

SMALL WIND: IS IT RIGHT FOR YOU?

February 2006



Just what do you need to know to install a small-scale wind turbine in Vermont? This fact sheet provides practical information about planning and permitting for small-scale wind energy to help citizens, industry and municipal offices decide whether and where to site a wind turbine. Wind power currently accounts for a very small percentage of Vermont's electricity use, but is expected to grow in the coming years. Small-scale wind turbines are likely to play a larger role in meeting Vermonters' energy needs- *maybe yours*.

DECIDING IF A SMALL-SCALE WIND TURBINE IS RIGHT FOR YOU

There are many factors that go into this decision. It is important to know your property's wind potential and topography, your energy needs, and the type of technology you that suit your needs.

What is small scale wind power?

Under Vermont statute, wind turbines are categorized by their height and capacity for energy generation. In general, to be considered *small-scale*, a tower needs to be less than 120 feet and have a maximum capacity of 15kW and a blade diameter of about 20-24 feet.

Is there enough wind?

The wind may howl on a cold November day, but there's more to know about the speed and consistency of the wind on your property. Knowing wind speed is crucial to anticipating how much energy a wind turbine on your property could generate. For instance, the American Wind Energy Association reports that an annual average wind speed of 9 mph is required for small wind electric turbines (less wind is required for water-pumping operations). At an annual average wind speed of 12 mph a 10 Kilowatt (kW) turbine can produce 10,000 kW hours, which is how much electricity an average U.S. home uses in one year.

One of the first things to do is to look for physical evidence of strong wind. The U.S. Department of Energy provides a detailed guide to assessing wind speed based on the way trees on your property grow (see Resource List). A more technical approach is to look at wind maps of your area to determine the wind strength and speed. You can get maps from the Vermont Department of Public Service in paper form or on-line (see Resource List). With on-line maps you can hone in on your

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WIND POWER IN VERMONT

Small Wind Towers vs. Utility-Scale Wind Farms

Wind power on ridgelines has become a hot topic in Vermont. At some proposed wind farms, towers would be 300+ feet tall and have large, slow spinning rotor blades designed to maximize energy production. These *utility-scale* projects have sparked concern about visual impacts, noise, and injury to bats and birds, but wind farms may also help to decrease Vermont's emission of greenhouse gases and offer local economic benefits.

Small-scale wind towers are less contentious, but it's helpful to be aware of issues that may affect your neighbors' attitudes towards wind power in general. Your neighbors may still have concerns about seeing and possibly hearing your turbine. The case studies on page 4 illustrate how some small wind turbine owners have dealt with neighbors' concerns.

Some Helpful Definitions:

Small Wind= Small Scale Wind = Small Wind System = Windmill = A system that uses the wind to power a turbine with a capacity of <15kW and which is <120 ft high.

Net-metering = when a small wind turbine is tied into the electric utility.

kW= Kilowatts, a measure of power for electric current

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neighborhood and even your property if you know the GPS coordinates or have enough landmarks to go by. Turbine manufacturers and installers can tell you how much energy you are likely to produce with a small system. Armed with estimates, you can assess whether a wind turbine is likely to power your water pump or your house. Then you're one step closer to deciding if this is a practical and cost-effective investment for you.

Where on my property?

The Public Service Board offers advice on siting your turbine to minimize visual impacts in a handy pamphlet (see resource list on page 6). If you are using an installer they will provide you with information on the most efficient placement for wind power. Ridges and hills are the most effective places but also the most visually dominant. DPS's pamphlet gives guidance on minimizing the impact on you and your neighbors' views by using a number of techniques. According to Fred Dunnington, Town Planner for Middlebury, absent specific standards, the planning commission will determine if a wind tower is sited properly based on the setting by asking 2 questions: Would the tower be shocking or offensive to the average person? And has the applicant taken reasonable steps to mitigate the adverse aesthetic impact? (See Cautionary Tale)

What is Net Metering and do I want it?

Net metering is a system whereby the power that is generated on site is fed into the utility grid. If you use more electricity than is generated, you pay the utility for the difference. If the system generates more electricity you used that month, the utility records a credit for the excess towards your next bill. At the end of the year if you still have credit, that credit reverts to the utility. Net metered customers must pay the same customer service charges and other monthly fees required of other consumers.

