

## Enron Wind Corp. Powers-Up Lake Benton using Patton Short Range Modems

*World's Largest Single Wind Power Generation Facility Connected by a Multipoint Network of 155 Patton 1080As*

LAKE BENTON, Minnesota, September 24, 1998—Representatives of Enron Wind Corp and the US Department of Energy take part in the dedication of the world's largest single wind power generation facility, located near this small town in the Midwest plains. The 107-megawatt Lake Benton I Wind Power Generation Facility, constructed, owned and operated by Enron Wind, will supply electrical power sufficient for 43,000 average households, or 120,000 people.

GENEVA, Switzerland, December 17, 1998—Scientists of the World Meteorological Organization (WMO) officially declare 1998 to be the hottest year on record, with average worldwide surface temperatures surpassing last year's record by 0.27 degrees. In their annual report on climate, the WMO scientists urge national governments to curb factory and automobile emissions—implicated as the worst man-made sources of heat-trapping “greenhouse” gasses.

### Enron Ahead of the Game

Although the two news stories above may seem unrelated at first glance, they actually illustrate that Enron Wind Corporation is at the leading edge of a worldwide movement to reduce greenhouse gas emissions and conserve energy resources. Because Enron's Lake Benton I facility (pictured at right) uses propeller-driven wind turbines to generate electricity, instead of burning fossil fuels, its operation will produce the equivalent emission-reduction effect of removing 50,000 cars and light trucks from the road. It seems Enron has beaten the WMO to the punch-line by almost three months!

Few projects have actually earned the title “massive”, but Enron's Lake Benton I certainly qualifies as one of them. Each of Lake Benton's 143 wind turbines—manufactured by Zond Energy Systems, a subsidiary of Enron Wind

Corp.—sits atop a 173 ft. high tower and is able to generate 750 kilowatts of electricity. The 3-blade, variable pitch propeller used on the Z-750 (as this latest-generation turbine is called) measures 156 ft. in diameter, and weighs 34,000 lbs! The turbines are spread over 10 square miles of farmland.



### Propelled into Networking

Decidedly upscale from the version battled by Don Quixote, these 21st Century “windmills” feature a motorized yaw system that automatically turns the entire turbine assembly to the right or left for maximum wind exposure. They also feature a hydraulically controlled propeller hub that varies the angle of the blades automatically (to maintain optimum RPM) or manually (to “pause” the turbine by feathering the

*“The Patton Model 1080A... met our requirements, and continues to perform reliably in the field.”*

—Jody Shadden, Senior Product Engineer  
Zond Energy Systems

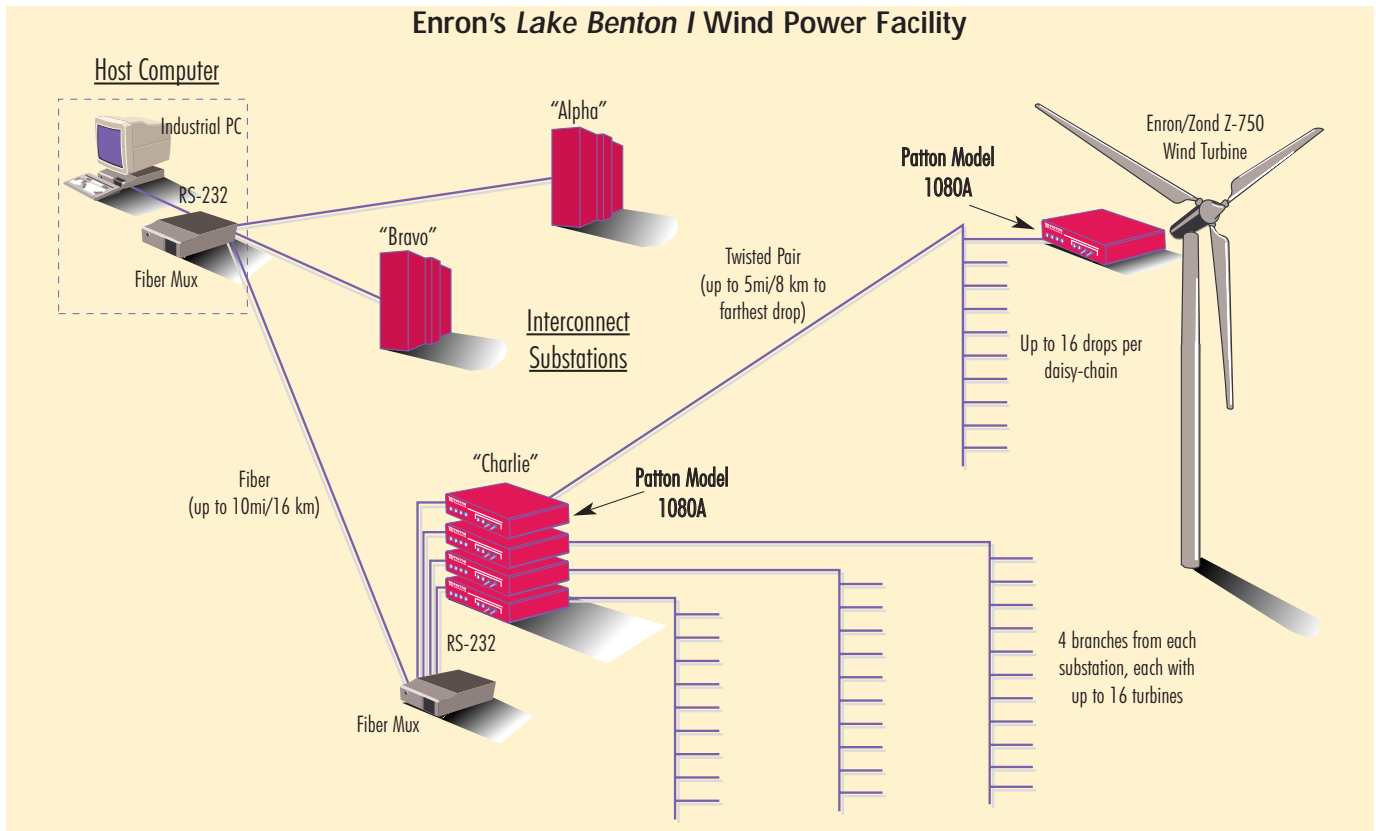
prop). But getting 143 high-tech giants to waltz on cue is no easy task. Rather than hiring an operator to inhabit each tower and manipulate the turbine's controls manually (it would be a long way down for coffee breaks), Enron's engineering team devised a SCADA (Supervisory Control and Data Acquisition) based system. SCADA allows a single central site operator to issue software commands that are received by one turbine, several turbines, or all 143 simultaneously. For example, if the utility desires to shut down or curtail the operation of certain turbines, in order to maintain their overhead distribution line, SCADA allows them to per-

