

Wind Power in Wisconsin

wind power

Wind power is growing in Wisconsin. Dozens of large scale wind turbines, as tall as 20-story buildings and producing enough power for 15,000 Wisconsin homes, are being built in the eastern part of the state, on the Niagara Escarpment. These wind farms produce no pollution and reduce carbon dioxide emissions (implicated in global climate change) by 250 million pounds per year, equivalent to taking over 10,000 sport utility vehicles off the road.

Capturing the power of the wind for clean energy is good news for the Wisconsin environment and also benefits Wisconsin's economy, creating local jobs and rural income. Farmers can rent a small part of their land for a wind turbine, and still be able to farm. Jobs are created to service the turbines, and tax dollars are generated to provide local services. But wind turbines are still new to Wisconsin and many people have questions about how they work, their impact on the natural landscape, property values, and the noise that they may create. Below, we answer some of the questions you may have about wind turbines, and what impact they could have on your life.

WHY IS WIND POWER GROWING IN WISCONSIN?

Wind power is growing rapidly all over the world. Technological advances have improved the performance of wind turbines and driven down their cost. In general, wind power is slightly more expensive than conventional power sources. However, in some locations wind power is competitive with coal, gas and nuclear power plants. Concerns about the environment have also created a demand for wind power, since it causes none of the

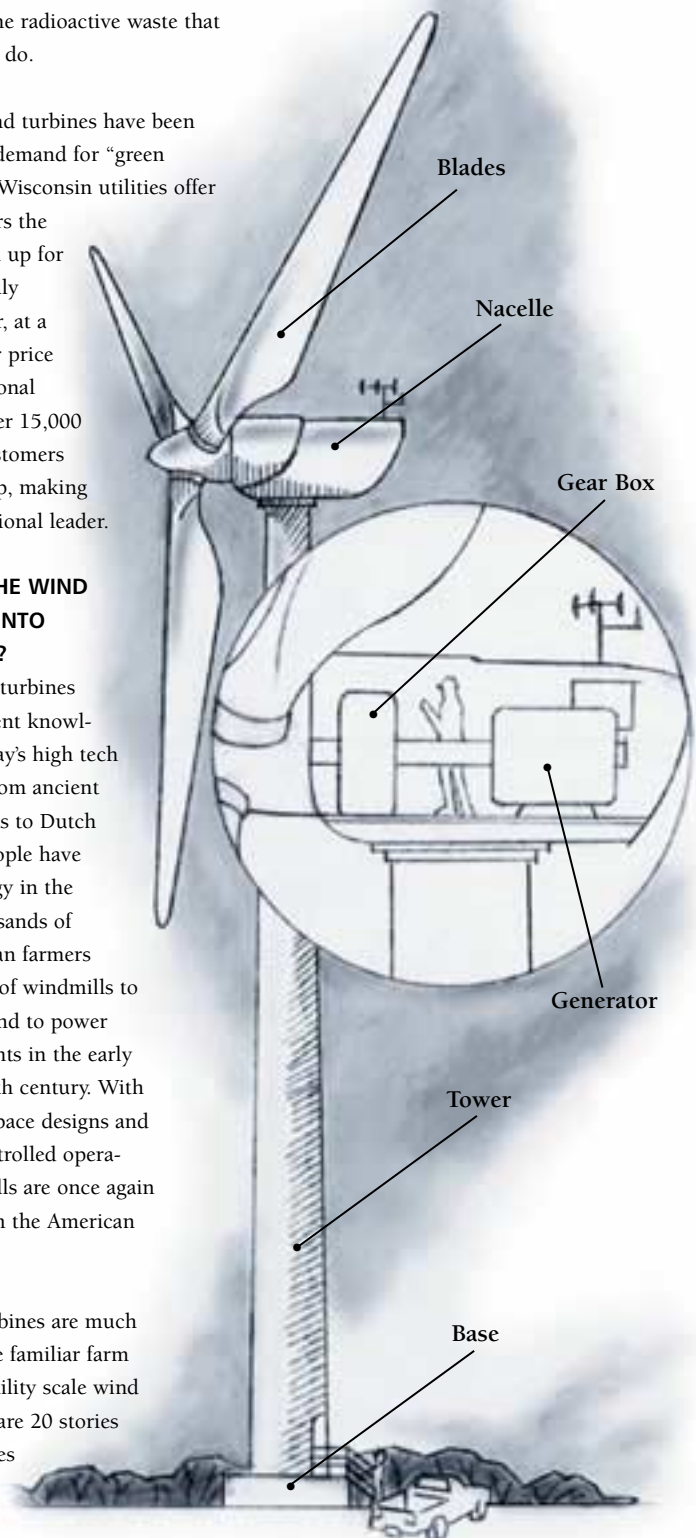
air pollution that fossil-fuel plants do, and none of the radioactive waste that nuclear plants do.

