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A Guide to Residential Wind Power

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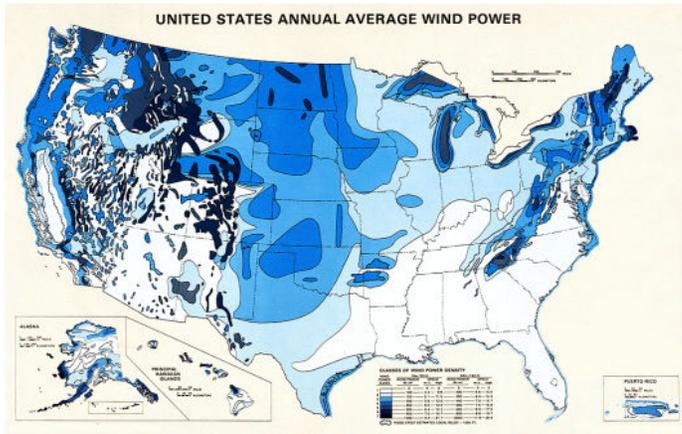
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A GUIDE TO RESIDENTIAL WIND POWER



Abstract

Our project goal is to develop a set of guidelines that a consumer can use to become better informed about wind power and help determine whether or not investing in residential wind power is a good decision. Advisability is determined by several factors, including: average wind speed in the area, the size and openness of the residential lot, any zoning laws or tax incentives in the area, the cost of electricity, the cost of installing a turbine, and the amount of time required to repay the investment. Specific examples of how the guidelines would be used to analyze different scenarios are included.

Steps to determining if residential wind power is right for you

- Look up the average wind speed for your area.** This information can be found on the wind speed map (left). It is recommended that your area have an average wind speed of 9 mph or better. The greater the wind speed, the more power the turbine will produce. In general, the most efficient areas of the United States for wind power are the Midwest and the Northeast.
- Check for any zoning laws and regulations in your area.** This information is cataloged on the site dsireusa.org. The site lists all state regulations that have an effect on the installation of wind turbines.
- Check for any financial incentives in your area.** This information is also cataloged on the site www.dsireusa.org. The site lists all federal and state tax credits, rebates, and financial incentives. These will reduce the initial investment of buying a turbine, and possibly decrease any amount the homeowner would be taxed.
- Look at the compiled list of wind turbines.** Choosing a particular turbine is the biggest step in the process. The reason for this decision can be one of many. Turbines that produce more energy are more expensive, and tend to be physically larger. The decision of which turbine to pick is based mostly on the specific needs and situation of each consumer. Take into account the price, size, and energy production of the turbines, and your particular need and desires about the turbine can narrow down your choices. Information about the best turbines can be seen on the chart.
- Calculate the total cost of the turbine or turbines you have narrowed your choices down to.** There are several factors that go into the total cost. Some of the smaller turbines can be installed manually, but many turbines require professional installation. If the turbine is grid connected, there is an extra cost to connect the turbine to the grid. If the turbine is battery charging, you need to purchase a battery and an inverter. Estimated costs are provided for installation, grid connection, batteries, and inverters.
- If you have chosen a grid connected turbine, determine if your local utility supports net metering.** Net metering is when the utility purchases any excess energy your turbine produces. This information can be found at www.dsireusa.org
- Determine the payback period of the total investment of your turbine.** This can be found by looking up the monthly output of the turbine you selected, multiplying it by the amount you pay the utility per kilowatt hour, and multiplying this number by 12. This will tell you how much your turbine will save you per year, on average. Dividing the total cost of your turbine, after additional costs and any rebates you receive, by the amount you save per year. This will tell you how many years after installation your turbine will cover its own cost.
- After taking all of the factors into account, cost, amount of space, and payback period, you have enough information to make an educated decision on whether or not investing in wind power is right for you.

Sample Case Study: Binghamton, New York

This case involves an average homeowner of the rural town in New York called Binghamton. The homeowner is looking for something to offset their electricity bill, especially during the colder months. There is not much room for a huge tower, but there are plenty of options for a smaller scale wind system that can certainly lower the cost.

Step 1 Average Wind Speed : 10.5 mph (4.7 m/s)

Average wind speed can be found using the map that we have provided, or go online and look at more detailed view of cities themselves. They have data from wind stations in many towns and they update it everyday

Step 2 Net metering allowed

Net Metering is the process of selling back the unused energy that builds up during times of low usage to a local utility.