In accordance with the net-metering code the net metering system needs to have less than or equal to 15 kilowatt AC capacity unless on a farm system, farm systems may have up to 150 kilowatt AC capacity. Net metering systems must be located on the customer's property with the primary purpose of partial or total offsetting of their electric bill.

In order to install and operate a net metered system you must apply for a **Certificate of Public Good** from the Public Service Board (see Resource List). You also have to purchase interconnection materials. All materials purchased for this use are exempt from sales tax. If you intend to net meter you must contact your local utility. Applying for a net metering permit happens at a state level. In most cases, this means that you will not have to apply for any local permits, but you should contact the official in charge of planning in your town ahead of time to ease the process.

Advice from a town planner:

Know where to look for more information.

Not all town planners have figured out how to deal with small-scale wind production because not all communities have voiced their opinions. A number of Town's that are currently undergoing Town Plan or Zoning revisions are attempting to integrate more specific language. According to Dick Horner, town planner for Killington, if you are proposing a wind turbine in a town that hasn't had one previously you should look at how the town plan and zoning ordinances treat communication towers for an indication of how they may deal with your wind turbine,

Working with the planning department and with your neighbors can ease the process.

The primary zoning consideration for wind systems is visual impact. The Town of Middlebury uses the same standards as Act 250 and the Public Service Board in assessing these- that it not have an "undue adverse" impact. Other towns may use language that speaks to the "essential character" of the setting. The effect on neighboring property owners is based on this assessment of undue adverse impact. However, assessing the impact of wind turbines on views enjoyed by passers-by or the community at large can be even trickier. The Public Service Board siting guidance pamphlet offers detailed criteria for evaluating viewshed impacts. These criteria address the scenic value of the affected area as well as how prominent the wind turbine would be in the landscape.

Working with the local planning commission or department may save trouble down the road.

Even though net-metering is out of a town's direct jurisdiction, Vermont law allows the town, as well as neighboring property owners, to call for a hearing on a Certificate of Public Good application. In fact, some towns have been 'parties' to wind turbine hearings at the Public Service Board. Before filing an application with PSB, it may be well worth the effort of meeting with a town planner to consider any objections or advice while your plan is still flexible.



After making some of the technical decisions about siting and installing your wind turbine, the next step is to obtain any necessary permits.

GETTING A CPG

If you plan to operate a net-metered wind turbine, you must submit an application for a Certificate of Public Good (CPG) from the Vermont Public Service Board (PSB). Robert Ide of DPS suggests the following steps:

- Download the appropriate forms from the DPS website
- Follow the guidelines in the PSB siting pamphlets
- Seek out an installer or planner for technical assistance
- Contact your electric utility

Discuss your plans with neighbors and others who will be able to see your turbine, as well as town planners. These conversations can help to prevent formal objections and their associated hassle and expense. Towns vary in their interpretation of the need for a local permit in addition to the CPG, so be sure to ask.

NOT NET METERING?

If your plan for your wind turbine does not involve net-metering with your electric utility, you do not need a CPG, but your structure will need a local permit. Your town's zoning may restrict the height of new structures on your property. If your proposed tower exceeds these height limits, you may apply for a *variance*. You may also need to obtain a construction permit prior to installing your turbine. If your town zoning ordinances do not specifically address wind turbines, you may want to review the section on communication towers or antennae. Conversations with town planners may provide all the answers you need, however, don't be surprised if they aren't sure of the process. You may be the first person in the town to seek a permit for a wind turbine, and there may be a learning curve for town officials as well as yourself.

SUBDIVISIONS AND DEED AGREEMENTS

If you live in a housing development or subdivision or are a member of a neighborhood association, your property may be subject to restrictions that limit your ability to install a wind turbine. These neighborhood rules supersede a state-level CPG, and you may need formal approval before you can be considered for a CPG or local permit. Depending on the agreement and on the character of your neighborhood, you may be granted an exception to build your wind turbine.

Hint: Creating mock photos of the proposed wind turbine or hiring a crane of similar size can help neighbors and regulators to more accurately evaluate changes to the view shed.

TOWN LAW AND WIND ENERGY:

Town's can show their encouragement, indifference, or opposition to wind power development through two major vehicles: the Town Plan and zoning ordinances. Small-scale wind production for on-site use is still relatively rare in Vermont. Many towns have not had a wind turbine built or even proposed in recent history.

TOWN PLANS:

A survey of town plans available via the web revealed a wide range of attitudes and specificity regarding wind production. Language in town plans is usually general but can be powerful in showing the general feeling of the town on wind turbines, on local energy production, and other related subjects. None of the town plans reviewed prohibited small wind, but some did prohibit utility-scale.

