WIND ENERGY PLANNING RESOURCES FOR UTILITY-SCALE SYSTEMS IN VERMONT

A PRODUCT OF THE WIND SITING CONSENSUS BUILDING PROJECT

Photo courtesy of VERA, Inc.

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Wind Energy Planning Resources for Utility-Scale Systems in Vermont

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"Appropriately sited wind energy should be an important part of Vermont's energy future.

We are committed to educating our own organizations on issues associated with its development and making appropriate public policy recommendations.

The Department of Public Service should continue to provide leadership in education and policy development with the public, the stakeholders, planning organizations and permitting agencies.

We believe that this approach is particularly appropriate in the context of Vermont's existing and ongoing commitment to achieving a high level of efficiency in energy use."

Stakeholder consensus statement,
Wind Siting Consensus Building Project,
Montpelier, VT May 2002

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IV. "State of Vermont Wind Resources and Transmission." Prepared by Vermont Environmental Research Associates with sponsorship from the U.S. Department of Energy, March 2002.

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1. Background: The Wind Siting Consensus Building Project

Wind power -- or electricity generated from the energy of the wind -- is the fastest growing source of electricity generation in the world[i]. Wind projects in the United States are expanding rapidly, especially in the western and mid-western states. In 2001, a wind farm on the Oregon-Washington state line with a maximum output of 263 megawatts (MW) came on line. On the east coast, wind developers are proposing a project with a maximum output of 450 MW to be located on Horseshoe Shoal five miles off the shore of Cape Cod. By comparison, Vermont peak electric demand is about 1,000 MW.

Multiple studies have shown that Vermont's wind resource is abundant enough to meet a significant portion of the state's electric power needs. While wind power may be environmentally sound in certain ways, it, like other forms of power generation, also has environmental costs, such as the aesthetic impact of wind turbines on the landscape.

Early in 2001, the Vermont Department of Public Service (DPS) recognized the need to address the environmental concerns, and especially the aesthetic impact, of utility-scale wind power generation facilities in the state. The DPS also saw the need to provide Vermont town and regional planners with the latest wind energy siting information so they could plan for wind energy development in their jurisdictions.

To these ends, the DPS received a grant from the U.S. Department of Energy (U.S. DOE) to build consensus among key stakeholders -- including developers, environmentalists, government, and others -- on how wind power projects can be appropriately sited in Vermont. The three objectives of the consensus building effort were to hold a series of wind energy stakeholder workshops, to produce a packet of wind energy siting resources for town and regional planners, and to disseminate information on wind energy around the state. These components are known collectively as the Wind Siting Consensus Building Project.

This document, "Wind Energy Planning Resources for Utility-Scale Systems in Vermont," is the second of these components. Its purposes are to:

> 1) Provide town and regional planners with current information on the issues surrounding the siting and development of utility-scale wind energy facilities and
>
> 2) Summarize the issues and information discussed by stakeholders in the four wind siting consensus building workshops held in the spring of 2002.

Ideally the information presented herein will help planners consider the long-term role of wind energy facilities in their town and regional plans. This documents also presents the informational materials and siting concerns discussed by the stakeholders in the four workshops. The complete report on the content and discussions of the workshop series, as well as the list of stakeholders, are located in Appendices I and II.

2. Past and Present Initiatives in Wind Power Development in Vermont

a. Wind Power in Vermont Since 1941

Vermont was the site of one of the most ambitious early attempts made in America to harness the energy of wind. In 1941 the Smith-Putnam wind turbine was erected on Grandpa's Knob near Rutland. This 1.25 MW turbine did not perform as well as expected, encountered technical problems, and fell in to disrepair on account of a failed bearing and a broken blade. While technical fixes were proposed in new designs they were never implemented primarily because of the relatively inexpensive cost of other electric generation sources in the postwar economy and the promise of a new, much cheaper form of energy: nuclear power[ii]. The turbine was abandoned in 1945.

The 1970s and 1980s also saw a number of failed attempts to generate wind power. Turbines were installed in Morrisville and at Vermont Technical College, though they ultimately proved unreliable and were abandoned. In 1980 and 1981, four 200 kilowatt (KW) turbines were installed on Equinox Mountain in Manchester. Though with frequent maintenance problems, these machines operated until the middle of the decade when they were removed by Green Mountain Power Corporation (GMP). The company then operated two 100 KW turbines into 1994 to verify winter operating performance before removing them to make way for the company's more ambitious wind power plans in Searsburg, Vermont. Equinox proved to be an important stepping stone between older, less reliable technology and today's modern wind machines. For more information about the history of wind power in Vermont, see Appendix III.

