

Wind power has come to stay in the American Midwest

by Robert Kahn

Drivers travelling across the United States on the transcontinental highway Interstate 90, don't notice the Buffalo Ridge. There are no roadway signs announcing the glacial moraine and no one needs to shift into a lower gear to traverse the crest. After all, a 300 meter (1,000 foot) elevation gain over 48 kilometers (30 miles) is subtle. Buffalo Ridge is only really discernable to the residents of southwestern Minnesota and northwestern Iowa who live atop it.

Today the most visible indication that the Buffalo Ridge exists at all are the hundreds of wind turbines that follow a north/south axis along it. The ridge runs roughly 120 kilometers from northwestern Iowa through southwestern Minnesota and on into South Dakota. The Buffalo Ridge is the most prominent topographic feature after hundreds of kilometers of otherwise unobstructed western prairie. The wind turbines are there because the ridge yields annual average wind speeds slightly over 7.2 meters per second at 30 meters. The area experiences its windiest periods during the winter, which in the Upper Midwest typically lasts five months. Large frontal systems generate intense winds sweeping across the prairies and accelerate as they hit the Buffalo Ridge.

The Schardin farm is at the highest point around Lake Benton. "Every spring," Lincoln County, Minnesota, farmer Conrad Schardin reports, "we were always the last to plant and the last to harvest. Our farm had more snow than anyone else." But the nuisance wrought by high ground became an asset when Enron Wind Corp. contracted with Schardin and his neighbors to install wind turbines on their property.

"An absolutely fabulous deal"

The community of Lake Benton, Minnesota calls itself the "original wind power capital of the Midwest." It's a meaningful delineation for a town of 700 in the oldest and poorest county in Minnesota. "It's hard to express what these wind farms mean to our community," says Jim Nichols, Lake Benton's economic development director, a former legislator and one



New life for the

time Minnesota commissioner of agriculture. "Only ethanol has been a better economic boost. And the beauty of wind power," Nichols says, "is that you can grow your crops right up to the base of the machines. It's an absolutely fabulous deal," adds Nichols with typical enthusiasm, "and it's going to be more and more impressive."

Southwestern Minnesota and northwestern Iowa are America's bread basket where corn and wheat are king. At harvest time this past fall, grain elevators were filled to the brim, a bittersweet sign in a depressed grain market. Thankfully, wind power has mitigated the vagaries of farming for growers lucky enough to host develo-



Street scene in Alta, Iowa, just after the community's first annual "wind fair"

The author
Robert Kahn is a journalist in Seattle, USA.



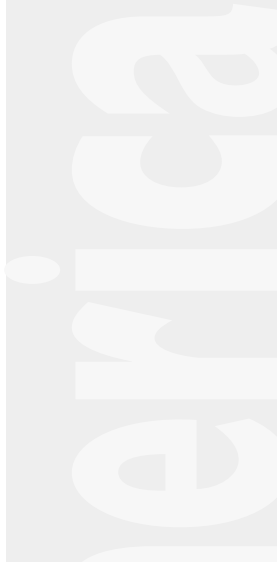
Photos: Kahn

Lange of the Izaak Walton League, an environmental advocacy group, explains, "if the state mandate wasn't there, it would really have stifled the renewable energy market in Iowa."

Ken Hauch, Midwest regional manager for Enron Wind Development Corp. emphasizes that it makes perfect sense for Iowa utilities to incorporate wind energy into their systems. "These utilities depend on coal primarily," he explains. "And everyone realizes that in the future there's going to be some kind of penalty paid for buying it. Wind power hedges the utilities' risk."

"Wind energy put us on the map"

Minnesota and Iowa's policy brought a bountiful harvest in mid-1999. As the federal production tax credit neared expiration, Minnesota counted a total of 272 MW of capacity installed and Iowa 242 MW. One tangible result was that northwestern Iowa earned the distinction of hosting the largest wind farm in the world. Enron Wind Corp. (EWC) completed its "Storm Lake Wind Power Generation Facility" in June, 1999. The project, which includes 257 Zond Z-750 kW turbines over 4,800 hectares in Buena Vista and Cherokee counties,



Jim Nichols, economic development director for the city of Lake Benton, Minnesota, (left) with Minnesota farmer Conrad Schardin.

agricultural community

pers' turbines. As one of Iowa's earliest "wind farmers," George Braaksma Jr. explains, "I figure I could farm that acre there for six years for what I could get off the wind turbines in one year."

