



BIOMASS



GEOTHERMAL



HYDROPOWER



SOLAR



WIND

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The wind has helped to power Midwestern farms for many years. Windmills pumped water for irrigation and livestock and generated electricity where there was no utility power available. As the government-funded electrical grid spread to rural areas, farmers became as dependent as town dwellers on the more reliable electricity from fossil-fueled generation plants. Wind-generated electricity seemed to be a thing of the past.

But today, relying primarily on fossil fuels for electric generation is being seriously challenged. Wind turbines have become an important technology in the search for renewable, non-polluting ways to generate power. Now, all over the Midwest, wind turbines are appearing not only on farms, but at factories and in schoolyards as well. Today's wind turbines are efficient and reliable—the product of years of research and experience.

THE BENEFITS OF WIND ENERGY

- The wind is free. As an energy source, it doesn't have to be purchased, mined, refined or transported.
- Wind energy is clean, non-polluting and non-depletable. It does not produce smog, acid rain or greenhouse gases, nor does it release mercury or particulates.
- A small-scale wind energy system can help make a home or business energy-independent.
- Like other renewable energy systems, wind turbines support the electric utility infrastructure by providing energy exactly where it is needed. When connected into the grid, these systems help prevent costly line upgrades and postpone the building of new power plants.
- Installing a wind turbine is a productive way of making a commitment to the community and the environment. Whether installed at a school or elsewhere, a working wind turbine can demonstrate to everyone the possibility of a clean energy future.

CHOOSING A WIND SYSTEM

There are three basic approaches to wind system design:

Grid-connected, non-battery system. This system provides the benefits of wind energy and the consistency of the utility. If more electricity is needed, the grid supplies it; if extra is produced, it may be stored on the utility grid as a credit, and used when the wind is not blowing.

Grid-connected, battery-backed system. This type of system provides power when both the wind and the utility



PHOTO COURTESY OF TDL ELECTRONICS

A combined solar electric and wind turbine system at TDL Electronics near Racine, Wisconsin. The 10-kW wind turbine and the solar electric system powers several homes in the neighborhood.

fail by adding a set of batteries to a grid-connected turbine. This configuration is most practical when an uninterruptible power supply is required for sensitive electronics such as computers.

“Off-grid,” independent system. This system has no connection to utility lines, and is most practical in isolated locations. A set of batteries stores the electricity and an inverter provides AC power. Independent systems frequently make use of more than one renewable resource, especially photovoltaics (PV), to take full advantage of seasonably variable weather conditions, and seasonal variation in wind and solar resources. Focus on Energy does not co-fund off-grid systems.



focus on energy™
The power is within you.

**TYPICAL PRICES*
FOR INSTALLED SYSTEMS (NOVEMBER, 2006)**

MODEL	SWEPT AREA	RATED OUTPUT	TURBINE COST	TOWER	TYPICAL TOWER COST	TURNKEY INSTALLED COST	kWh/mo @ 10 mph	kWh/mo @ 12 mph
Lakota	36.9	1 kW	\$1,699	84' T	\$3,935	\$14,700	96	155
Whisper 100	40	900 w	\$2,085	84' T	\$3,935	\$14,986	63	105
BWC XL .1	58	1 kW	\$2,450	80' T	\$1,890	\$12,734	93	145
Cyclone	65	1 kW	\$2,148	85' T	\$3,600	\$15,137	163	260
Whisper 200	80	1 kW	\$2,602	84' T	\$3,935	\$14,981	124	193
Skystream	115	1.8 kW	\$5,400	84' T	\$3,935	\$19,000	138	228
Proven 2.5	97	2.5 kW	\$13,665	105' T	\$7,364	\$35,774	230	338
ARE 110	110	2.5 kW	\$8,700	105' T	\$4,400	\$21,628	218	338
Whisper 500	175	3 kW	\$7,095	105' T	\$7,364	\$31,079	341	538
Proven 6.0	254	6 kW	\$22,439	120' G	\$10,850	\$59,596	577	870
BWC XL-S	452	10 kW	\$24,750	120' G	\$10,850	\$56,871	614	987
ARE 442	452	10 kW	\$36,000	120' G	\$14,825	\$68,232	947	1452
31-20	754	20 kW	\$21,255	120' F	\$14,887	\$63,709	1077	1818
V-15 35-1Ø	1963	35 kW	included	110' F	included	\$135,000	3110	5067
V-17 90-3Ø	2396	90 kW	included	132' F	included	\$180,000	5060	8198

* Cost of wind systems will vary due to site specifics and local construction and material costs.