The first modern, utility-scale wind facility in Vermont, GMP's 6 MW Searsburg facility, came on line in 1997. Many of the lessons learned from the Equinox experience were incorporated into the design of the Searsburg facility. This project received funding assistance from the U.S. DOE, which was interested in wind turbine operation in a cold climate and the effects of blade icing on power production. The project is considered exemplary in the way it has minimized the environmental impacts associated with construction and operation, while involving the local community from the start. The Searsburg facility generates enough electricity to serve approximately 2000 average households. The successes of the project are attributable to thorough research by developers and an extensive review process.

b. Assessments of Vermont's Wind Resource

In recent years, several studies have shown that Vermont's wind resource is abundant enough to meet a significant portion of the state's electric energy needs. A 1994 study estimates that Vermont has over 1,000 MW of wind energy potential, though it clearly states that much of this is undevelopable for economic or environmental reasons[iii]. In general, the strength and persistence of the wind typically increases with elevation, such that the strongest winds are often found at the highest mountain summits. Furthermore, in the northeast United States, winds flow from west to east. For these two reasons, Vermont's topography is particularly well suited for wind power generation.

In 1993 the Vermont Legislature directed the DPS to assess the history and potential of wind power as a source of electricity in the state. All the electric distribution companies in the state were contacted for input; GMP, Morrisville Electric Department, and Burlington Electric Department responded. While acknowledging that the cost competitiveness of wind was not evident at the time, and that avian and aesthetic concerns did exist, the study concluded that Vermont has the potential to meet several percent of its electric energy needs with wind power. Refer to Appendix III for the complete assessment.

In 1997, with funding from the U.S. DOE, the DPS conducted a quantitative wind resource assessment. This study gathered, analyzed, and published wind data from several sites within Vermont. These data were ultimately used in the development of the DOE/National Renewable Energy Laboratory's "Vermont – Most Favorable Wind Resource Areas" map published in June 1999. The map is available on line at www.state.vt.us/psd/ee/wind/ee-wind.htm.

In 2001, Princeton Energy Resources International, GMP, and the DPS studied "Wind and Biomass Integration Scenarios in Vermont." This study assessed the strength of the state's wind resource, proximity to the existing electric distribution or transmission system, environmental compatibility, and other factors. Together, these indicators were then used to estimate the theoretical maximum wind power potential in Vermont. The methodology for this study is available on line at www.northeastwind.com.

In 2002, Vermont Environmental Research Associates developed the "State of Vermont Wind Resources and Transmission Map" by overlaying NREL's GIS wind resource data with Vermont's transmission line data. Since the economic viability of a wind power facility is largely determined by its proximity to existing transmission lines, this map helped identify particularly promising sites. Like the 1999 map, each square-kilometre block indicates a wind power class on a scale of two to seven. Purple, "class 7" blocks indicate what are thought be the windiest areas in the state. The map is reproduced in appendix IV.