form this function remotely. In addition, SCADA queries each turbine for real-time data, such as operating temperature, propeller RPM, outside air temperature, wind speed and power generated. This data is critical in determining whether or not each turbine is operating at 100% efficiency.

### Nerve Cells by Patton

Just like the myriad parts of the human body are connected to the Central Nervous System by an interwoven network of nerve cells, so the 143 turbines at Lake Benton I are connected to the SCADA Host Computer by a specialized network. And at each “synapse” is a **Patton Model 1080A** short range modem. The illustration (below) shows how the SCADA network is laid out. At the Host Station is a rack mounted industrial PC, connected by RS-232 to a fiber multiplexer. From the multiplexer, individual fiber optic cables run out in a 10 mile radius to three Interconnect Substations: “Alpha,” “Bravo” and “Charlie”. At each substation, the fiber line is connected to another fiber multiplexer, which

de-muxes the signal into four RS-232 outputs. Each of the four RS-232 outputs is, in turn, connected to its own Patton Model 1080A short range modem, which functions as the “master” modem in a multipoint array. Finally, in a wind farm variation on “last mile access,” a single twisted pair cable is run in daisy-chain fashion from each master Model 1080A to up to 16 “slave” Model 1080As, one mounted in each tower. In this manner, each of the three substations may potentially serve as a data collection and control hub for up to 64 turbines. The distance from any substation to the most remote tower in its group can be up to 5 miles—quite a long stretch for *any* short haul in a multipoint scenario! According to Jody Shadden, Senior Product Engineer at Enron, it was primarily the Model 1080A’s long distance performance that won Patton the job: “We tested the Patton Model 1080A against a competitive multipoint short range modem, and the other company’s product could not support the distance we needed. On the furthest drops, the other short haul essentially quit communicating. We found no



similar distance problems with the Patton Model 1080A; it met our requirements and continues to perform reliably in the field.”

While the multipoint communication technique used by the Model 1080As is by no means cutting-edge technology, it was perfect for the Lake Benton I application. Says Shadden, “The Model 1080A’s multipoint setup lets us broadcast the same message to every slave modem in the group, even if we only want to talk to one of the towers. When the modem in the correct tower ‘sees’ its unique address in the broadcast, it raises a carrier signal that is recognized by the appropriate master modem. At that point, an exclusive link between the substation and that one tower is set up. We can then download that turbine’s specific data, or issue commands without the other towers ‘listening’ in. It’s simple and effective.”

Enron Wind was chosen as the contractor for an additional 102-Megawatt wind power facility, also near Lake Benton, and construction is already underway. It is expected that Patton Model 1080As will be deployed at that site as well.

## Blowin’ in the Wind

In his famous ‘60s protest song, Bob Dylan sings that, “...the answer, my friend, is blowin’ in the wind.” When it comes to the planet’s future energy needs, Dylan’s words were clearly prophetic. Over the past decade, global use of wind power has expanded at the rate of 20% per year. And the American Wind Energy Association predicts that over 47,000 Megawatts of new wind generation capacity will be added worldwide by the year 2007. With over 3,400 of its own wind turbines already installed at various sites around the globe, Enron Wind Corp. expects to be leading this invasion of “green giants” for many years to come. SL

### Patton Electronics... In Brief

Patton Electronics Company is a manufacturer of connectivity, transmission and network access products for data communication applications. Founded in 1984, Patton Electronics is headquartered in Gaithersburg, Maryland (just north of Washington D.C.)

Patton Electronics manufactures its own products, with **ISO-9001** quality, **BABT** approval and **Y2K** compatibility. Call on us for your next project—we’re ready to deliver!

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