Harvesting the Wind

A Landowners' Guide to Wind Energy Development in the Great Plains

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POWER

How do I attract wind energy developers to my land?

This question applies only to landowners interested in making their land available to wind energy developers for placement of wind turbines and to receive negotiated royalty payments. It does not apply to those interested in some form of self-generation, which involves putting excess power onto the electrical grid system. Wind energy developers are interested in large-scale wind energy development involving large groups of wind turbines.

EERC and Spirit Lake Nation personnel in the nacelle of a Micon 108 turbine in Devils Lake, North Dakota.

What are the steps leading to wind development?

Typically, wind developers need a power purchase agreement, a good wind resource, low-interest financing, and low transmission upgrade or construction costs. The steps leading to development involve prospecting for good wind sites, negotiating land lease agreements, and monitoring wind speeds.

How do wind turbines work?

Wind turbines are sophisticated machines with computer controls. A typical operating sequence is as follows: On a calm day, the turbine sits idle, blades not spinning. As the wind picks up, it eventually reaches the cut-in speed of the turbine (usually around 10 mph). At this wind speed, the turbine blades will spin up to operating speed, usually around 14 to 29 rpm (varies by turbine model), and start generating electricity. As the wind speed increases, the generator output increases. When the wind speed increases to the rated wind speed (usually around 30 to 35 mph), the generator will be outputting its nameplate-rated capacity (i.e., a 750-kW turbine will be outputting 750 kW). As the wind speed continues to increase, the generator output will remain at the rated capacity (i.e., 750 kW) until such time as the wind speed reaches the cut-out speed (usually around 55 to 65 mph). At this wind speed, the turbine will actuate a disk brake, stopping the blades in a few revolutions, and then rotate itself 90 degrees out of the wind and park itself. If the wind speed drops to a level below the cut-out speed for a sufficient length of time, the turbine will point itself back into the wind and release the brake. The blades will spin back up to operating speed, and the turbine will resume producing power.

How can wind be a resource to me, the landowner?

As a landowner, you have a resource associated with your land: the wind above it. The wind above your land can be considered a resource similar to the "mineral" resource below your land. To gain access to the wind resource, developers must first obtain permission from you, the landowner. This permission comes at a cost to the developer in the form of a lease agreement for access to and development of your land. This is similar to leasing arrangements for mineral rights when companies explore for coal or oil.

Would my land be a good wind site?

The wind resource in your area may or may not be conducive for large-scale wind energy development. A small increase in wind speed results in a large increase in power output from the turbine, so developers want to find the windiest spots. The wind speed increases with altitude and is slowed down by surface roughness elements such as trees, rough hilly terrain, and buildings. The site must also be accessible to large cranes and other construction equipment and be near the transmission grid.

From windmills to windchargers to wind turbines, the changing face of wind energy.

What type of deal can I expect from a wind energy developer?

Land lease agreements between landowners and wind energy developers are negotiated. Specific details of binding contracts can vary from project to project. Current land lease agreements typically pay the landowner 2%–4% of the gross annual turbine revenue, resulting in a payment of $2000 or more annually per turbine on your land. The exact amount will depend on the size of the turbine and the amount of electricity it produces each year.

What type of wind turbine(s) would be on my land?

The turbines used by wind energy developers are utility-scale turbines. They differ in almost every aspect from the typical 10- or 20-kW single-user wind turbines. Current utility-scale wind turbines range in size from 750 kW up to 1.5 MW. Tower heights will range from 180 to 320 feet. Each turbine blade will be approximately 80 to 100 feet long and weigh between 8000 and 10,000 pounds. Utility-scale wind turbines cost approximately $1 million per MW of installed capacity. A 1.5-MW wind turbine in a moderately windy area could produce as much as 5,000,000 kWh per year, enough to power between 400 and 500 homes.

Enron wind turbines in Iowa.

How many turbines can be put on a section of land?

The wind energy developers evaluate many factors to determine how many turbines will be placed on a given section of land. In general, up to twelve 750-kW turbines or six 1.5-MW turbines can be placed on a section of land. Spacing between turbines is usually 5 to 10 rotor diameters to avoid interference with each other.