Some new wind turbines have been built to meet demand for "green power." Four Wisconsin utilities offer their customers the chance to sign up for environmentally friendly power, at a slightly higher price than conventional electricity. Over 15,000 Wisconsin customers have signed up, making the state a national leader.

HOW CAN THE WIND BE TURNED INTO ELECTRICITY?

Modern wind turbines combine ancient knowledge with today's high tech know-how. From ancient Greek sailboats to Dutch windmills, people have used the energy in the wind for thousands of years. American farmers used millions of windmills to pump water and to power radios and lights in the early part of the 20th century. With modern aerospace designs and computer controlled operations, windmills are once again cropping up in the American landscape.

New wind turbines are much larger than the familiar farm wind mills. Utility scale wind turbines now are 20 stories tall, with blades 90 feet long, and produce



**ENERGY CENTER
OF WISCONSIN**
We show you how

595 Science Drive
Madison, WI 53711
Phone: 608.238.4601
Fax: 608.238.8733
www.ecw.org



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enough power for 200 homes or more. They are typically built in groups, but can also be built by themselves to supply a factory or small town.

Wind turbine blades use *lift* to capture the wind's energy, like an airplane wing, rather than drag, the force of the wind pushing against something. Because of the blade's special shape, the wind creates a pocket of pressure as it passes behind the blade. This pressure pulls the blade instead of pushing it, as in the case of drag. This captures the wind's energy much more efficiently than old farm wind mills.

The three slowly spinning blades are attached to a generator, inside the nacelle, through a series of gears. As the generator spins, electricity is produced.

Although the potential for wind power in Wisconsin is not as great as in other states, there are some places windy enough, especially in the eastern part of the state. As the technology improves, less windy areas may become viable. Wisconsin's 35 large wind turbines already in place produce enough power for 7,000 homes. Another 30 turbines are planned, and more could be built over the coming years.

ENVIRONMENTAL IMPACTS AND SITING

Wind power is seen as a solution to the environmental problems caused by nuclear, hydroelectric, natural gas, and coal power plants. Coal and natural gas power plants cause air pollution. Nuclear plants create dangerous waste. Hydroelectric plants block rivers. Carbon dioxide emissions from fossil-fuel plants are a significant source of greenhouse gases, a leading cause of global climate change. Wisconsin gets 75 percent of its power from coal plants, which cause 48 million tons of greenhouse gas emissions (carbon dioxide), 206,000 tons of acid rain emissions (sulfur dioxide), and 107,000 tons of smog emissions (nitrogen oxides) each year.

BIRDS

But no energy source is completely free of environmental impacts. Wind turbines in northern

California and Spain, situated in areas with large bird populations, resulted in some avian deaths. In the Midwest, turbines have been sited more carefully, so bird deaths have been negligible. Also, newer turbines, with larger, slow-moving blades, are safer for birds than the older machines found in California.