The economic value to the farmer is clear cut. Developers either pay landowners a lump sum for "wind rights" and road and power line easements or agree to share a percentage of power sale revenues. The community at large benefits from construction and "windsmith" jobs that are created and the property tax collected by each county and township.

Wind makes perfect sense

Marlin Thompson is the mayor of Lake Benton. He credits wind power with breathing new life into the agricultural community surrounding his town. "While people were understandably skeptical at first, before long there were real smiles on farmers' faces. Now we take a lot of pride in the developments around here." In this agricultural landscape, the marching lines of turbines look like so much oversized

farm equipment. But as natural as they look, wind power was a long time coming.

Northern States Power (NSP), the largest utility in the Upper Midwest, took its first foray in wind energy in 1986 when it installed three Danish-built 65 kilowatt turbines in the Buffalo Ridge town of Holland, which at 600 meters elevation, is the second highest point in the state. But the technology, while state-of-the-art for the mid-1980's, failed to impress NSP. What really got it interested was the Minnesota legislature's insistence that state approval of the utility's plans to store spent nuclear fuel at NSP's nuclear plant on Prairie Island be linked to its acquisition of 425 MW of wind power by 2002. NSP became a believer.

Iowa jump started wind power with a 1983 law instructing its utilities to acquire renewable energy followed by legislation passed seven years later that set attractive rates at which the state's recalcitrant utilities were required to buy it. Iowa's pricing scheme enjoyed widespread public support and survived legal challenge by the Iowa Utilities Association. As Nancy



has a name plate capacity of 193 MW.

Storm Lake and nearby Alta, Iowa, are prosperous communities 160 kilometers from the nearest four lane highway. Storm Lake is home to Buena Vista College and one of Iowa's largest hog processors while Alta (a 19th century abbreviation for altitude) is dominated by its grain elevators. Alta's Main Street traces the continental

divide between two of the United States' largest watersheds: the Missouri and Mississippi Rivers. "We half-jokingly tell outsiders that 'if you move here they'll never find you,'" says Jim Gossett, executive director of the Storm Lake Area Development Corporation. "But the Storm Lake wind energy project really put us on the map." Gossett actively supports wind power

and sums up his community's position saying: "We would like to have 250 more machines."

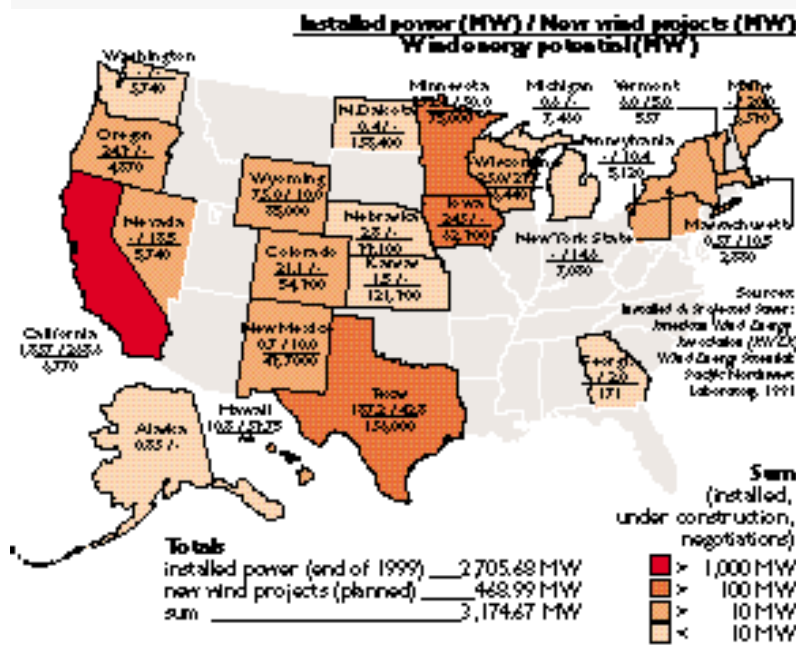
The 257 wind turbines at Storm Lake are hard to miss. Each of the Z-750 kW turbines stands on a 63 meters lattice tower. Each blade is 24 meters long; the rotor diameter is 50 meters, slightly larger than the Z-750s used in Minnesota. EWC's manufacturing subsidiary chose black blades to help the rotors shed ice that forms during the long Midwestern winters.