ZONING:

In many towns, zoning ordinances address small-scale wind turbines in Conditional Use sections. If the ordinances do not speak directly to siting wind turbines, they may be considered *accessory structures*. If it is not initially apparent from the zoning ordinances where wind turbines fall, consult your town planning office.

HEIGHT WAIVERS:

The process of receiving a waiver for height restrictions is spelled out in the State Planning Act which outlines specific criteria. These criteria are less restrictive for *renewable energy installations*. A height restriction waiver for most other structures requires the applicant to show that they have exhausted all other design alternatives. For renewable energy installations, the applicant need only demonstrate that the height restriction poses an economic hardship. In many cases, this may be straightforward to do if the height limits prohibit a wind turbine that would be minimally efficient and cost-effective.

According to Fred Dunnington, town planner for Middlebury, it may be cost-effective to depend on wind power, alone or in conjunction with solar power, for new structures on remote properties if the cost of extending power lines to the property is high. Dean Pierce, the town planner for Shelburne believes a demonstrated economic need for a wind turbine may help your case when requesting a permit or zoning height variance from your town.

Case Studies: Lessons Learned

A CAUTIONARY TALE

In a state which prides itself on pastoral views and forested landscapes, the visibility of a even a small-scale wind turbine can be a sticky subject. In 2001, Tom Halnon filed an application for a Certificate of Public Good with the Vermont Public Service Board. Tom planned to install an unlighted, Bergey brand wind turbine with a 100-foot tower and 23-foot diameter blades on his property which is in the Forest Conservation District of the Town of Middlebury. Tom had spoken with each of his neighbors, none of which had seemed alarmed at the prospect of the wind system. As required by the permit process, he mailed copies of the application to his neighbors, the Middlebury town office, and his electric utility. The statute stipulates that there is a 30 day review period during which a petition for a hearing can be filed. On the 29th day a neighbor contested the application. Tom's neighbors' claimed that their view would be impacted by the proposed turbine. The Board did not approve Tom's application in light of his neighbor's complaint, and suggested that Tom move the site. Tom appealed to the Vermont Supreme Court, but was unsuccessful.

A picture is worth a thousand words

Tom altered his plan to net-meter his wind turbine, moved the site 75 feet south, and applied for a local zoning permit for an off-the-grid windmill. He hired a crane for a day to imitate the dimensions of his proposed wind turbine. Town Planner for Middlebury, says that when the zoning board stood at the front porch of the neighbor's house they determined that the impact on the neighbor's view was not adverse, much less unduly adverse, and granted the permit. Tom's wind turbine has been in place for three years. Currently the system is used to create radiant heat, which is used to heat the Halnon's house.

A New Venture

Tom has taken his contentious ordeal in getting his wind permit in stride. A believer in renewable energy since his high school years in the midst of the oil embargo, Tom believes making renewable energy a reality in everyday life involves having people step up and make it happen. In addition to playing his part in creating energy on his own property, Tom was inspired to make small wind energy his career as well as his ideal. Tom now runs Vermont Green Energy Systems and installs primarily net-metered systems throughout the northeast. Through this business Tom advises interested parties on the process from determining if there's enough wind, to picking a the right turbine, to permitting and installing. In this way Tom is encouraging not only his growing business, but on-site energy production throughout the state. Small wind systems, he says, are a growing field, and as the price of other electricity sources rise, those who invest in small systems now will soon have the cheapest energy around.

POWER POTENTIAL:

Two school districts in the state have had very different experiences with the potential electricity component of their wind turbines. Danville, in the Northeast Kingdom; and Addison, in the Central Champlain Valley each constructed turbines with grants from the Wind Demonstration Funding program administered by the Department of Public Service. Each wind turbine was constructed for the dual purposes of a tool for education about renewable energy and to offset electricity bills.

