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Wind power has come a long way—just ask Dan Wubben of Hazel Green, Wisconsin. In the summer of 2004 Wubben had three 65 kW wind turbines installed at Twin Oaks, his family-owned business that supplies finished wood products to homebuilders. His new installation is distinctive for two reasons. First, the turbines were imported from a wind field in California. The 20-year-old turbines were fully refurbished and given a new life here in Wisconsin. According to installer David Blecker, executive director of Seventh Generation Energy Systems, Inc., the turbines should easily last another 20 years with minimal maintenance.

Secondly, these turbines are among the first of their size to be installed in Wisconsin. They boast blade rotors 50 feet in diameter and stand on 110-foot towers. At 65 kW, they fall between the small residential models (20 kW or less) and the utility scale turbines (500 kW to 1.5 MW) currently installed at large wind farms.

These turbines can economically provide most or all of the power needed by a farm or business. When sized for a specific load, they will displace the energy normally purchased from a utility. This provides immediate bill reductions at the retail rate even though the turbines are too large to take advantage of net metering benefits (which apply to systems of 20 kW or less). The result is a cost effective way for businesses to produce their own power from the wind and still be connected to the grid. “The introduction of this kind of turbine in Wisconsin should fill a gap in the market for small businesses and farms,” said Blecker. “We’re hoping more businesses will take advantage of the environmental benefits as well as the financial savings that wind turbines can provide.”

Wubben’s objective in installing the turbines was to reduce his business’s operating costs and traditional energy dependence. The turbines are expected to generate enough electricity to power 26 average American homes. More importantly to Wubben, the turbines will supply over 80 percent of Twin Oak’s electrical needs, and should pay for themselves in twelve years.




SEVENTH GENERATION ENERGY SYSTEMS, INC.

This trio of wind turbines generates most of the electricity needed by Dan Wubben’s wood products business in Hazel Green, Wisconsin.

UP-FRONT COSTS, LONG RANGE EFFICIENCY

While the turbines will generate savings for Wubben, the up-front costs could have been prohibitive—each of the three Twin Oaks turbines cost approximately \$85,000. Wubben was able to finance the project with the help of a \$45,000 Implementation Grant from Focus on Energy’s Renewable Energy Program. “Electricity prices continue to rise as the cost of renewable energy systems goes down. But in all honesty, without the help of Focus on Energy, I wouldn’t have considered this project because it would have been too costly,” said Wubben. Since the cost of fuel is free, wind turbines offer an additional advantage in that they provide a hedge against rising utility rates. Each utility rate hike improves the financial benefits of a wind energy system.

	<h1 style="text-align: center;">Case Study Facts</h1> <h2 style="text-align: center;">Twin Oaks Turbines</h2> <p style="text-align: center;">Date Completed: June 2004</p>
<h3>Personnel</h3>	<p>Owner: Dan Wubben, Twin Oaks Lumber LLC</p> <p>System Contractor/Installer: David Blecker, PE, Seventh Generation Energy Systems, Inc.</p> <p>System designer: David Blecker, PE</p>
<h3>Building and Site</h3>	<p>Location: Twin Oaks Lumber, a 24,000 square-foot manufacturing facility, is located in Hazel Green, Wisconsin. The company produces custom hardwood milling and molding.</p> <p>Average estimated wind speed on site: 12.3 mph at hub height</p> <p>Annual & monthly energy usage and cost before turbine installation: 300,000 kWh per year—\$2,240/month</p>
<h3>Equipment</h3>	<p>SYSTEM COMPONENTS</p> <ul style="list-style-type: none"> ■ Three remanufactured Vestas V-15 65 kW fixed pitch upwind turbines with 480V 3-phase induction motors <p>MANUFACTURER</p> <ul style="list-style-type: none"> ■ Energy Maintenance Service/Vestas <p>ELECTRICAL SPECIFICATIONS</p> <ul style="list-style-type: none"> ■ kW peak 65kW per machine (195 kW total system) ■ Capacity factor or kWh production 255,000 kWh per year ■ Grid inertia, no battery backup <p>MECHANICAL SPECIFICATIONS</p> <ul style="list-style-type: none"> ■ 50-foot rotor diameter, 110-foot free-standing 3-legged lattice tower, 14,000-pound nacelle and rotor ■ PLC based control system <p>SYSTEM INTEGRATION</p> <ul style="list-style-type: none"> ■ Connected at 480VAC 3 phase to electric panel on customer side of meter
<h3>Equipment Costs and Benefits</h3>	<p>ECONOMIC COSTS AND BENEFITS</p> <ul style="list-style-type: none"> ■ Total cost of equipment, labor, permits: \$275,000 ■ Grants, loans, tax benefits: \$45,000 Implementation Grant from Focus on Energy ■ Projected monthly utility usage and cost after wind turbine installation: 3,750 kWh or \$336 per month <p>ENERGY AND ENVIRONMENTAL BENEFITS</p> <p>Projected production/year: 255,000 kWh</p> <p>Percentage of load offset (electricity): 85 percent</p> <p>Pollution avoided: 253 tons of CO₂; 1,061 lbs of NO_x; 2,037 lbs of SO₂</p> <p>Calculations based on: 1.988 lbs CO₂/kWh; 4.16 lbs NO_x/MWh; 7.99 lbs SO₂/MWh</p>