3. Policy Initiatives Related to Wind Energy

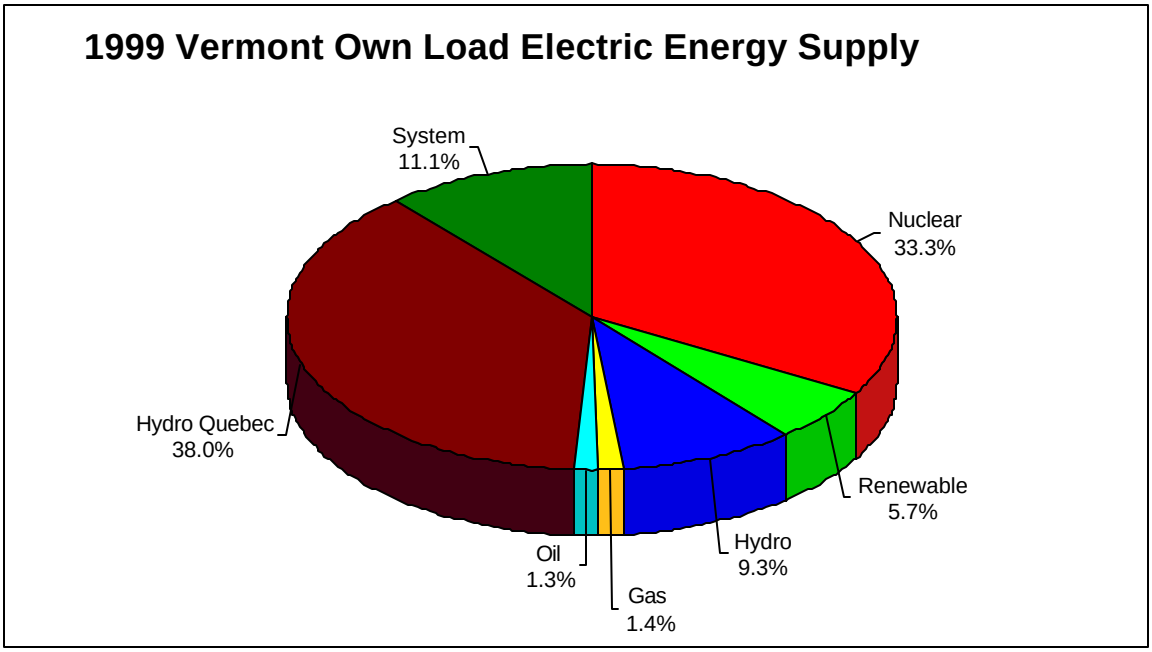
a. Wind Power in the Comprehensive Energy Plan

The state's comprehensive energy plan, "Fueling Vermont's Future," acknowledges Vermont's abundant wind resource and its potential to meet a greater portion of the state's power needs. The plan recommends that "When the DPS prepares the forthcoming shutdown study for Vermont Yankee, opportunities for replacing nuclear generation with wood and wind generation should be explored." The plan recommends that the state "vigorously pursue policies to encourage cost-effective development" of wind energy. A summary of this document can be viewed on the website of the Vermont Department of Public Service at http://www.state.vt.us/psd/DPSLibrary/cepGuide.htm.

b. Vermont's Power Needs

Vermont's demand for power is growing in all sectors -- commercial, industrial, and residential -- and this growth is expected to continue into the future. As harnessing wind energy becomes more economically competitive through advances in turbine technology and penalties on polluting generation, utilities and private developers will increasingly look to Vermont's abundant wind resource to meet electric energy needs.

The chart below illustrates the relative contributions to Vermont's electric energy supply in 1999 from various fuel types. This power is acquired in one of three ways: (1) from utility-owned generation facilities; (2) from contract power purchases; or (3) though exchanges within the regional power pool. Because Vermont draws from the New England Power Pool it often uses power generated by facilities other than its own. For this reason, the chart represents as "gas" the power used from, for example, natural gas-fired facilities in both Vermont and Massachusetts. System power represents that which comes from no specific source, but rather from a portfolio of sources owned by a seller, or from spot market exchanges. Wind energy's contribution is included in the renewable portion.



Source: Department of Public Service, Utility FERC Form 1, Annual Report 1999.

c. Legislation Pertaining to Local and Regional Planning

In 1967 the Vermont legislature passed the Vermont Planning and Development Act. It suggests that towns and regions:

> "encourage the efficient use of energy and the development of renewable energy resources;

> identify, protect, and preserve important natural and historic features of the Vermont landscape, including: . . . significant natural and fragile areas . . . [and] significant scenic roads, waterways, and views;
>
> maintain and improve the quality of air, water, wildlife and land resources; and
>
> provide for the wise and efficient use of Vermont's natural resources and to facilitate the appropriate extraction of earth resources and the proper restoration and preservation of the aesthetic qualities of the area."
>
> 24 V.S.A. § 4302(a)(5), (6), (7).

Wind energy resources have not traditionally been considered in natural resource planning by town and regional planners, and have thus generally been outside of that scope of planning and assessment. The Vermont Planning and Development Act does, however, require regional planning commissions to include an energy component to their plans:

> "An energy element, which may include an analysis of energy resources, needs, scarcities, costs and problems within the region, a statement of policy on the conservation of energy and the development of renewable energy resources, and a statement of policy on patterns and densities of land use and control devices likely to result in conservation of energy."
>
> 24 V.S.A. § 4348a(a)(3).