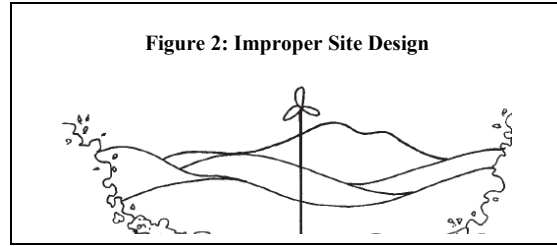
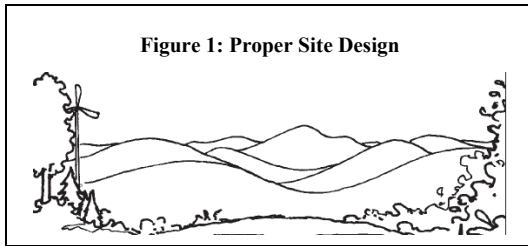
The Caledonian Record reports that the Danville turbine, which has been in place for a year and a half, is falling short of the projected electricity benefits. The Record reports that the 96 foot wind tower "produces about \$400 in electricity a year compared to the anticipated \$2,000 a year." The electricity produced, by the Danville tower is enough to run a small house. New turbine blades have been slated to be installed and should increase the efficiency and production of the installment.

A number of town planners in the Champlain Valley discussed the Addison wind turbine as having outstanding success. The turbine, on a ridge overlooking the Dead Creek Wildlife Refuge, has exceeded the expected electricity production.

Why might this be the case?

Wind testing towers, used to estimated potential energy based on wind speeds, are not typically used for small scale wind projects. Test towers or even smaller anemometers can increase the cost of the installation dramatically. Potential production is a formula based on three major components, 1) the type of turbine, 2) the height of the tower, and 3) the projected average wind speed.

Wind speed is variable. While wind maps (see resource list) can provide a general idea of the average wind speed, this is largely based on model projections. In addition, wind speed is a phenomenon of weather and topography. While we can discuss the average monthly precipitation for the state of Vermont, we do not expect that to be the precipitation on any given month. There are years of relative drought or flooding and it is over decades or generations of data that the average is revealed. Likewise, the wind on any given year may not equal the average. Both of the school systems discussed above are relatively new. While the wind available at those sites may have been underestimated- due perhaps, to physical features that weren't accounted for on the wind map's model; there is a possibility that those areas had an unusual wind year. Time will tell if the energy production will even out or if the 1st year of production will be the norm.



WHERE DO I GO TO FIND OUT IF I HAVE ENOUGH WIND?

Both the American Wind Energy Association and the National Wind Coordinating Committee websites have links to wind maps. See links above. The Public Service Board website links to a local renewable energy firm with some Vermont County detailed maps available at: <http://www.northeastwind.com/resources/maps.html>

TRUE WINDS: NEW ENGLAND WIND MAP

CONTACT INFO: [HTTP://TRUEWIND.TEAMCAMELOT.COM/NE/](http://truewind.teamcamelot.com/ne/)

Prepared by consultants: sponsored by utility companies throughout the northeast. Has complete New England mapped down to 200 meter resolution (1/8 of a mile)

<http://truewind.teamcamelot.com/bin/TrueWind.dll?StateView?Area=NE&State=VT&Z=50> however this is mapped in wind speed as opposed to Wind Power Classes; the translation from speed to quality is found at <http://truewind.teamcamelot.com/ne/>

WHERE DO I GO IF I WANT TO TALK TO A PROFESSIONAL ABOUT INSTALLING/ BUYING A WIND TURBINE?

Keep in mind that the industry and technology is evolving and becoming increasingly efficient. Talk to a professional about new designs.

RENEWABLE ENERGY VERMONT

CONTACT INFO: [HTTP://WWW.REVERMONT.ORG](http://www.REVERMONT.ORG)

A Vermont based trade organization; this website offers information on renewable energy options in the state and has links to businesses.

VT RENEWABLE ENERGY LISTINGS

CONTACT INFO: [HTTP://ENERGY.SOURCEGUIDES.COM/BUSINESSES/BYGeo/US/BYs/VT/VT.SHTML](http://ENERGY.SOURCEGUIDES.COM/BUSINESSES/BYGeo/US/BYs/VT/VT.SHTML)

Includes numerous renewable energy business including wind testing and turbine selling, turbine installing business. Gives short breakdown of what each does and includes contact info as well as website links.

WHERE DO I GO IF I WANT MORE INFO ON FUNDING ASSISTANCE FOR WIND POWER

DEPARTMENT OF ENERGY: ENERGY EFFICIENCY AND RENEWABLE ENERGY

CONTACT INFO: [HTTP://WWW.EERE.ENERGY.GOV/WINDANDHYDRO/](http://WWW.EERE.ENERGY.GOV/WINDANDHYDRO/)

The website offers links to funding options. In addition the PDF Small Wind Resources Guide has a page on funding resources, including some available to farm systems and some available to residential systems.

