numbers’ game: with the help of behavioral science, Opower has gotten as many as 80 percent of targeted households to reduce their consumption by a few percent. As data become more accessible, opportunities to find further efficiencies will only increase, Mr. Wellinghoff said.