

# WIND ENERGY

Fact Sheet Developed by the Pioneer Valley Planning Commission and the Franklin Regional Council of Governments

## AT A GLANCE

**Commercial \$ / kWh:** 5 cents, not including federal tax credit and available grant funding

**Average Size:** 500 kW – 2 MW

**Residential \$ / kWh:** find info

**Average Size:** Below 30 kW

**Energy Returned on Energy**

**Invested:** ??????

**Ease of Development:** Low

**Benefit to the Environment:**

Medium

**Benefit to Local Economy:** High

**What goes in:** Wind currents

**What comes out:** Electricity and Renewable Energy Credits



### What is Wind Energy and how does it work?

One of the fastest growing and most commercially viable forms of clean energy, wind turbines provide significant amounts of energy using only the natural power of wind. Wind turbines capture the wind's energy with two or three propeller-like blades mounted on a rotor to generate electricity.

The turbines sit high atop towers, taking advantage

of the stronger and less turbulent wind at 100 feet or more above ground. Wind Energy harnesses kinetic energy of flowing air and then transforms the mechanical energy of spinning blades into pollution-free electricity.

### Why is Wind Energy considered a clean renewable energy technology?

Wind is considered a renewable energy because it uses only the power of the wind to produce electricity, rather than using a material fuel like coal, natural gas, or oil. Because wind requires no physical resources for its fuel, it also produces zero emissions. In addition, using wind energy to replace fossil fuel-based generation also eliminates other forms of pollution such as chemical and thermal discharges into water, and solid combustion and radioactive wastes.

### Where is Wind Energy technology typically used?

Wind turbines are used around the world for many applications. Wind turbine use ranges from homeowners with single turbines to large wind farms with hundreds of turbines providing electricity to the power grid. They can be used as stand-alone applications, or they can be connected to a utility power grid or even combined with a photovoltaic (solar cell) system. For utility-scale sources of wind energy, a large number of wind turbines are usually built close together to form a wind plant. Stand-alone wind turbines are typically used for water pumping or communications. However, homeowners, farmers, and ranchers in windy areas can also use wind turbines as a way to reduce their electric bills or generate electricity completely off the grid.

### **What are the production and maintenance costs of Wind Energy?**

The cost of electricity from utility-scale wind systems has dropped by more than 80% over the last twenty years. In the early 1980s, wind generated electricity cost as much as 30 cents per kWh; today, wind power plants are generating electricity at less than 5 cents per kWh. Selection of a suitable site is the key to the economics of wind energy. In general, winds exceeding 11 mph are required for cost-effective application of small grid-connected wind machines, while larger wind farms require wind speeds of 13 mph.

### **Does a Wind installation have any environmental impacts?**

Wind energy offers many environmental benefits, from the use of renewable fuel to the absence of the polluting emissions that have a powerful global impact on the environment and climate stability. However, production of wind energy also has several environmental concerns, including impacts on local sites, scenery, and wildlife. Many of these concerns occur when turbines are not thoughtfully sited and most of the environmental impacts can be avoided in part or in whole by a good design and appropriate construction and operating practices. Although wind is compatible with many land uses, installations can pose siting challenges, since all sites must offer adequate wind resources, be close to end uses and the electric grid, and allow access for construction and maintenance. When improperly sited, wind facilities can fragment wildlife habitat, and have noise and visual impacts. In addition, wind facilities can impact bird and bat migration.

### **What is the quality of the power produced by Wind?**

Because the wind blows intermittently, wind technology alone cannot supply all the electricity for a customer, community, or region. In off-grid applications, energy storage or back-up generation systems can often help to provide a continuous power by storing excess power from the wind turbine. For installations connected to the electric grid, the grid itself ensures a continuous supply of power.

### **How long can I expect a Wind Energy system to last?**

With proper maintenance, a wind energy system can last at a minimum between 20-30 years.



*Municipally-owned wind turbine, Hull, MA*

#### Sources:

- Massachusetts Technology Collaborative ([www.mtpc.org](http://www.mtpc.org))
- US Department of Energy, Energy Efficiency and Renewable Energy ([www.eere.energy.gov](http://www.eere.energy.gov))
- Renewable Energy Access ([www.renewableenergyaccess.com](http://www.renewableenergyaccess.com))
- Center for Energy Efficiency and Renewable Energy, Renewable Energy Research Lab (<http://www.ceere.org/rerl/index.html>)
- <http://hullwind.org>