

Land of Ten Thousand Turbines?

Minnesota is known as the “land of ten thousand lakes.” Given the rapid growth of the state’s renewable energy sector will it soon become the “land of ten thousand turbines?” More than 1400 wind turbines now generate 1800 MW of electricity -- providing 7.5 percent of the state’s power. Renewable market experts rank the state ninth in the nation for wind energy potential, yet Minnesota currently ranks fourth in the country for installed wind power capacity.

Under the state’s renewable energy objective, among the most ambitious in the nation, 25 percent of the state’s power must be provided by renewables by the year 2025. To meet this goal, Minnesota will need to install another 5,000 MW of capacity over the next 15 years according to Mark Rathbun, who is the Renewable Energy Project Leader for Great River Energy, one of the state’s leading utilities. This aggressive goal exceeds the national target set by the U.S. Department of Energy of 20 percent by 2030.

Monitoring Wind Output

Like any large energy project, building a wind plant is a complex undertaking. It involves balancing issues that include proximity to transmission lines, securing access to capital, and negotiating site, zoning, and environmental permits. One factor given relatively little publicity is communication. Modern next-generation wind turbines are much more complex than older models, and they require constant monitoring to optimize output and maximize revenue. Turbine manufacturers, developers, and operators measure dozens of statistics at each turbine location, including electric output and mechanical and hydraulic factors like yaw, noise, and pitch. This constant stream of data requires high-performance communications.

New Communications Challenges

Fiber optic communications has been an established norm in the domestic wind industry for years, but that paradigm could shift as other technology alternatives mature. Globally, wireless communication systems are as likely to be utilized as fiber. As international and more experienced wind developers and owners bring projects to the American market, the use of wireless technology for data transmission will become more common.

Wireless has inherent advantages over other forms of landline communication. Foremost is its ability to avoid trenching and re-trenching costs. Once the wireless cloud is in the air, any moves, additions or changes can be done without dispatching the backhoe. Maintenance is easier than fiber optic cable. Gophers don’t eat it. Backhoes can’t run over it. And wireless avoids the considerable damage and deterioration that naturally occurs with fiber. Wireless also sup-

Wind generators and wireless networks are poised to push Minnesota to the lead among renewable integrators.



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ports mobility workforce applications and provides coverage both inside and outside a wind plant on the same uniform network.

Wireless Case Studies

In Minnesota, wireless communications already supports wind farms. These farms are part of one of the nation's largest smart grid networks (and perhaps the only state-wide smart grid network in the country). This high availability, high-speed, private network was built for Great River Energy and its member co-operatives. It supports NIST communications and security standards, such as DNP3.0, 802.x, 802.11, IPSEC, and SSL, and provides high-speed connectivity to over 16 utilities operating a variety of smart grid applications, including mesh and PLC based AMR/AMI, SCADA, video surveillance, VoIP, and remote workforce management.

The American Wind Energy Association (AWEA) named Great River Energy 2009 "Rural Electric Cooperative Utility of the Year" for being the electric co-op using the most wind in the United States. Great River Energy purchases power from six different wind plants, totaling 318 megawatts. Several of its sub-stations, each equipped with a wireless modem, serve as junction points for the transmission of turbine data. Arcadian Networks provides the network backbone for 535 sub-stations located throughout Great River Energy's 56,000 square mile service area. Currently, wind plants are incurring the cost and limitations of using fiber optic cable to transmit data into the grid. Whether this arrangement will continue depends upon the continuing evolution of wireless. The innovative use of wireless technologies in Minnesota is paving a new path and creating a strategically relevant business model for the use of wireless networks as a primary carrier of wind data.

Beyond Minnesota

With 28 states now mandating renewable portfolio standards, and new North American Electricity Reliability Corporation (NERC) standards calling for ten minute forecasting requirements, wireless solutions that allow independent turbine readings and off-site weather readings will soon become an operational necessity. The move to wireless is a "natural and beneficial progression" according to Ed Solar, CEO of Arcadian Networks.

The roll-out in Minnesota of a private, standards-based, wireless broadband data network allowing plug-and-play connections may be particularly appropriate for their needs. Not only does it deliver communications across sparsely populated rural areas of the country, but use of licensed, protected spectrum provides security benefits far greater than unlicensed frequencies used in the public domain. The networks are NERC/FERC compatible, fully secure and encrypted, and use ruggedized equipment with proven ability to withstand the harshest weather. Utilities throughout the nation's wind corridor, from the Midwest to the Dakotas to Texas, will soon be implementing their own communication networks. Will what's working in Minnesota apply throughout the wind belt?



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