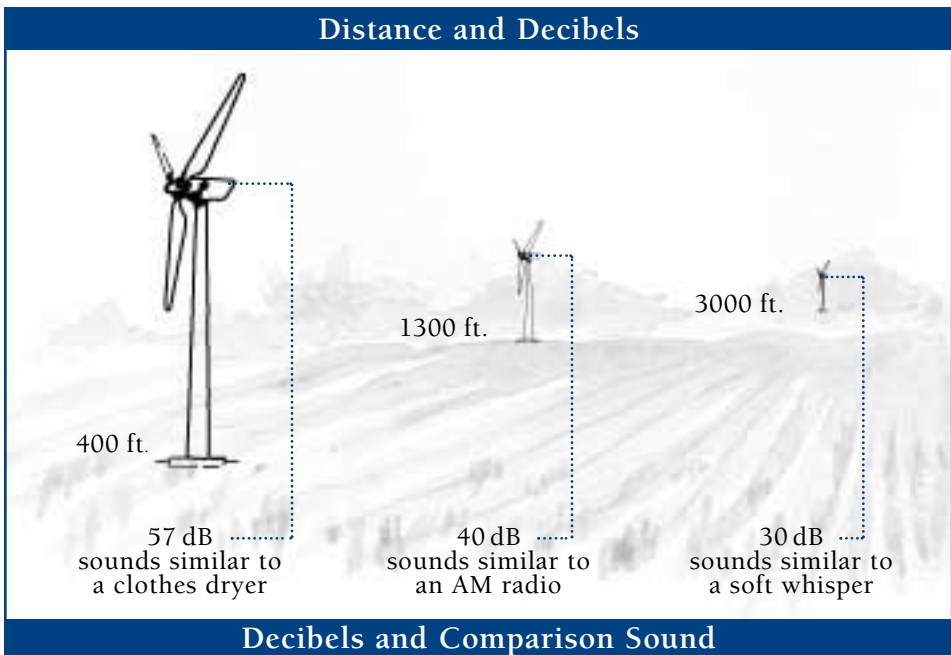
NOISE AND AESTHETICS

Some people are concerned about the noise of wind turbines and their aesthetic effect on the landscape. A modern wind turbine will produce about 50 decibels of noise at a distance of about 300-600 feet. This is comparable to the sound of light traffic at a distance of 100 feet, or the typical sounds of a private business office. The effect of the sound will vary depending on distance from the turbine, wind speed and direction, the amount of background noise and the time of day.

Aesthetic issues are harder to discuss, since they vary widely from one person to the next and are affected by emotional factors. Some people consider wind turbines to be an eyesore, while others consider them to be beautiful.



Wind turbines have none of the environmental impact of coal, natural gas, or nuclear power.



The farther away you are from a wind turbine, the quieter it'll be. Background noise will further mask sounds so that a wind turbine at 1,300 or 3,000 feet might be inaudible.



Wind turbines use only a fraction of the land they're on, leaving the rest available for grazing or crops.

USE OF LAND

Wind turbines also use land, which might otherwise be available for animal habitat, farming or development. Each turbine needs about a quarter acre of land for the foundation and access roads. Turbines must be spaced apart from each other to avoid creating turbulence, typically about one turbine for each five acres (this is specific to the Midwest and is not the case in California). All of the land in between can still be used for farming and grazing.

ECONOMIC IMPACTS

Wind power has two substantial economic effects: on local economies and on the state economy. On the local level, wind power provides jobs, tax payments to counties and local communities, including school boards, and lease payments to landowners, usually farmers. Manufacturing parts for wind turbines has employed as many as 60 Wisconsin workers. Wind power can increase the property value of windy land. Critics of wind power claim that it can reduce property values for neighboring resi-

dential land, but this is difficult to prove.

On the state level, wind power can help keep energy dollars in Wisconsin. Since Wisconsin produces no coal, oil, natural gas, or uranium we must import over \$6 billion worth of these fuels every year. We also import about 15 percent of the electricity we consume. By keeping the money in the state, we produce more economic activity in Wisconsin.