Storm Lake took only nine months to build. During fall 1998, EWC's contractor graded roads, poured 51,400 tons of concrete for the turbine foundations, and placed collection and transmission lines underground and overhead. By January the substation was complete and turbine assembly began.

Public utility interest in wind power

EWC reports that its Storm Lake facility generates approximately 650,000 Megawatt-hours annually. Power is sold under 20-year contracts to two of Iowa's investor owned utilities: MidAmerican Energy Company which contracted for 113 MW and IES Utilities, a subsidiary of Alliant

Wind energy projects across the United States



Energy, which accounts for another remaining 80 MW of capacity. The Storm Lake project also generates power for smaller utilities. Production from three machines are wheeled to a consortium of Iowa public utilities led by Waverly Power & Light, which deli-

vers "green" power to retail customers.

Public utility interest in wind power is also on display east of Storm

The Algona project secured public funding to test whether contemporary wind turbines, with sophisticated power electronics, could regulate vol-



WINDPOWER 2000

**April 30 - May 4, 2000,
Palm Springs, California
Wyndham Palm Springs
Hotel & Palm Springs
Convention Center**

America's pre-eminent wind energy conference and exhibition will be held April 30 - May 4, 2000 in Palm Springs, California, in the heart of one of the biggest wind energy resource and development areas in the world.

The WINDPOWER 2000 conference will offer manufacturers' exhibits, technical sessions, forums and panels, as well as receptions and the annual AWEA industry awards banquet.

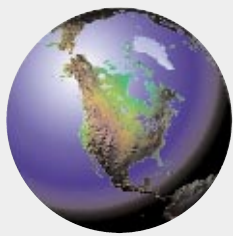
Info: www.awea.org



Lake in Algona, Iowa. There, in 1998, the Cedar Falls Utilities along with six other smaller municipal utilities, installed a 2.25 MW project with assistance from the federal department of energy and Edison Power Research Institute (EPRI). The project is part of the "Turbine Verification Program" which showcases advanced wind technology capable of crossing difficult technical barriers.

tage levels within remote rural electric service areas. The utilities tied three Zond Z-750 units into an existing 13.8 kV feeder owned by Algona Municipal Utilities, a partner in the project. The turbines are over ten kilometers away from Algona's 69/13.8 kV 10 MVA substation. After months of operation it was found that the turbines absorbed reactive power keeping voltage rise manageable while mi-

Wind farming generates electricity for Iowa's utilities and a new source of income for its farmers.



nimizing the voltage fluctuations often associated with wind generation. As Tom Wind, the aptly-named consulting engineer for the project reported, "we found that wind energy is attractive as distributed generation for rural electric systems such as those in the Great Plains states."



A wind turbine goes to school

Electricity production at the site for the 12 months ending in November 1999 was 6,527 Megawatt-hours, 13% above projections. The utility consortium has been selling all of the power generated by its 2.25 MW project to over 600 residential customers who pay an extra \$2.50/month for the service.

A distinguishing feature of wind power development in the Midwest has been the success of small installations such as that at Algona. Minnesota and Iowa lead other states in this category of wind energy development, but a handful of commercial turbine installations can be found in North Dakota, Nebraska and Kansas. Com-

Wind power is a part of the community spirit in northwestern Iowa.



mercial wind farms have arrived in Wisconsin, and South Dakota is on the brink of major development.