Step 3 Tax Exemptions:

1- *Small systems (less than 25 kW): \$2,000/kW up to \$20,000 per project site *

This was determined using the Database of State Incentives for Renewables and Efficiency (DSIRE), which features easy to read tables of what incentives can be obtained from going green in terms of energy.

Step 4 The Air Breeze was chosen as a suitable turbine for a few reasons. Due to the location of the house, a huge turbine was not a feasible idea. What we were looking was a small turbine that would produce a good enough amount of power at lower average wind speeds. Due to the high cost of energy in New York \$0.19/kWh the intent of the consumer was not to completely be independent of the grid, but to do his part in the energy crisis. The Air Breeze performed much better at the average wind speed than the other models, this, combined with the cost made it a good choice of turbines. With an inverter and battery there is no need to worry about connecting to the grid, the battery stores the energy that is produced from the turbine and the inverter converts it into something that can be used in a home.

Steps 5-7

Model: Air Breeze

Price of Turbine: \$565-\$700

Battery: Concorde sun X-tender PVX-1080T - \$275

Inverter: Outback FX2524T off grid inverter - \$1800-\$2000

Monthly Output: 25 kWh/mo at 4.7m/s (10.5mph)

Average Price of Electricity in New York: \$0.19/kWh

Average Savings: \$57.00/yr

Average Savings = Monthly output x cost x 12 months

Cost of Installation + Price of Turbine + Battery + Inverter = Total Cost = \$2640.00-\$2975.00

Installation cost (varies, \$1000.00 average)

Subtract Exemptions: \$2/W x 400W = \$800.00

400W is the rated max power of the turbine

Total Cost - \$800.00 = \$1840.00-\$2175.00

Payback Period: 32.3 - 38.2 years

Total Cost/ Average Savings = Payback Period

Left to Right: Air Breeze, Whisper 100, Whisper 200

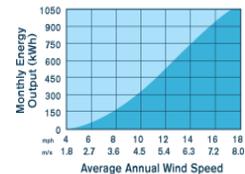
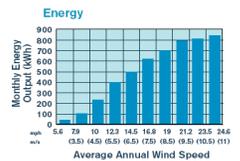
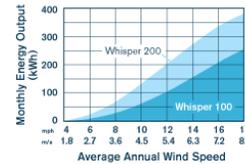
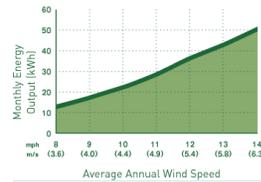


Left to Right: Skystream 3.7, Whisper 500



Wind Turbine Comparisons

Model	Price	Rotor Diameter	Weight (Turbine)	Start Up Speed	Voltage	Peak Power	Output/Month	Warranty	Connection	Uses
Air Breeze	\$556-\$699	46 in	13 lbs	6 mph	12,24	200W @ 28 mph	38 kWh @ 12 mph	3 year	Battery	Small Appliances, Computers, Radios
Whisper 100	\$2,254.74	84 in	47 lbs	7.5 mph	12,24,36,48	900W @ 28 mph	100 kWh @ 12 mph	5 year	Battery	Remote Homes, Telecommunications, Best for moderate to high wind 9+ mph
Whisper 200	\$2,411-\$2,724.67	108 in	65 lbs	7 mph	12,24,36,48	1000W @ 28 mph	200 kWh @ 12 mph	5 year	Battery/Grid	Remote Homes, Water pumping, Best for low to moderate wind 7+ mph
Skystream 3.7	\$4,595-\$4,899	144 in	170 lbs	8 mph	120-240 VAC	1900W @ 21 mph	400 kWh @ 12 mph	5 year	Grid	Utility Connected Homes/Businesses, All-inclusive wind generator w/ inverte Best suited wind speeds 10+ mph
Whisper 500	\$6,300-\$6,537.67	180 in	155 lbs	7.5 mph	24,32,48/240 VAC	3200W @ 27 mph	540 kWh @ 12 mph	5 year	Battery/Grid	Remote Homes, Grid/Battery, minimum 8 mph, provides up to half the electricity for a house



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