

10 Steps to Developing a Wind Farm

This information is intended for landowners interested in developing or hosting a wind farm on their property. It briefly addresses key factors in this decision:

Understanding your wind resource

Distance from existing transmission lines

Securing access to land

Establishing access to capital

Identifying reliable power purchaser or market

Addressing siting and project feasibility considerations

Understanding wind energy's economics

Obtaining zoning and permitting expertise

Establishing dialogue with turbine manufacturers and project developers

Securing agreement to meet O&M needs

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1. Understand Your Wind Resource. The most important factor to consider in the construction of a wind energy facility is the site's wind resource. A site must have a minimum annual average wind speed in the neighborhood of 11-13 mph to be considered. Local weather data available from airports and meteorological stations may provide some insight as to averages. You can also check the wind maps for your state on the [National Renewable Energy Laboratory Web site](#). Eventually, you will want to install your own monitoring devices to record the site's wind characteristics. A listing of consultants specializing in wind resource assessment can be found at the American Wind Energy Association Web site: <http://www.awea.org/directory/consultcde.html>. More information on basic principles of wind resource evaluation can be found at http://www.awea.org/faq/wwt_basics.html.

2. How Far Is Your Site from Existing Transmission Lines? A critical issue in keeping costs down in building a wind farm is minimizing the amount of transmission infrastructure that has to be installed. High-voltage lines can cost thousands of dollars per mile. Whenever possible, availability and access to existing lines should be considered in selecting a site.

3. Secure Access to Land. Landowners, both private and public, will expect to be compensated for any wind energy development that occurs on their land. Royalty or lease agreements will need to be discussed with all parties involved. Roads, transmission equipment, maintenance infrastructure, turbines, etc. all need to be considered. Moreover, the construction of a wind farm requires the use of heavy industrial equipment so developers will need to ensure there are roads capable of handling significant weight. The planning phase requires cooperation of landowners and the local community.

4. Establish Access To Capital. Building a wind farm is not cheap. Wind power development can cost around \$2 million per megawatt (MW) of generating capacity installed. To take advantage of economies of scale, wind power facilities should be in excess of 20 MW. Assuming the average wind turbine is rated at 1.5 megawatts (MW) in capacity, this means the installation of at least 13 turbines and an initial investment of about \$40 million.

5. Identify Reliable Power Purchaser or Market. Today, wind energy is one the most cost-effective renewable energy options on the market. In fact, the cost of electricity from a new wind project is now in a range that is competitive with the cost of electricity from new power plants of any kind. However, utilities will tend to purchase power from what they consider to be the cheapest and most reliable technology. There is a fast-growing demand for wind power as well. Demand for "green power" (electricity from clean sources like wind that is sold to customers at a premium price) and environmental requirements are also creating buyers for wind energy at competitive rates. A developer should typically secure a commitment from one or more buyers for the plant's output over 10-30 years of its operational lifetime.



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6. Address Siting and Project Feasibility Considerations. The fact that a site is windy does not always mean it is suitable for wind power development. A developer needs to consider many factors in siting a project. Are there endangered or protected species that could be jeopardized by the presence of the facility? Is the site's geology suitable and appropriate for industrial development? Will turbine sound and aesthetics be issues for the local community? Will the turbines obstruct the flight path of local air traffic? There are quite a few environmental and social issues that will need to be addressed in the siting of a wind power facility. Wind farms can make great neighbors, but it is the obligation of the developer to work to ensure that a project proceeds in a fashion that is acceptable to regulators and the local community. AWEA has developed a Siting Handbook that can be a useful tool in addressing siting considerations. The Handbook is available online at <http://www.awea.org/sitinghandbook/>.

7. Understand Wind Energy's Economics. There are many factors contributing to the cost and productivity of a wind plant. For instance, the power a wind turbine can generate is a function of the cube of the average wind speed at its site, which means that small differences in wind speed mean large differences in productivity and electricity cost. Additionally, the swept area of a turbine rotor is a function of the square of the blade length (the radius of the rotor's swept area). A modest increase in blade length boosts energy capture and cost-effectiveness. Financing methods can make a major difference in project economics as well. Securing significant investment capital or joint ownership of a project can cut costs significantly. Furthermore, there are federal and state incentives for which a project may qualify and which could reduce costs and encourage more favorable investment. For an online database of state and federal renewable energy incentives, go to <http://www.dsireusa.org/>.

8. Obtain Zoning and Permitting Expertise. Siting any power project can be a daunting task due to the complex array of social and environmental factors at play. A wind power developer would be well served to obtain the services of a professional familiar with the regulatory environment surrounding wind power development. A listing of consultants is available at <http://www.awea.org/membercenter/memberdirectory.aspx>.

9. Establish Dialogue With Turbine Manufacturers and Project Developers. Every wind turbine is different despite seemingly similar power ratings. Some machines are designed to operate more efficiently at lower wind speeds, while others are intended for more robust wind regimes. A prospective wind power developer would be wise to investigate all of the various considerations and compare the projected performance to existing machines. Moreover, anecdotal information and even the professional services of wind power developers may prove helpful. A listing of utility-scale wind turbine manufacturers can be found at <http://www.awea.org/directory/wtqmfg.html> and a listing of developers can be found at <http://www.awea.org/membercenter/memberdirectory.aspx>.

10. Secure Agreement to Meet O&M Needs. Wind turbine technology has made great strides in the recent years. Today's machines are more efficient and cost-effective than ever. However, they are also more complex. Turbine availability (reliability) is a major factor in project success, and the services of professional familiar with the O&M (operation and maintenance) of wind turbines can prove to be invaluable. Also, turbine manufacturers may offer more favorable product guarantees knowing that qualified project operators will be on site to maintain the equipment. A listing of project operators can be found at <http://www.awea.org/membercenter/memberdirectory.aspx>.