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## You Do Have to Know Which Way the Wind Blows on the Grid -- Study

By PETER BEHR of [ClimateWire](#)

How and when the fickle winds blow are increasingly critical issues for operators of the nation's electricity grid, concludes a new 10-year assessment of regional outlooks for renewable energy.

The questions already matter to the energy companies, funds and speculators that trade more than \$500 billion in over-the-counter electricity contracts annually.

The North American Electric Reliability Corp. released this week its annual assessment of the long-term vulnerabilities of its eight regional grid organizations and asked them to consider a scenario with 15 percent of electricity output coming from renewable generation -- primarily wind.

Meeting the 15 percent target for renewable electricity output by 2018 would require more than 95,000 megawatts of new wind and solar generating capacity, or nearly one-quarter of all power plant capacity, NERC said. "Significant operational challenges are expected," it said. (One of the eight NERC organizations, SERC Reliability Corp. in the Southeast, chose an alternative scenario that relies on doubling its nuclear power capacity.)

The report again stresses the need for more transmission lines, both to maximize the potential for wind and solar generation and to reduce threats to the transmission



grid from overloaded lines. "The [renewable] generation usually gets built first, and the transmission may follow months or years later," the NERC report says.

Texas, one center of wind power production, will require 660 miles of high-voltage alternating and direct current lines, including a direct DC link from Western wind centers to Houston, NERC said. Wind generation in the Great Plains -- the other wind hub -- grew by 50 percent between June 2008 and this past June, and could grow to 32,100 megawatts in 2017, meeting 42 percent of electric power requirements, under that region's scenario.

If you build it, when will the lines come?

"There would be a need for tremendous transmission facility additions to accommodate the added wind resources. However, at this time there are no plans that indicate which types of facilities or who and when any of them would be constructed," NERC said.

But along with the familiar warnings about transmission shortages, NERC's report also gives a hard push to the need to improve wind and weather forecasting.

"Although accurate wind generation forecasts have been routinely achieved 24 to 48 hours out in the future, wind cannot be forecast with any accuracy out two to three weeks, which is the time frame required to assess transmission maintenance outages," the report by the Princeton, N.J., grid monitor said.

Better short-term forecasts also are needed. NERC's report notes an "urgent need to better forecast wind speeds that results in a more accurate hourly wind generation profile."

"As wind generation penetration levels increase, the forecast accuracy becomes essential to operate a reliable system," NERC added.

Lanny Nichol, vice president of operations for the Southwest Power Pool Inc., said the rapid growth of wind power has not created any general reliability or power line congestion problems. The Little Rock, Ark., regional reliability organization straddles the lower Mississippi River area. "So far, we've been fine. We haven't had to take extreme aggressive actions" to reduce line congestion or balance the system

because of sudden shifts in wind output, Nichol said. He acknowledged a few "uncomfortable" moments.

But wind power is projected to grow rapidly in his region. "We are still exploring and investigating and analyzing what it would take to continue to integrate an increase number of renewable resources into our footprint," Nichol said.

Better data and forecasts may reduce power bottlenecks

SPP and other grid operators are developing more sophisticated forecasting models.

The challenge of mastering wind prediction is attracting commercial innovations. This week, Genscape's Enva marketing intelligence group and WSI Corp. announced a new analytical tool that will provide seven-day hourly wind forecasts, updated throughout the day.

Enva's contribution comes from several thousand sensors it has deployed around the country, which read the power flows on high-voltage transmission lines leading away from wind farms and other generator sites, said Hudson Gilmer, Genscape's managing director for North America. "We have the ability to monitor directly the output of wind farms," Gilmer says.

This enables it to combine wind data, hourly changes in power line congestion, and spot wholesale electricity prices at "nodes" or transmission line hubs where traders and utilities buy and sell electricity. The forecasting systems are being offered in Texas and the Great Plains-Midwest regions.

In the Midwest, there are hundreds of individual nodes that have their own price points, Gilmer said. "A lot of traders will trade spreads between several nodes." The company's forecasting tool is designed to predict how changes in wind production could cause prices to separate between two nodes, he said.

The rapid growth of wind power in both regions is producing dramatic spreads in wholesale power prices in Texas and the Midwest, and transmission line congestion is the key element. "Certainly, the increasing wind generation has contributed to transmission congestion and created operational issues that have to be managed," said David Patton, president of Potomac Economics, the independent market

monitor for the grid networks in Texas, New England and the Midwest, and the market adviser in New York state.

### Strange economics blowin' in the wind

On Feb. 24 this year, at 9:30 a.m., for example, wind generation west of Minnesota's Twin Cities was so plentiful relative to demand that wind farms were paying more than \$10 an hour to utilities to take their electricity. Wind generators can afford to sell at a small loss because they make \$19 a megawatt-hour from a federal production tax credit.

But congested power lines prevented the excess wind from moving through northeastern Iowa toward population centers in the Midwest, where prices jumped above \$40 a megawatt-hour in that hour.

"If we see day ahead pricing that is negative or below a certain threshold, we make the assumption in our forecasts that some or all of the wind generation in that region will not run," Gilmer said. "You don't have enough transmission capacity to carry all that wind power."

"Wind is having a pretty remarkable impact on the grid in a number of places," said one executive of a power trading firm, who was not authorized to speak for attribution. "If it's not blowing in West Texas, prices there will be the same as in Houston." But when the wind picks up, the prices split apart, he said.

Understanding -- and accurately predicting -- how wind shifts affect prices is a central issue to the future stability of the grid, and not just the profit goals of traders, grid officials agree.

Coal-fired power plants cannot be ramped up and down efficiently or effectively by the hour or the day to match swings in wind generation. So grid managers may have to choose which kind of power is crucial to keeping the grid operating safely. As wind power expands, so will natural gas-fired generation, NERC predicts, and that could make electricity markets more vulnerable to the volatility of gas prices, or compel utilities to invest in gas pipelines or storage, the organization said.