Utility customers now have the option to purchase wind power from several Wisconsin utilities. Over 15,000 customers have signed up so far, including many business customers. Some businesses see buying wind power as a good way to express their commitment to a clean environment. In addition, by keeping their energy dollars inside the state, Wisconsin's businesses can promote the state's economy, thus helping themselves in the long run.

WIND POWER AND AGRICULTURE

Farmers play an especially important role for

wind power, since farmers often own the land where wind turbines must be sited. Wind turbines can be an important source of income for farmers, one that isn't connected to the ups and downs of prices for dairy, grains and livestock. At the same time, the wind turbines take up very little of the farmer's land — about a quarter acre per turbine— leaving the rest of the land available for grazing and crops.

Farmers are also the largest market for small wind turbines, which can generate enough power for one farm, business or home. Customers in Wisconsin can generate their own power using wind turbines as small as 400 watts and as large as 20 kilowatts. If they produce more than they need, they can sell the excess back to their local utility, using a procedure called "net metering."

While stray voltage is always a concern when electricity is used around dairy farms, properly installed wind turbines should not create stray voltage problems.

WIND POWER AND BUSINESS

Dozens of Wisconsin businesses are buying power generated from the wind and other renew-



Wisconsin currently imports more than \$6 billion worth of coal, oil, natural gas, and uranium. Wind turbines will lessen our dependence on these fuels.



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Wind turbines can be a steady source of income for farmers, one that is not affected by fluctuations of the market for livestock, grains and dairy products.

able resources. As of late 1999, four utilities offer their customers the option to buy "green" power, at a price premium. Businesses sign up for green power because of the personal commitment of their owners, to show that they are responsible members of the community and to attract green-minded customers.

For example, Madison Metro, Madison Wisconsin's transit service, was looking at ways to reduce the environmental impacts of their buses. While switching to natural gas buses would have reduced emissions, it would have required a major investment in fueling infra-

structure. Instead, they decided to buy 25 percent of their electricity from a Wisconsin wind farm, reducing their overall carbon emissions by over 1.5 million pounds per year.

"Wind power is a far less expensive means for Metro to be a smart energy consumer, as well as an environmentally sensitive city agency," said Metro manager Paul Larrousse. "Metro's wind power purchase [is] roughly the equivalent of running ten buses per year with no carbon dioxide emissions."

WIND POWER AND YOU

There are two ways in which you can become personally involved in the use of wind power. First, you can contact your local utility company to find out whether

you can sign up for green power. Several utilities around the state allow you to purchase a percentage of your electricity via wind turbine.

Second, if you have the financial and space resources, you can purchase your own small wind turbine to power your home. Depending on the size and type, small wind turbines can power everything from lights and a radio to an all-electric home complete with central air conditioning, or even a small farm or business.

The Public Service Commission of Wisconsin publishes a booklet titled "Renewable Energy

Resources" that deals with interconnection requirements in Wisconsin. The booklet also lists the designated contact people for Wisconsin utilities. Contact Public Service Commission of Wisconsin, P.O. Box 7854, Madison, WI 53707-7854, phone 608.261.8524.

The Wisconsin Energy Bureau publishes "Wisconsin's Renewable Energy Yellow Pages" which lists the renewable dealers doing business in Wisconsin. Contact Wisconsin Energy Bureau, P.O. Box 7868, Madison, WI 53707-7868, phone 608.264.9577, www.doa.state.wi.us/depb/boe/index.asp



Visit the Energy Center of Wisconsin's wind power web site at www.wind.ecw.org or call 608.238.4601

ABOUT US

The Energy Center of Wisconsin is a private nonprofit organization dedicated to improving energy efficiency and renewable energy in Wisconsin. Funded in part by Wisconsin utilities, the Center invests \$5 million annually in energy efficiency research, education and demonstrations aimed at residents, business and government.