The act also places emphasis on protecting access to renewable energy resources like wind and solar gain. It bans conditional uses that might adversely affect use of renewable energy resources, prohibits site plan approvals of projects that might have such an effect, and authorizes towns generally to adopt regulations encouraging protection and access to those resources. The Vermont Statutes are available on line at www.leg.state.vt.us/statutes/statutes2.htm

d. State Regulatory Process for Wind Power Generation Facilities

The Vermont Public Service Board (PSB) is the regulatory body in Vermont that governs proposals to build wind power facilities, except where the facilities are operated solely for on-site consumption by the owner. The PSB reviews these applications under 30 V.S.A. § 248, the law pertaining to electric generation, construction, and investments. Prior to issuing a Certificate of Public Good under § 248, the PSB considers many issues, including most of the Act 250 criteria and the town and regional plans for the areas where the facility would be located. The PSB evaluates whether the project will pose an undue, adverse effect on the aesthetic and scenic beauty of the area and what mitigation efforts the developer has included in the design of the project. As part of the review process, town select boards, town planning commissions, and regional planning commissions are given notice and may appear at PSB hearings to assist in cases regarding an application's conformity with their local or regional plan.

Appendix V is a presentation given by Peter Meyer, environmental analyst with the PSB in 2001 titled "Green Mountain Power Corporation's Searsburg Wind Project: The Vermont Public Service Board's Perspective." For more information consult 30 V.S.A. § 248 or contact the PSB directly.

4. The Costs and Benefits of Wind Power

Although wind power is environmentally sound in many ways, it, like all forms of power generation, has environmental costs. The potential for wind power facilities to have detrimental effects on plant and animal life, as well as on Vermont's visual resources, are real and must be carefully considered. The aesthetic impact of wind power has been the most significant issue in Vermont because tall towers with rotating turbine blades are felt by some to detract from the state's valuable visual resources. As the technology advances and turbines become larger, the aesthetic impact will continue to play a central role in the siting, permitting, and on-going discussions of wind power in Vermont.

While many people take the benefits of electricity for granted in their daily lives, it is important to recognize the environmental costs of various generation sources. There is a need to balance the economic and environmental benefits with the related costs inherent with all fuel sources.

a. The chief benefits of wind power include:

Emissions-Free Power Generation. Wind power does not burn fossil fuels and does not release carbon dioxide (CO_2), sulphur dioxide (SO_2), oxides of nitrogen (NO_x), particulates, or other potentially harmful pollutants into the air. It does not contribute to smog, acid rain, global warming, or the greenhouse effect. Nor does it use a fuel that requires mining or extraction. There is no fuel by-product requiring disposal.

Wind Power is Nearly Economically Competitive. Fossil fuel-fired power plants have relatively low capital costs but substantial fuel costs. Wind power plants have higher capital costs but the fuel cost of wind power is zero. Wind power is thus nearly competitive over a project's 25- to 30-year life cycle. Renewable energy credits, emissions offset products, and technological advances are all further improving wind power's competitiveness. As government increasingly penalizes polluting power plants and provides incentives for clean ones, wind power may become increasingly competitive with generating technologies that have dirty air emission profiles. The chart in Appendix VI illustrates the declining cost of wind power.

Wind is a Free, Inexhaustible Resource. Whereas many kinds of conventional power generation have substantial fuel costs, the fuel cost of wind power is zero. This fuel is also locally available, inexhaustible, and not subject to price volatility.

Financial Benefits for Towns and Land Owners. In Vermont and many other states, wind power facilities pay substantial tax revenues to local communities while requiring a minimal outlay of community services. Additionally, landowners are typically paid royalties on the power generated from turbines on their land, while retaining use of all but a small portion of it.

Wind Power Can Have a Stabilizing Effect on Price and Supply. Because wind power is a local source of electricity, it reduces the state's dependence on imported fuels and long distance transmission networks. If natural gas or fuel oil prices were to spike, for example, the cost of wind power would likely remain stable because (1) its price has been previously established though long-term contracts and (2) the cost of the fuel remains constant - zero.

Wind Power Is an Educational Resource for Tourists and Students of All Ages. Communities that host wind power facilities may benefit from public interest surrounding the facility in terms of increased tourism dollars. Similarly, school groups of all ages, politicians, government leaders, and the general public can learn about environmental science, environmental studies, physics, and public policy from the facility and its operation.

b. The chief costs of wind power include:

Impact on Visual Resources. Because wind strength and persistence generally increases with elevation, the most suitable wind resource is usually found at high elevations on mountaintops or prominent ridgelines. Disagreement exists on the aesthetic impact of wind turbines. Some feel that the environmental benefits of wind power offset the aesthetic impact, while others feel that, regardless of their benefits, they can mar pristine vistas and detract from the sense of remoteness.

