



## Wind

Minnesota is one of the windiest states in the nation, according to the Department of Energy. Wind power could theoretically generate many times more electricity than currently used in the state. In 2003, Minnesota was fourth in the nation in wind power development, with only California, Texas and Iowa having built more wind turbines. Most of the wind development to date is on the very windy Buffalo Ridge in Southwestern Minnesota. There are many other promising wind sites in the state, with high elevations and minimal obstructions, many across all of southern Minnesota.<sup>1</sup>

**How much does wind energy cost?** Over the last 20 years, the cost of electricity from utility-scale wind systems has dropped by more than 80%. In the early 1980s, when the first utility-scale turbines were installed, wind-generated electricity cost as much as 30 cents per kilowatt-hour. Now, state-of-the-art wind power plants can generate electricity for less than 5 cents/kWh, a price that is competitive with new coal- or gas-fired power plants.<sup>2</sup>

**How much electricity can one wind turbine generate?** The ability to generate electricity is measured in watts. Watts are very small units, so the terms kilowatt (kW, 1,000 watts), megawatt (MW, 1 million watts), and gigawatt (GW, 1 billion watts) are most commonly used to describe the capacity of generating units like wind turbines or other power plants. Electricity production and consumption are most commonly measured in kilowatt-hours (kWh). A kilowatt-hour means one kilowatt (1,000 watts) of electricity produced or consumed for one hour.

The output of a wind turbine depends on the turbine's size and the wind's speed through the rotor. Wind turbines being manufactured now have power ratings ranging from 250 watts to 1.8 megawatts (MW).

Example: A 10-kW wind turbine can generate about 10,000 kWh annually at a site with wind speeds averaging 12 miles per hour, or about enough to power a typical household. A 1.8-MW turbine can produce more than 5.2 million kWh in a year--enough to power more than 500 households.

<sup>1</sup> Pawlisch, Melissa, Carl Nelson, Lola Schoenrich.2003. *Designing A Clean Energy Future: A Resource Manual*. P.21. Retrieved on February 4<sup>th</sup>, 2005, from: [www.cleanenergyresourceteams.org](http://www.cleanenergyresourceteams.org).

<sup>2</sup> All questions and answers listed come from the American Wind Energy Association's Frequently Asked Questions link. Retrieved on February 4<sup>th</sup>,2005, from: <http://www.awea.org/faq/index.html>. They have a link to specific Minnesota projects at <http://www.awea.org/projects/minnesota.html> .

**How much land is needed for a utility-scale wind plant?** In open, flat terrain, a utility-scale wind plant requires about 60 acres per megawatt of installed capacity. However, only 5% (3 acres) or less of this area is actually occupied by turbines, access roads, and other equipment--95% remains free for other compatible uses such as farming or ranching. In California, Minnesota, Texas, and elsewhere, wind energy provides rural landowners and farmers with a supplementary source of income through leasing and royalty arrangements with wind power developers. A wind plant located on a ridgeline in hilly terrain will require much less space, as little as two acres per megawatt.

**How much electricity does wind generate in the U.S. today?** About 6,374 megawatts of wind power capacity were installed in the U.S. as of January 2004, generating over 16 billion kilowatt-hours annually. That is enough electricity to power about 1.6 million average American households each year.

**What size turbine do I need for my home?** Homes use approximately 10,000 kilowatt-hours (kWh) of electricity per year (about 830 kWh per month). Depending upon the average wind speed in the area, a wind turbine rated in the range of 5 to 15 kilowatts would be required to make a significant contribution to meet this demand.

**How much does a wind system cost?** Small wind energy systems cost from \$3,000 to \$5,000 for every kilowatt of generating capacity, or about \$40,000 for a 10-kw installed system. This is much cheaper than solar systems, but the payback period can still be lengthy. That's why it's important to take advantage of rebates or tax credits available for small wind system installations. Well-sited small wind turbines can usually pay for themselves within 15 years, about half their serviceable lifetimes, if the right incentives are applied.

### ***Links:***

American Wind Energy Association: <http://www.awea.org/faq/index.html>.

Wind Power Monthly: <http://windpower-monthly.com/>.

National Renewable Energy Laboratory: <http://www.nrel.gov/>.

Minnesotans for an Energy-Efficient Economy Wind Energy Resources:  
<http://www.me3.org/issues/wind/>.

Minnesota Public Radio "Wind Power Is Another Cash Crop":  
[http://news.minnesota.publicradio.org/features/2003/09/29\\_steilm\\_windone/](http://news.minnesota.publicradio.org/features/2003/09/29_steilm_windone/).

Windustry: <http://www.windustry.com/default.htm>.

MN Dept. of Commerce Wind Information: <http://www.state.mn.us/cgi-bin/portal/mn/jsp/content.do?subchannel=-536881511&programid=536902421&id=-536881350&agency=Commerce&sp2=y>.

MN Department of Agriculture: <http://www.mda.state.mn.us/crp/wind.htm>.