



Tjaden Farms Charles City, IA

Technical Specifications

450-kW Bonus MK1 wind turbine

100 ft. tubular tower

Project Cost: \$204,432

AERLP: \$75,000

Loan Term: 9 yrs.

Lender: First Security Bank & Trust,

Charles City, IA

Lender Share: \$75,000

USDA Share: \$45,500

Annual Ave. O & M Cost: \$410

Installation Date: December 2004

In December 2004, Tjaden Farms installed a Bonus 450-kW wind turbine that was previously used from 1992 to 2002 on a California wind farm. Tjaden Farms is a family farming operation about 12 miles north of Charles City, run by brothers Larry and Dean Tjaden and Larry's son Scott. The electricity they produce is sold to Dairyland Power Cooperative of Lacrosse, Wisc. via transmission lines owned by Iowa-based Heartland Power Cooperative. Originally the Tjadens received an avoided-cost rate of \$.03 per kWh.

In 2008, that rate was adjusted to .065 per kWh, greatly increasing the cash flow of the project.

Project History

In 2001, the Tjadens added a confinement hog operation to their grain farm as a way to diversify and stay competitive. The facility added about \$600 per month to their electricity bill, and the Tjadens began to consider wind energy production as the next step in the evolution of their business.

They collected wind data for a year with an anemometer mounted at about 30 ft. and found that it correlated closely with wind energy maps provided by the Iowa Energy Center. Encouraged by the data, the Tjadens initially thought they'd buy a turbine in the 65 kW range and pursue a net-metering agreement to offset their own energy use. But further analysis convinced them that a larger turbine would provide a better return on investment, and they eventually learned about the Bonus turbine over the Internet.

Because the turbine requires three-phase power, the Tjadens located the turbine on a remote piece of land near a suitable transmission line. They thus avoided a costly substation installation at their farmstead site, but also gave up the opportunity to net meter with Heartland who considered the turbine as a separate enterprise from the farm business.



Project Performance

Date	Actual Production (kWh)	Production Value (\$)	Production Tax Credit (\$)	Total Value (\$)
01/05 - 12/05	393,057	11,792	7,468	19,260
01/06 - 12/06	447,507	13,425	8,503	21,928
01/07 - 12/07	457,824	13,735	8,699	22,434
01/08 - 12/08	428,577	12,857	8,572	21,429
totals	1,726,965	51,809	33,242	85,051
avg.	431,741	12,952	8,311	21,263

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Scott Tjaden says the installation went smoothly, though negotiating interconnect and power purchase agreements was challenging and time consuming.

"It was a very big learning curve for both us and the utilities," he says, noting that Heartland had no prior experience with private turbine owners.

System Performance

The turbine produced just under half of its expected output of 800,000 kWh in the first year, which Tjaden attributes in part to lower than expected wind speeds in 2005. The next three years showed somewhat better performance, with the turbine averaging 444 MWh per year, or 55 percent of projections.

Tjaden says that they're satisfied with the performance, noting that they got a very good purchase price on their used turbine and that their production estimates were inadvertently based on a newer Bonus model with a longer blade length. And he adds that shortly after the turbine became operational they were forced to adjust the turbine controller in a way that reduces production in order to satisfy the complaints of two neighbors who were experiencing frequent voltage drops of 20 percent each time the turbine drew power to engage its generator. The Tjadens resolved this issue by adjusting the generator's cut-in velocity from 4.5 to 7.5 meters per second in order to reduce the number of on/off cycles during days with low and variable winds speeds. They also adjusted the controller to provide a less abrupt current draw while powering up.

"Basically on low-wind-speed days we're not making any power," Scott says. The alternative, he says, would be to make expensive upgrades to their transmission infrastructure.

The Iowa Energy Center's Alternate Energy Revolving Loan Program (AERLP) plays a supporting role in stimulating renewable energy development within the state. Since its inception in 1996, the AERLP has supported numerous wind, biomass, solar, hydro, and hybrid projects.

Successful applicants receive a low-interest loan from a combination of Energy Center and lender funds. The Energy Center provides loan funds equal to 50% of the projects financed cost (up to \$1 million) at zero percent interest. Matching financing must be obtained from a lender of the applicant's choice. The maximum loan term for the Energy Center's funds is 20 years.

The lending institutions are responsible for financially qualifying the borrower, while

Operation and Maintenance

The Tjadens perform their own maintenance and repairs and are happy with this decision. Tjaden says that he invested considerable time learning how to maintain the turbine, including many calls to Europe to speak with the manufacturers of both the turbine and the controller. "You've got to have a pretty good trouble-shooting ability", he says, as well as "basic knowledge of electronics and hydraulics."

Each year they perform regular maintenance that includes greasing bearings and checking fluid levels. Aside from adjusting the controller to resolve the power-up issues, the only major repairs were the replacement of a broken blade-tip cable for which they rented a manlift and spent \$300, and the rebuild of a hydraulic yaw motor for which they had spare motor parts so no down time occurred.

Overall Satisfaction

While the turbine's performance has not met their original performance estimates, Tjaden says the project is profitable because of several financing pieces, including a \$75,000 no-interest loan through the Energy Center's Alternate Energy Revolving Loan Program.

"Even at the low cost we paid for the turbine, without the production tax credit, our [\$45,500] grant from the USDA, and the Energy Center loan, we probably wouldn't have had a profitable project," he notes.

Tjaden reported in 2008 that the adjusted rate from the utility makes future projects more feasible, and they continue to investigate expanding their wind energy business.

the Energy Center assists in technically qualifying the borrower. By partnering with expertise from lending institutions the Energy Center is able to cost-effectively process the loans in a timely manner and maximize the impact of the loan program.

Eligibility

The AERLP is open to all individuals and groups who want to build renewable energy production facilities in Iowa. Utilities that are not required to be rate-regulated are not eligible. AERLP loan funds may not be used to refinance an existing loan or be applied to existing alternate energy facilities.

Application Deadlines

January 31, April 30,
July 31, October 31

For more information

Contact the Iowa Energy Center,
(515) 294-8819
www.energy.iastate.edu

The Iowa Energy Center is dedicated to improving Iowa's energy efficiency and use of renewable energy through research, demonstration, and education.