What happens to the electricity produced from the wind turbines?

Electricity from large-scale wind farms must be transported to the consumer, like other commodities produced by farmers such as grain or livestock. Electricity is generated or produced on your land or your neighbors' land and, through a network of transmission lines and substations, delivered to a central facility for distribution and sale to the public. The sale of the electricity is established by a negotiated power purchase agreement between the wind farm developer/owner and the power company.

What happens when the wind doesn't blow?

The existing electricity generation system has baseload equipment that runs at the same level all the time and load-following equipment that is designed to vary its output to match the load. When wind turbines put electricity onto the grid, the load-following equipment will respond by backing down, as if the load had been decreased. This automatic system is capable of compensating for some percentage of wind energy added to the system. Studies indicate that a penetration level of 10% wind on the grid may be feasible under current control systems. In reality, it will be many years from now before we see wind penetration levels approaching 10%.

Wind turbine at Sacred Heart Monastery, Richardton, North Dakota.

State Contacts

Name	Phone Number	E-Mail Address
Iowa		
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Kansas		
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Steve Wegman	580-470-8066	steve.wegman@state.sd.us

Nonprofit Wind Energy Contacts (partial list)

Name	Phone Number	Web Site or E-Mail Address
EERC	*701-777-5000*	*www.undeerc.org/wind*
Bradley Stevens, P.E.	701-777-5293	bstevens@undeerc.org
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John A. Harju	701-777-5157	jharju@undeerc.org
U.S. Department of Energy		*www.eren.doe.gov/dro*
Steve Palomo	303-257-4838	steve_palomo@nrel.gov
National Renewable Energy Laboratory		*www.nrel.gov*
Larry Flowers	303-384-6910	larry_flowers@nrel.gov
Brian Parsons	303-384-6958	parsonsb@tcplink.nrel.gov

Web Sites with Landowner Information (partial list)

Organization	Phone Number	Web Site Address
American Wind Energy Association	202-383-2500	www.awea.org
National Wind Coordinating Committee	888-764-9463	www.nationalwind.org

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Tax Incentives in the Central and Northern Great Plains States
(listed by wind potential)

State	Wind Energy Potential[1]	Tax Incentives[2]
North Dakota	**1210**	• **Centrally assessed wind generation units larger than 100 kW will have a taxable value of 3% for a period of 5 years after installation** • **Local property tax exemption on wind energy devices; exemption available only to the property owner** • **Exemption on sales and use tax for systems larger than 100 kW** • **Income tax credit of 3% of the cost of installation of a wind energy device on owned or leased property for a period of 5 years after installation** • **Income tax credit (above) may be claimed by holder of lease for wind rights above land in North Dakota**
Kansas	1070	• Property tax exemption on renewable energy property
South Dakota	**1030**	• **Local property tax exemption for wind energy systems on residential property and a 50% exemption of installation costs for systems located on commercial property, 3 years in duration and depreciates thereafter**
Montana	1020	• Property tax exemption for commercial and residential entities on renewable energy sources for a period of 10 years after installation • Corporate and personal income tax credit of 35% on all wind energy generating systems and equipment greater than $5000
Nebraska	**868**	**None**
Oklahoma	**725**	**None**
Minnesota	**657**	• **Property tax exemption on wind energy systems rated less than 2 MW, incremental exemptions apply to larger systems** • **Sales tax exemption on costs of equipment and all materials used to manufacture, install, construct, or repair wind energy devices** • **State production credit of 1.5 cents/kWh on all projects less than 2 MW in capacity, duration of 10 years**
Iowa	551	• Property tax assessment for wind turbines at a special valuation that starts at 0 and increases to 30% of cost in the seventh and succeeding assessment years • Sales tax exemption on cost of equipment and materials used to manufacture, install, or construct wind energy systems • Zero-interest loans for up to half of the project costs of a wind energy system (up to $250,000)

[1] Annual energy potential in billions of kilowatt hours (kWh).

[2] Sources include personal communication, state legislative Web sites, and the American Wind Energy Association's (AWEA) *"An Inventory of State Incentives for the U.S.: A State by State Survey"* (2001; www.awea.org). This information was current as of August 2001.