Potential Impacts on Biological Resources. Because wind power facilities are often sited at high elevations in the Vermont, they have the potential to negatively impact ecosystems, including bears, birds, and certain species of alpine flora. Potential impacts of this nature vary greatly by ecological region. Experience with the Searsburg facility has shown that these impacts can be mitigated through careful site selection and design.

Wind Power Often Requires Long-Term Contracts. Because wind power facilities require a greater initial investment, non-utility developers look for long-term power contracts of 10 to 20 years to obtain financing for their projects. While a stable purchase agreement can be advantageous, it may also preclude less expensive, short-term options for power acquisition.

Wind Power is an Intermittent Source of Generation. Wind turbines only generate power when the wind is blowing, making wind power an intermittent source of generation. This means that other, more controllable generation will be needed to supply uninterrupted electricity to a state or region. Building wind power into the mix, however, can improve price stability and reliability.

Wind Power could Negatively Impact Tourism. Tourists who react negatively to aesthetic impacts of wind turbines at high elevations may take their business elsewhere.

5. The Wind Siting Consensus Building Workshops

The four workshops were conducted monthly from February to May 2002 and assembled a large and varied stakeholder group including members of environmental groups, wind

development companies, and government agencies. Participants were not asked to represent or speak on behalf of their groups, but to bring their group's perspective to the workshop proceedings. Nothing about what was said at the workshops was legally binding and all stakeholders participated voluntarily.

Throughout the workshops three key issues were addressed surrounding the siting of utility-scale wind energy facilities: land use, visual resources or aesthetics, and biological resources. The Woodbury Dispute Resolution Center (WDRC) facilitated the workshops and compiled the thoughts, ideas and concerns expressed during the discussions into the report in Appendix II. What follows is a summary of the workshops based on the report.

a. Workshop One – Overview and Land Use Issues

The first workshop presented an overview of wind power in Vermont and then progressed into questions about wind power and land use.

- David Lamont with the Planning Division of the Department of Public Service gave an overview of Vermont's current electrical power mix and the Department's present and anticipated wind-related activities.

- David Blittersdorf of NRG Systems discussed Vermont's wind resource and siting requirements for large wind projects.

- Peter Meyer of the Public Service Board explained the Act 248 permitting process and the siting issues addressed in it.

- The Woodbury Dispute Resolution Center facilitated a discussion on wind power siting and land use issues.

The power planning presentation raised questions around the long-term pricing of wind power. Stakeholders asked, "How will wind power be priced and delivered to the consumer?" and "How will the good of renewable wind power be weighed against the impact it might have on wildlife and Vermont's visual resources?" To the first question various stakeholders stated that long-term power contracts are often essential to financing a wind project. Responses to the second were much more varied.

David Blittersdorf made the point in his presentation that the most economic sites for wind power generation are often at the higher elevations along the state's ridgelines. The use of these high elevation lands for wind power facilities along with other land uses was a primary topic of the workshops. Many felt that locations with scenic view corridors, wilderness lands, and hiking trails may not be as suitable for wind power facilities as lands managed for timber production, for example. Many stakeholders felt that the ability to identify suitable co-location opportunities was important to successfully incorporating wind power into Vermont's landscape.

It was generally agreed that further discussion that defines and identifies "special areas"--whether they be scenic vistas, sensitive wildlife habitat, or areas of cultural-historical

significance -- is needed to move the parties closer to agreement on what sites are suitable for potential development.

b. Workshop Two - Aesthetics

The second workshop examined aesthetics and the impact of utility-scale wind turbines on Vermont's visual resources.

- Landscape Architect Jean Vissering presented a draft of her visual resource considerations for siting utility-scale wind turbines. The presentation included images of undeveloped ridgelines, different wind power facilities, and computer-assisted project simulations to illustrate the visual impact of wind turbines. The complete document, "Wind Energy and Vermont's Scenic Landscape," is available from the Vermont Department of Public Service.

