



American Wind  
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## 10 Steps in Building a Wind Farm

**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 even 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, at <http://rredc.nrel.gov/wind/pubs/atlas/>. In time, 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: see <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/basicwr.html>.

**2. Determine Proximity to 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, and the like all need to be considered. Moreover, the construction of a wind farm necessitates the use of heavy industrial equipment. Developers will need to invest in roads capable of accommodating significant weight. To do so will require the cooperation of landowners and, in some cases, the local community.

**4. Establish Access To Capital** Building a wind farm is not cheap. On average, wind power development costs around \$1 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 750 kilowatts (kW) in capacity, this means the installation of at least 26 turbines and an initial investment of \$20 million dollars.

**5. Identify Reliable Power Purchaser or Market** To date, wind energy is the most cost competitive renewable energy option on the market. In fact, wind energy's cost has declined so much that it rivals many traditional power generation technologies. However, utilities will tend to purchase power from what they consider to be the cheapest and most reliable technology. In most cases today, that is natural gas. That does not mean there is not a market for wind, though. Demand for "green power" (electricity from clean sources like wind that is sold to customers at a premium price) and environmental requirements are creating buyers for wind energy and competitive rates. Before investing thousands of dollars into wind resource assessments, permitting, and pre-construction activities, a developer will secure tentative commitments from one or more buyers for the wind plants output over 10 to 30 years of its operational lifetime.

**6 Address Siting and Project Feasibility Considerations** The fact that a site is windy does not mean it is suitable for wind power development. A developer needs to consider many factors in siting a project. Is there high raptor activity in the area? 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 noise 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.

**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.

**8. Obtain Zoning and Permitting Expertise** Siting any power project can be a daunting task due to the dizzying 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 appropriate consultants can be found at <http://www.awea.org/directory/consultsflm.html> and <http://www.awea.org/directory/consultcde.html> . Additionally, legal counsel familiar with the local political climate may be able to help navigate the permitting process.

**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 the various considerations and compare the 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/wtgmfr.html> and a listing of developers can be found at <http://www.awea.org/directory/developers.html> .

**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 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/directory/developers.html> .

For additional information on wind power development please refer to AWEA's Web site at <http://www.awea.org> or contact AWEA by e-mail at [windmail@awea.org](mailto:windmail@awea.org) or by phone at (202) 383-2500.