

Guide to Small Wind Energy Systems

Harnessing the wind to make electricity and meet at least a portion of your power needs provides immediate and long-term environmental and financial benefits.

Why Wind?

Wind is one of the great renewable energy resources on the planet because it is in limitless supply. Using wind energy to generate electricity can have environmental benefits because it produces no greenhouse gas emissions or pollutants, and it takes the place of fossil fuels typically used for power.

How Small Wind Energy Systems Work

The key feature of a small wind energy system is the wind turbine. The turbine uses the energy of motion (kinetic energy) from the wind to turn a shaft, thus making mechanical energy. This shaft is attached to a generator. The resulting spin within the generator makes electricity. A wind turbine thus operates the opposite way of a fan. Whereas a fan uses electricity to move air, wind turbines use the wind to make electricity.

Benefits of Wind

The size of a turbine and the speed of the wind determine how much electricity (power) a wind energy system will produce. A small wind energy system has a power output as much as 100 kilowatts. A 100-kilowatt turbine operating in a sufficiently windy location (on average 12MPH) can produce enough electricity over a year for 20 typical homes.



This picture shows a 2.4-kilowatt power wind turbine in Mullica Hill, New Jersey. Wind turbines are growing more and more popular for use in private residences.

Photo courtesy Southwest Windpower

Am I a Good Candidate for a Small Wind Energy System?

If you are interested in owning a small wind energy system, the best place to start is to educate yourself. There are many resources available, some of which are listed in *Further Reading* at the end of this fact sheet. Being an educated consumer will also help you when the time comes to work with wind system installers. Before proceeding with installing a small wind energy system, however, there are several important factors to consider. These include property size and local zoning laws, adequate wind resources, cost and price of electricity in your area, and local grid connection and metering rules. These factors are described in further detail below.

Factors to Consider

Requirements:

- At least ½ acre of land
- Trees and other structures with lower height than turbine
- No local zoning laws, building codes, or other covenants restricting structures such as turbine towers, which can range from 30 to 140 feet
- Area must maintain an annual average wind speed of 10 MPH or greater at hub height

Utilities Using Wind

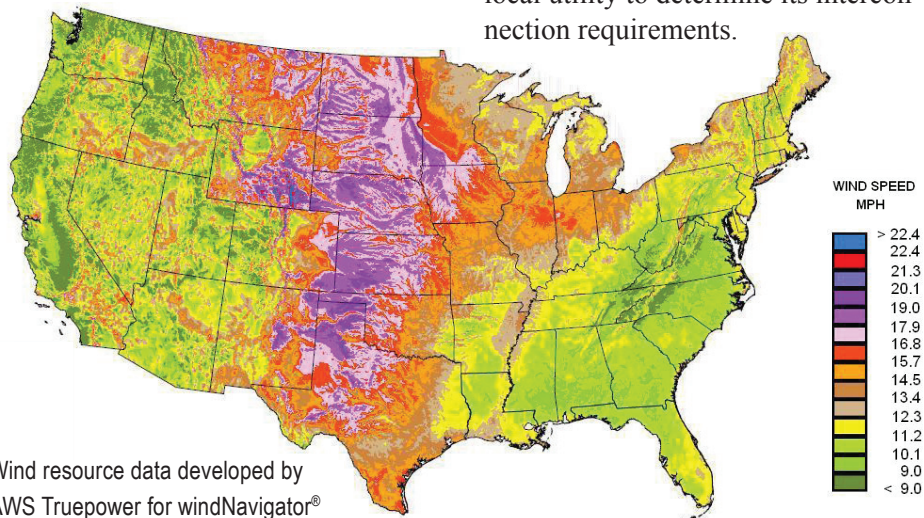
Utility companies across the United States have recognized the benefits of wind power and are increasingly investing in it. The electricity generated by such projects is safely fed into the U.S. electrical power grid and already provides enough power for millions of households nationwide.

Cost

Purchasing and installing a small wind energy system can cost anywhere from \$4,000 to \$8,000 per kilowatt. However, tax incentives, credits, and grants can substantially lower the cost. For example, current federal law allows consumers to claim 30% of the total cost of a small wind energy system as a tax credit, as long as the system is in place by December 31, 2016.

Determining Payback Time

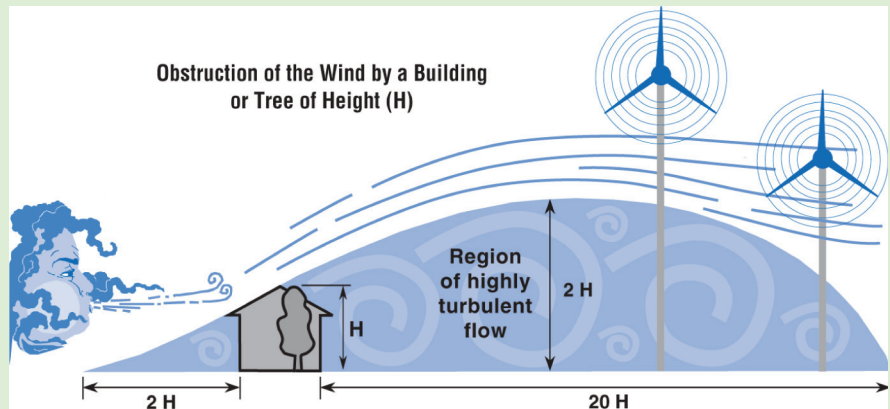
A small wind energy system has about a 20-year lifetime, but with routine maintenance, some systems have successfully operated for 50 to 60 years. Under the right circumstances the system can pay for itself in roughly 10 to 20 years. This requires the necessary combination of tax incentives, local wind resources, and retail price of electricity from your utility company.



Wind resource data developed by AWS Truepower for windNavigator®

Predicted average annual wind speed in miles per hour (MPH) at an elevation of 80 meters (240 feet) above the ground for the lower 48 United States. Note that winds at 30 meters or 90 feet (the typical height of a small wind turbine) are usually slower.

Siting Your Wind Turbine to Avoid Unwanted Turbulence



The higher above and the farther away you place your wind turbine from obstacles on the ground such as buildings and trees, the less turbulence it will encounter. Placing a turbine high above and far away from obstacles, such as buildings and trees, results in less turbulence, greater turbine productivity, and a longer turbine lifetime.

Connecting to the Grid

Nearly all small wind energy systems installed today are (or can be) safely connected to the larger power grid. This allows you to take electricity from the grid when your system cannot supply all your power needs, or to possibly supply excess power to the grid, typically earning wholesale rates for excess power. Contact your local utility to determine its interconnection requirements.

Further Reading

American Wind Energy Association
www.awea.org/smallwind

Database of State Incentives for Renewable Energy
www.dsireusa.org

DOE Energy Savers: Small Wind Electric Systems
www.energysavers.gov/small_wind

Wind Powering America
www.windpoweringamerica.gov

Financial Incentives

Tax credits, incentives, and rebates may be available in your area. Please visit www.energysavers.gov/taxcredits for more information.

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ENERGY

Energy Efficiency &
Renewable Energy

EERE Information Center
1-877-EERE-INFO (1-877-337-3463)
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