Table shows the cost of wind energy systems, including installation. These prices are for “turnkey” systems, where all equipment is new and the wind energy contractor does all labor. The last two columns show the kilowatt hours per month produced by each system where the average wind speed is 10 mph and 12 mph. Note the tremendous increase in power that is produced by the increase of only two miles per hour in wind speed.

T stands for tilt-up tower, G stands for guyed tower and F stands for freestanding tower. The tower listed with each turbine is usually the most cost effective tower option available, along with a “typical” tower height for that machine. For example, the Skystream might be able to go on the 84’ tower listed in the table at one site, while another site might require a 120’ tower. This table is not meant to be a site assessment, but only to provide a relative cost for any given “typical” system. A more elaborate table with tower and turbine options suitable for any given homeowner is what a wind site assessment provides.

OTHER CONSIDERATIONS

While there are many benefits to owning a wind energy system, there are also a number of considerations to take into account:

- Not all locations are suitable for a wind system. The quantity and quality of the wind resource on a site must be carefully evaluated, including windiness, terrain and proximity of buildings, trees and other obstacles. A rule of thumb in Wisconsin is that home-sized wind turbines should be installed to operate 30 feet above the trees and buildings within 500 feet, including the area’s treeline. This means that most towers for Wisconsin will be in the 80 to 120-foot range, or taller.
- Wind turbines generate the most energy on high open land where the winds are unimpeded by trees and buildings.
- Zoning can be a significant barrier to the installation of a wind turbine. They are easiest to permit in rural areas.
- Wind turbines must receive regular maintenance in order to function reliably. And remember that someone has to climb the tower to do this.
- Wind turbines are quiet but not all of them are silent. Educating neighbors and zoning officials about wind energy systems may be necessary, along with obtaining a building permit for the tower.



WISCONSIN SOLAR USE NETWORK

Wind towers are designed to withstand Wisconsin winters.

- Batteries are not environmentally benign and must be replaced every four years to seven years. Although recycling helps mitigate their harmful effects, the trade-offs between using batteries and connecting to the grid should be carefully considered. Wind turbines can be used in either case.

To learn more about planning and installing a small wind turbine, see the ‘Small Wind Toolbox.’ Visit focusonenergy.com/renewableenergy, click on ‘Renewable Energy Info Library’ and select ‘Small Wind and Solar Electric (PV) Toolbox’ to locate the ‘Small Wind Toolbox’ link.

INCENTIVES FOR WIND TURBINES

Focus on Energy incentives. Cash-Back Rewards and Implementation Grants are available for the installation of a wind system. Contact Focus on Energy for more information about these incentives and eligibility.

Net metering. With a system connected to the utility grid, excess energy goes back into the grid and the system owner receives credit. If a wind system is rated at 20 kW or under, most utilities will credit at retail rates for this excess. We Energies offers net metering for wind systems at 100 kW or under.

Property taxes. Wisconsin law exempts wind energy equipment from property taxes (Wisconsin State Statute 70.111).

Regulation. Local jurisdictions can only regulate wind turbines if it is the interest of “public health and safety” (Wisconsin State Statute 66.0401).

SITE ASSESSMENT

Focus on Energy offers site assessments to give site specific information about whether or not a wind system can help meet your energy needs. During the site assessment, a renewable energy consultant will visit and evaluate your site and answer your specific questions. You will also be provided with a detailed written report from the assessment necessary to receive rewards.

FOR MORE INFORMATION

focusonenergy.com

Contact Focus on Energy to learn more about renewable energy choices. We have fact sheets and case studies featuring solar water heating, solar electricity, passive solar design and wind turbines. Renewable energy incentives are also available. Call 800.762.7077 for more information.

www.renewwisconsin.org

Look for the “Small Wind Toolbox”. This site has many fact sheets on zoning issues and other concerns that will be helpful when applying for a building permit for a wind turbine, as well as information on utility interconnection.