



# Forest City Schools

## Forest City, IA



### Technical Specifications

600 kW, 125 Nordex  
Wind Turbine  
160 ft. tower

**Project Cost:** \$674,261

**AERLP:** \$250,000

**Loan Term:** 12.25 yrs.

**Lender:** Commercial Federal  
Bank, Forest City, IA

**Lender share:** \$424,216

**Est. Annual O & M Cost:** \$5,000

**Est. Payback:** 12.25 yrs.

**Installation Date:** February 1999

In 1999 the Forest City School District began generating electricity from a 600 kW Nordex wind turbine installed on its 72-acre property. The project was a pioneering effort in two respects.

### Project History

First, although several other school districts in Iowa had already installed wind turbines, all but one involved smaller turbines in the 65-250 kW range. Second, Forest City's turbine foreshadowed the later development of more than 300 utility-scale turbines within a 45-mile radius of the schools. The project began as a high school science project initiated by then student Paul Smith with support from science teacher Ron Kvale.

### System Performance

School superintendent Dwight Pierson says the district has been pleased with the turbine even though it has generated less than two-thirds of the electricity predicted by the project's engineering consultants.

The district believed the turbine would produce 1371 MWh of electricity annually, covering about 85 percent of the schools' needs. During the turbine's first eight years, it generated an average of 862 MWh per year. With increased electricity demand due to the installation of geothermal heating and cooling in 2004, the turbine's average annual output amounted to less than 40 percent of district use by 2006.

Pierson says the district benefits greatly from its net-billing agreement with Forest City Municipal Utility. The district earns full production credit at the same price they pay for electricity: \$0.042 per kWh through May 2006 and \$0.0441 thereafter.

Additional revenue comes through the Department of Energy's Renewable Energy Production Incentive (REPI) for the first ten years of the project. The REPI credit netted the district about

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### Project Performance

Year	Production (kWh)	School Use (kWh)	Production/Use (%)	Production Value (\$)	REPI <sup>1</sup> (\$)	Total Value (\$)
1999 <sup>2</sup>	812,350	1,192,007	68.1	34,119	9,142	43,261
2000	1,044,845	1,648,039	63.4	43,883	18,614	62,497
2001	829,850	1,646,544	50.4	34,854	14,459	49,313
2002	1,050,700	1,655,266	63.5	44,129	20,102	64,231
2003	800,329	1,503,239	53.2	33,614	13,762	47,376
2004	942,900	1,919,392	49.1	39,602	13,056	52,658
2005	649,400	2,253,910	28.8	27,275	5,491	32,766
2006	716,450	2,217,510	32.3	30,972		30,972
totals	6,846,824	14,035,907		\$288,448	\$94,626	\$383,074
avg.	862,068	1,834,833	48.7%			\$48,545

<sup>1</sup> REPI not fully funded FY 03-05; FY 06 REPI payments not available at this time; see [www.eere.energy.gov/wip/rep/rep.html](http://www.eere.energy.gov/wip/rep/rep.html).

<sup>2</sup> Partial production year, not included in average.

\$13,637 per year through 2005, but has not been fully funded since fiscal 2002.

### Operation and Maintenance

Unexpected turbine outages, generally occurring during strong winds and as frequently as once or twice per month, have contributed to the performance shortfall. The district partially addressed this issue in 2002 by sending their maintenance director to Denmark for three weeks of training by Nordex. He is now able to fix most problems in minutes rather than the days it often took for an outside contractor to restore operation.

The district also experienced more than four months of total downtime while resolving three major mechanical issues. They spent more than \$70,000 in 2003 to replace the turbine's gearbox; \$14,000 in 2004 to rewind the turbine's motors; and \$6,000 in 2006 to repair lightning damage.

The district budgets \$5000 per year to pay Nordex for scheduled maintenance and 24/7 phone support, but emergency expenses come from their general fund. Once their loans are paid off, they plan to budget \$20,000 of their annual production revenue towards maintenance.

Pierson believes that a similar project would face far fewer technical challenges today. He notes that "mature" companies now provide solid support and services for wind projects and that turbine technology has evolved greatly.

"We were a little ahead of the learning curve but still feel proud to have pioneered wind energy in our part of the state," Pierson says. He emphasizes that their

turbine still promises to be economically prudent.

"We have been told the life span of the turbine is 30-plus years, so we have many good years of production ahead of us," Pierson says.

### Overall Satisfaction

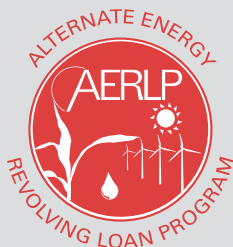
Pierson notes that the school board and the community never dwelled on the financial promise of the turbine, but simply sought assurance that it would be revenue neutral. In this regard, he says, locating attractive financing was crucial.

"As we studied ways to finance the project," says Pierson, "news of the interest-free loan through the Iowa Energy Center's Alternative Energy Revolving Loan Program certainly had an impact of the final decision of the Board to put the project out to bid and awarding a contract."

He also says that the environmental, educational, and symbolic aspects of the project were embraced early on. The 6900 MWh of clean electricity generated by the turbine as of the end of 2006 prevented the release of 5100 tons of carbon dioxide and 23 tons of sulfur dioxide, Kvale estimates. The district shares its performance information through its website, and its high school science classes continue to study the turbine and its data.

More importantly, says Pierson, the turbine has become a source of community pride and an iconic symbol of the town's entrepreneurial spirit.

"Forest City takes pride in being a progressive and innovative community," says Pierson. "The school board, in particular, has always taken pride and pleasure in being out front."



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 \$250,000) at 0% 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 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](http://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.

