



## *Everyday Environmental Stewardship*

### **Wind Turbines** *Andrew Siliski*

**Key issue:**  
Creating electricity by renewable resources

**Stewardship Opportunity**  
Buying and Installing Wind Turbines

Most of today's electricity in Massachusetts comes from coal, oil, and natural gas power plants. Although fossil fuels can be burned cleanly, the old Massachusetts power plants are loud, dirty, and often use obsolete, technology. Green energy is much cleaner than fossil fuels, and uses a *renewable* resource. Buying green energy helps develop future green technology while at the same time drastically reducing one's carbon footprint.

Four of the five largest electric power plants in Massachusetts rely on fossil fuels. Brayton Point, the state's largest power plant, relies on natural gas, oil, and coal. With a capacity of over 1,500 megawatts, it is more than twice the size of the Pilgrim Nuclear Power Plant in Plymouth. Renewable electricity such as that from wind turbines produce no green house gasses (e.g. CO<sub>2</sub>) and no byproducts of electricity production (e.g. nuclear waste). Electricity from renewable resources also eliminates SO<sub>x</sub>, NO<sub>x</sub>, VOCs, and gaseous mercury from being released into the air.

#### **How wind power works**

Wind turbines use wind to push blades to power a generator which produces the electricity. There are four main parts of a wind turbine: the blades (also called rotors), power shaft, gears, and generator.

#### **Home Wind Power Systems**

Wind turbines come in variable sizes and kilowatt (KW) capacity. These can be used for supplementing one's existing power supply or becoming completely electrically independent. Depending on the wind turbine installed and how much kWh used, installing a residential wind turbine typically reduces electric bills by 50-90%. 100% independence from the power grid may be achieved with the reduction of electricity consumption.

Homes and houses of worship typically draw 1-2 kWh (that is, a continuous use 1-2 kw 24 hours a day). A wind turbine rated at 5-15 kw would be a good size depending on the site's average wind speed. Even these small wind turbines are very tall (80-120 ft). This height is necessary in order to raise the turbine above turbulence created by ground objects and obtain a strong, steady wind. Wind velocity increases with height, so turbine productivity also increases with height. The wind turbine will need to be in a location where it is at least 20' higher than the surrounding trees. A wind turbine generally cannot

be installed on top of a building, but it may be possible if the building structure is strong enough (i.e. steel framed and concrete).

### **Who Should Consider Buying and Installing a Wind Turbine**

Though wind turbines can produce inexpensive, clean electricity, there are some restrictions to their applicability. The most important factor in installing a wind turbine is wind speed. The second is the price paid for electricity. It is not advisable to install a wind turbine if the average wind speed is less than 10 mph. Go to...

[http://www.masstech.org/renewableenergy/Community\\_Wind/maps/maps.htm#n](http://www.masstech.org/renewableenergy/Community_Wind/maps/maps.htm#n)  
for maps of average wind speed by town in MA.

Wind Turbines are most applicable where the owner has one or more acres of land. Check with municipal officials on building height restrictions because this does change by town. One consideration is matching tower height to the radius of the property so that if it falls down it will fall only on the property.

### **Cost and Prices**

The cost of a wind power system depends on how much power you wish to generate. If you want to supplement your existing grid-based power, or supplement a solar system, you can get a small system that will run between \$5,000-10,000. If you want to install a larger system that will cover most of your power needs, the system will cost between \$20,000-50,000. A good source for price estimation is New England Breeze at

<http://www.newenglandbreeze.com/turbines.shtml>

Depending on the size of the system you buy, the amount of power you use, and any tax or other incentives you may qualify for, your payback period should be 5-15 years. Like solar, wind power is a long-term green investment.

### **How to Hook your Turbine to your Electrical System: Tied Grid vs. Stand Alone**

Similar to solar power, there are two ways to route the electricity the wind turbine produces. In a grid system, the house is connected to both the wind turbine and the local electricity utility. Any surplus electricity produced (electricity the turbine produces which the house does not consume) is fed into the power grid. The utility (required by law) buys back the electricity. The power grid, in a sense, acts as the storage system for the electricity. A standalone system requires buying batteries and is significantly more expensive. However the standalone systems provides complete independence from the power grid.

### **Alternatives to Wind Power**

Installing solar panels is a great alternative if you do not have the space for a wind turbine. See MIP&L's *Solar Power EES* file. You can also buy RECs and green power from your utility. See MIP&L's *GreenE EES* file.

## **Additional Resources**

### **Massachusetts Division of Energy Resources (DOER)**

Go to <http://www.mass.gov/doer/programs/renew/renew.htm#wind> and scroll one third down the page to the large heading labeled 'WindPower' then go to the sub header labeled 'Small Wind Systems. Download the guidebook written by the US Department of Energy and DOER. This guidebook has comprehensive information on small wind power, tax incentives, and answers to commonly asked questions such as 'Is wind power practical for me' and 'What sized turbine do I need?'

### **Tax Incentives and Exemptions**

Go to [http://www.awea.org/smallwind/massachusetts\\_sw.html](http://www.awea.org/smallwind/massachusetts_sw.html) for all current tax incentives and exemptions for installing wind turbines in Massachusetts such as Small Renewables Initiatives, Tax Incentives for Homeowners, Local Property Tax Exemption, and State Sales Tax Exemptions.

### **Small Renewable Initiative**

Go to [http://www.masstech.org/renewableenergy/small\\_renewables.htm](http://www.masstech.org/renewableenergy/small_renewables.htm) for information on the Small Renewable Initiative offered through MTC (MA technology Collaborative). Grants of up to \$50,000 are available for private or public buildings (homes; houses of worship) for small wind power (less than 10 kW).

### **Manufacturer List**

Go to <http://www.awea.org/smallwind/smsyslst.html> for a complete list of US small wind turbine manufactures and their model and size turbines. Contact them for installer locations.

### **Suppliers and Distributors**

Go to <http://www.lowimpactliving.com/providers/category/34> and enter in your zip code to find wind turbine suppliers and distributors in your area. This works nationally.

### **Payback Calculator**

Go to <http://www.newenglandbreeze.com/payback.shtml> to download an Excel payback calculator and an explanation on how to use it.