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Wind energy turns out to have a complication: reliability

By Matthew L. Wald

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Wind, almost everybody's best hope for big supplies of clean, affordable electricity, is turning out to have complications.

Engineers have cut the cost of electricity derived from wind by about 80 percent in the last 20 years, setting up this renewable technology for a major share of the electricity market.

But for all its promise, wind also generates a big problem: Because it is unpredictable and often fails to blow when electricity is most needed, wind is not reliable enough to assure supplies for an electricity grid that must be prepared to deliver power to everybody who wants it — even when it is in greatest demand.

In Texas, as in many other parts of the country, power companies are scrambling to build generating stations to meet growing peak demands, generally driven by air-conditioning for new homes and businesses. But power plants that run on coal or gas must "be built along with every megawatt of wind capacity," said William Bojorquez, director of system planning at the Electric Reliability Council of Texas, a power grid that covers most of the state.

The reason is that in Texas, and most of the United States, the hottest days are the least windy.

As a result, wind turns out to be a good way to save fuel, but not a good way to avoid building plants that burn coal. A wind machine is a bit like a bicycle that a commuter keeps in the garage for sunny days. It saves gasoline, but the commuter has to own a car anyway.

Xcel Energy, which serves eight states from North Dakota to Texas and says it is the nation's largest retailer of wind energy, is eager to have more. Wind is "abundant and popular," said Richard Kelly, the chairman, president and chief executive, speaking at a recent conference on renewable energy.

Frank Prager, managing director of environmental policy at the company, said that the higher the reliance on wind, the more an electricity transmission grid needs to keep conventional generators on standby — generally low-efficiency plants that run on natural gas and can be started and stopped quickly.

He said that in one of the states the company serves, Colorado, planners calculate that if wind machines reach 20 percent of total generating capacity, the cost of standby generators will reach \$8 per megawatt hour of wind. That is on top of a generating cost of \$50 or \$60 a megawatt hour, after including a U.S. tax credit of \$18 per megawatt hour.

By contrast, electricity from a new coal plant currently costs in the range of \$33 to \$41 a megawatt hour, according to experts. That price, however, would rise if the carbon dioxide produced in burning coal were taxed, a distinct possibility over the life of a new coal plant.

Without major advances in ways to store large quantities of electricity or big changes in the way regional power grids are organized, wind may run up against its practical limits sooner than expected.

At a recent discussion of clean energy technologies at General Electric's research center in Niskayuna, New York, Dan Reicher, an assistant secretary of energy for conservation and renewable energy in the administration of President Bill Clinton, predicted that renewables, led by wind, could reach 20 percent of demand in the next decade or two. President George W. Bush has also said that wind could supply 20 percent of the nation's electricity.

But Reicher drew a quick response from James Rogers, chief executive of Cinergy, one of the nation's largest utilities, and chairman of the Edison Electric Institute, the industry's trade association. "I love his optimism," Rogers said. "But unfortunately, I have to deliver electricity every day."

Rogers said that wind and another big renewable source that is available only when nature cooperates, solar power, would be necessary because the government would eventually regulate carbon emissions from coal-fired power plants. He later said that his reply to Reicher had been a "cheap shot," but that he and others were still wondering how much wind the nation can absorb.

General Electric, a major manufacturer of wind machines, says that along with lowering the price for a megawatt-hour, engineers have made other improvements in wind machines. With better electronic controls, many of them now help stabilize voltage on the grid, and have been cured of their tendency to shut off when detecting a voltage fluctuation, a problem that can escalate into a blackout.

The economics of wind would change radically if the carbon dioxide emitted by coal were assigned a cash value, but in the United States it has none. Coal plants produce about a ton of carbon dioxide each megawatt hour, on average, so a price of \$10 a ton would have a major impact on utility economics.

Another possibility is energy storage, although this presents other difficulties.

In May, Xcel Energy and the Energy Department announced a research program to use surplus, off-peak electricity from wind to split water molecules into hydrogen and oxygen. The hydrogen could be burned or run through a fuel cell to make electricity when it was needed most.

Xcel plans to invest \$1.25 million, and the government \$750,000. But storage imposes a high cost: about half the energy put into the system is lost.

The Electric Power Research Institute, a nonprofit consortium based in California that is sponsored by the utility industry and its suppliers, said that existing hydroelectric dams could be used as storage; they can increase and decrease their generation quickly, and each watt generated in a wind machine means water need not be run through the dam's turbines; it can be kept in storage, ready for use later, when it is most needed.

The institute listed another possibility, still in the exploratory stage: using surplus electricity made from wind to pump air, under pressure, into underground caverns. At peak hours, the compressed air could be withdrawn and injected into generators fired by natural gas.

Natural-gas turbines usually compress their own air; compression from wind would cut gas consumption by 40 percent, the institute said.

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