VERMONT SOLAR AND SMALL WIND INCENTIVE PROGRAM

CONTACT INFO: [HTTP://WWW.RERC-VT.ORG/INCENTIVES/](http://WWW.RERC-VT.ORG/INCENTIVES/)

This program's goal is to increase demand for high quality small wind and solar systems. The website offers background on the program and links to applications and additional information.

RESOURCE LIST

OR, WHERE DO I GO WHEN...?

WHERE DO I GO FOR MORE BASIC INFORMATION ABOUT SMALL WIND?

DEPARTMENT OF ENERGY: ENERGY EFFICIENCY AND RENEWABLE ENERGY

CONTACT INFO: [HTTP://WWW.EERE.ENERGY.GOV/WINDANDHYDRO/](http://www.eere.energy.gov/windandhydro/)

The Small Wind Electric Systems Consumer Guide Produced by the Department of Energy offers a very complete guide. There is detailed information on choosing sizes and types of wind turbines and towers as well as basics on wind turbine design and a handy tool to estimating the strength of your wind based on vegetation.

This page is highly suggested if you want to learn more. PDF Consumer Guide available at:

http://www.eere.energy.gov/windandhydro/windpoweringamerica/pdfs/small_wind/small_wind_guide.pdf

AMERICAN WIND ENERGY ASSOCIATION

CONTACT INFO: [HTTP://WWW.AWEA.ORG/DEFAULT.HTM](http://www.awea.org/default.htm)

This pro-wind organization has plenty of basic and detailed information concerning both Utility-Scale and Small-scale wind production. Check out their wind basic section at:

http://www.awea.org/faq/tutorial/wwt_basics.html

NATIONAL WIND COORDINATING COMMITTEE

CONTACT INFO: [HTTP://WWW.NATIONALWIND.ORG/](http://www.nationalwind.org/)

Publications list includes information on all the major topics associated w. the debate: avian and wildlife, siting and permitting, transmission, state policies, etc.

RENEWABLE ENERGY ACCESS

CONTACT INFO: [HTTP://WWW.RENEWABLEENERGYACCESS.COM/REA/HOME](http://www.renewableenergyaccess.com/rea/home)

This trade paper offers a quick wind basic sheet and has current news about wind power and renewable energy in the country.

WHERE DO I GO FOR MORE INFO ON PERMITTING AND VERMONT LAW?

PUBLIC SERVICE BOARD

CONTACT INFO: [HTTP://WWW.STATE.VT.US/PSB/](http://www.state.vt.us/psb/)

PHONE: (802) 828-2358 FAX: (802) 828-3351

Description: The Public Service Board has authority to decide permits related to wind generating facilities. Also they that may approve meteorological testing towers and non-commercial turbines under a different process referred to as net-metering. The board is charged with supporting the public good. You can download a permit application for a net metering system at:

http://www.state.vt.us/psb/application_forms/application_forms.stm

The residential siting pamphlet is found at:

http://www.state.vt.us/psb/application_forms/PSB_Wind.PDF

DEPARTMENT OF PUBLIC SERVICE

CONTACT INFO: [HTTP://PUBLICSERVICE.VERMONT.GOV/](http://publicservice.vermont.gov/)

PHONE: (802) 828-2811 FAX: (802) 828-2342

DPS acts as an advocate for rate payers and the public interest at large. Their website offers documents related to Energy Planning, Public Hearings, and is generally easy to navigate through. Links to wind information are found at: http://publicservice.vermont.gov/energy-efficiency/ee_renewables.html

VERMONT ASSOCIATION OF PLANNING & DEVELOPMENT AGENCIES

<http://www.vapda.org/>

If you are unsure of how to get to your town plan and zoning ordinances, this is one way to start. This site will take you to your regional planning association- from there you should be able to navigate to most of the town plans that are on-line.

US DEPARTMENT OF ENERGY: ENERGY EFFICIENCY AND RENEWABLE ENERGY

[HTTP://WWW.EERE.ENERGY.GOV/WINDANDHYDRO/](http://www.eere.energy.gov/windandhydro/)

Has an excellent state-by-state summary. VT permits at:

<http://www.eea-inc.com/rrdb/DGRegProject/States/VT.html> VT

summary at:

http://www.eere.energy.gov/state_energy/tech_wind.cfm?state=VT