- Facilitators led a discussion focused on two questions: (1) What would be a useful end uses for a document like the one Jean Vissering has drafted? and (2) If such a document were to be used to guide the siting and approval processes, what edits would you make to the current draft?

- Stakeholders were asked to respond to two more questions in small groups: (1) Should the amount of energy produced by a wind energy facility be part o the aesthetic considerations? (2) The Public Service Board stated that whether or not the Searsburg facility would have an undue adverse impact would be determined in part by the public perception of wind power as a generation option. Now that the facility has been there for some time, is its aesthetic impact undue?

In Vermont, wind power's most significant impact is thought to be aesthetic, particularly in areas valued highly for the absence of human-made structures. Some stakeholders felt that wind turbines are an interesting enhancement to the view, but others did not. One participant referred to a study suggesting that the more people know about wind power, the more likely they are to support it. It became clear that, to the viewer, the aesthetic impact of wind turbines depends to some extent on how he or she feels about clean power generation, energy security, and the benefits of renewable energy in general. Some felt that these benefits should affect the perception of aesthetic impact, while others felt that the aesthetic impact should be assessed without regard to those benefits. Public Service Board docket 5823 issues a certificate of public good to GMP to construct the Searsburg wind power facility, and addresses the question of whether the benefits of renewable energy play a role in the siting decisions. Two excerpts from the docket can be found in Appendix VII: "Scenic and Natural Beauty, Aesthetics, Historic Sites, and Rare and Irreplaceable Natural Areas" and "Environmental Considerations."

In her presentation, Jean Vissering raised the point that people tend find things more aesthetically pleasing when they are located in logical or meaningful places. For example, agricultural fields are expected to be located on flatter land just as important civic buildings are expected to be located in the center of town. By this reasoning -- and by some people -- the most aesthetically appealing wind power facilities would coincide with the windiest locations.

There was a great deal of discussion about the Act 250 aesthetic criteria and their role in the PSB's Section 248 permitting process. The PSB evaluates whether the project will have "an undue adverse effect on the scenic or natural beauty of the area, aesthetics, historic sites or rare and irreplaceable natural areas." In reviewing the Searsburg project the PSB considered to what degree the developers included mitigation elements into the design of the facility.

Stakeholders also raised as a key issue the Federal Aviation Administration's (FAA) requirement that lighting apparatus be placed on all structures higher than 200 feet above ground. Many stakeholders in the workshop objected to the lights, and especially to red blinking lights, saying their impact on the state's visual resources would be undue, especially during the night time. Partly because wind power technology is more and more commonly exceeding this height limitation the DOE, through NREL, has provided funding to support an FAA study of this issue. At the time of this writing the FAA had not yet released its report. When it does become available the study will be posted on the internet at http://www.faa.gov/.

c. Workshop Three – Avian and Biological Issues

The third workshop focused on the impact of wind power facilities on Vermont's avian and biological resources.

- Forest Hammond from the Vermont Department of Fish and Wildlife discussed avian and wildlife concerns regarding wind energy development in the state.

- In small groups stakeholders discussed the following questions: (1) Given a concern about the Bicknell Thrush would you support a moratorium on wind development in areas with prime Bicknell Thrush habitat? (2) Other than direct turbine interaction, what other possible wildlife impacts (land clearing, roads, power lines) should wind energy stakeholders be aware of? What weight should be given to these less direct impacts?

To a great extent the impact of wind power facilities on existing wildlife habitat focused on the experience with the 6 MW Searsburg facility. "Before and after" construction studies of the avian and bear habitats found neither to be significantly impacted by the installation of the plant. Furthermore, mitigation elements incorporated into the design of the plant helped minimize the facility's adverse impact. See Appendix VIII the complete bear-impact study. For the complete avian-impact study, conducted by NREL, see http://www.nrel.gov/docs/fy02osti/28591.pdf.

Tree clearing of roads was kept to a 50' wide area where possible. Turbine pads were kept to an area just large enough for tower and rotor assembly erection and maintenance.

Tubular towers (versus lattice towers) eliminated any potential for birds to perch or nest as well as providing protective access for maintenance personnel.

Cleared turbine pad areas are being allowed to return to as much of their natural state as possible.

The presence of human activity is kept to a minimum. In accordance with an agreement between GMP and state fish and wildlife officials, public tours of the facility are conducted at specific times of the year and within a specific area.

Accommodations are made for existing wildlife habitat in scheduling routine operation and maintenance of the facility.