In northern Iowa, there are 11 projects under two MW scattered throughout the countryside. These small projects typically use Danish turbines and either directly sell the power they generate to their own utilities or engage in net metering where the turbine owner, after using what-

"We reached our destination"

PTC extension until December 31, 2001

Wind energy advocates breathed a huge sigh of relief last October when the federal energy production tax credit (PTC) was extended for two and a half years. The credit, which is the foundation of the domestic U.S. wind industry, was extended retroactively to June 30, 1999, the date it had expired.

The extension campaign was led by the industry's trade group, the American Wind Energy Association (AWEA). As AWEA's legislative director, Jaime Steve, reflected, "while we had to tack a bit here and there, we stayed the course with confidence and determination, and reached our destination."

The PTC grants a wind farm owner a 1.5 cent tax deduction for every kilowatt-hour his project generates. The credit, which escalates with inflation, remains in effect for ten years provided the wind farm is installed no later than December 31, 2001.

The original tax credit was linked to the capital cost of a wind farm. It helped initiate the American wind industry in the early 1980's. But some developers misused it by installing faulty equipment; they could reap the tax benefit regardless how efficient their projects were – or weren't. This history of abuse, coupled with the unfriendly attitude of the Reagan administration, squelched any hope for an extension when the credit expired at the end of 1985. It was seven years before the PTC passed into law. Its linkage to operational efficiency made it far more palatable and in 1992, the PTC was enacted with support from President Bush and Congress.

Unfortunately, just about the same time, U.S. utilities became preoccupied with restructuring and the industry remained in the doldrums

until much later in the decade. With a lot of catching up to do, the stakes for PTC renewal loomed large. The Clinton administration, with its pro-environment tilt, signed on early, as did a long list of Republicans and Democrats including a majority of the members of the tax committees in the Senate and House of Representatives.

The problem was centered within the Republican House leadership, specifically Bill Archer, a powerful Texas Republican who chairs the Ways and Means Committee that reviews tax measures. "Archer is an oil and gas man and he has no use for wind energy," said one industry insider who lobbied for PTC passage. "Archer single handedly stopped the extension from passing in 1998, and AWEA's challenge was to get past him somehow in 1999."

Fortunately for the industry, its congressional advocates were accomplished legislators who wouldn't take "no" for an answer. "Gaining the PTC extension was made possible by leadership from senator Chuck Grassley (Republican, Iowa) and representative Bill Thomas (Republican, California.), both of whom sponsored legislation calling for a five-year extension," said AWEA executive director, Randall Swisher. Swisher also credits many other legislators from both parties who co-sponsored Grassley and Thomas' bills. He's also quick to salute AWEA's members who invested countless hours rallying "grassroots" support for the effort.

The fact that AWEA ended up with a two and a half year instead of the five year extension it originally sought isn't a failure as much as it is testimony to the difficulty of getting legislation passed in Washington. Expect the trade group to try again early in 2001.

ever electricity his turbine generates, sells back any excess at the retail rate. This simplified power swapping arrangement is quaintly known as "running the electric meter backwards."

The most visible of these small installations is the 250 kW turbine owned by Iowa's Spirit Lake school district. In its first year, 1994, the turbine provided the entire load for the elementary and high school and netted \$25,138 in utility payments. The machine, which is a source of considerable pride to students and faculty alike, subsequently paid for itself, but the school superintendent, Harold Overmann, sees more than economics at work. Overmann told the Des Moi-

nes Register newspaper that his students figured that in its first year the turbine had saved 619 barrels of oil or 175 tons of coal and that it had offset 525,000 pounds of carbon dioxide and 74,000 pounds of sulfur dioxide. It's those findings, the superintendent said that "is the message, not the dollars."

Algona and Spirit Lake demonstrate that wind power not only works as a central station power plant, but that it is effective as disbursed generation too. Taken with the results at the utility scale projects along the Buffalo Ridge, the lessons learned by school children and utility executives alike suggest that wind power has come to stay in the American Midwest. ●