Many workshop participants agreed that the positive findings of the wildlife studies done at the Searsburg site do not lessen the need to continue wildlife resource inventories and impact assessments at future wind energy sites.

d. Workshop Four – Aesthetics and Consensus Building

The fourth workshop had three main agenda items:

- Jean Vissering presented a redraft of "Visual Resource Considerations in Siting Utility-Scale Wind Energy Facitlites" and solicited final feedback.

- Stakeholders worked with facilitators in an attempt to arrive at a final consensus statement that encompassed the issues discussed in the last three workshops.

- The group discussed the next phase of the Wind Siting Consensus Building Project – this document– and which materials should be included in it.

Regarding Jean Vissering's siting guidelines, a small number of stakeholders stated that, for them, an acceptable impact on visual and biological resources is related to the amount of wind development in Vermont. Without knowing how much wind power will eventually be developed it was difficult for them to define acceptable impacts. For example, if wind power were to expand rapidly such that the number of turbine-free lookouts from the Long Trail decreased significantly, then the visual impacts of more wind power would become increasingly objectionable. Although this may be an unlikely scenario, it illustrates the point that for some the idea of an acceptable impact depends on the number of wind power facilities developed over time and their cumulative aesthetic impact.

After extensive discussion the participating stakeholders did reached a consensus statement. They formalized their agreement in the following statement:

> *"Appropriately sited wind energy should be an important part of Vermont's energy future.*
>
> *We are committed to educating our own organizations on issues associated with its development and making appropriate public policy recommendations.*
>
> *The Department of Public Service should continue to provide leadership in education and policy development with the public, the stakeholders, planning organizations, and permitting agencies.*

We believe that this approach is particularly appropriate in the context of Vermont's existing and ongoing commitment to achieving high levels of efficiency in energy use."

e. Summary of Workshop Series

One position raised in several of the workshop discussions was that wind energy siting discussions should take place in the context of energy conservation and efficiency. Many stakeholders felt that the entire discussion of what constitutes the appropriate siting of wind power could in some cases be circumvented entirely by using less energy. Reflected in the final consensus statement, this sentiment is rooted in a broader concern that the growth of electric loads and building more electric generation capacity is thought to be inevitable. In this respect, they asserted, conservation and efficiency may be Vermont's greatest and least contentious energy resources.

In all, the quality of discussion in all four workshops benefited from a diverse group of stakeholders, all of whom brought important points of view to the discussion. The Woodbury Dispute Resolution Center's facilitators were helpful in focusing the discussion on key questions, clarifying key terms, and identifying common ground on which to build consensus. Furthermore, the presentations by experts in fields related to wind energy siting helped participants of diverse backgrounds establish a common, base-line understanding of the issues.

6. Summary and Conclusions

Wind power has become the single fastest growing source of electric generation in the world. Although facilities of the magnitude being built in the western and mid-western United States will likely never be built in Vermont, projects like these indicate a nexus of power demand, government support, resource abundance, and technological maturity.

Studies have shown that there is an abundant, developable wind resource in Vermont. The potential of wind power in the state is evidenced by an increasingly active community of developers, interest by the state's many environmental organizations, and policy supportive of the thoughtful development of the state's wind resource by the Department of Public Service. It is easy to imagine around 100 MW of wind power being built in the state in the next 5-10 years, mostly in the form of 10-20 Megawatt projects.

As interest in wind power grows around the state, so does concern that these facilities be carefully and appropriately sited. The four stakeholders workshops showed that the wind power industry in Vermont is quite nascent and that policy questions relating to wind power development have yet to be completely resolved. To a great extent, the point of departure for resolving these questions is the body of information included in the appendices of this packet.

Though questions around the siting of wind power projects may be years from being answered in a clear and consistent manner, now is the time to examine the issues and implications. Through the planning process, Vermont's town and regional planning

commissions will have a strong influence on the development of wind energy. Towns and regions that establish a clear planning direction for wind resources and wind power will be most influential in directing this policy discussion.

[i] Christine Real de Azua, American Wind Energy Association, October 2002.

[ii] Koeppl, G.W. Putnam's Power From the Wind. Van Nostrand Reinhold: New York, 1982.

[iii] "Wind Generated Electricity: History and Assessment." Prepared Pursuant to Act. No. 59 of the 1993 Vermont Legislature. January 1994.