From: John Zimmerman
Date: Sun, Feb 10, 2013 at 4:18 PM
Subject: Addition to list of wind/biomass studies
To:
Cc:

Hi Linda,

You are doing an incredible job keeping the sea of information straight for the Commission and other participants. Much appreciated.

In looking over the list of the Documents, Studies, and Reports over the last 15 years or so ago, I couldn't find mention of the studies below (and attached). These are noteworthy not only for the participants and funding sources, but that is was the first study that attempted to quantify the theoretical large wind potential in Vermont, with consideration given to electric system and environmental constraints. Subsequent studies, such as the wind potential on public lands with VERA conducted for the DPS in 2004 built on this earlier research.

Attached are two of the documents. HQ produced a much more technical document relating to the electrical system capabilities which I did not include.

This is public info., so please feel free to circulate as you see appropriate.

ANALYSIS OF WIND-HYDRO INTEGRATION VALUE IN VERMONT

WINDPOWER 2003
MAY 21, 2003
10:40AM – 12:00PM
HYBRID AND DISTRIBUTED GENERATION SESSION

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ABSTRACT

This study evaluates (1) technical issues and cost impacts associated with integrating a large amount of windpower on the Vermont grid in 2010 and (2) the potential value from operating the wind plants in conjunction with the largely hydro-based power system of Hydro-Québec (HQ). Analysis showed there are no major technical nor cost constraints to preclude wind power from becoming a large share of Vermont's electric system. Because of low correlations between wind, loads, and electricity spot prices, there was an increase in system costs from blending 810 MW of wind energy, assuming current wind power costs, pool prices. However, using a range of future wind energy costs and NEPOOL spot prices, wind's cost premium varied from negative to over 1 cent/kWh. The additional value of wind, when integrated with HQ's system, was 22%, assuming a perfect correlation of HQ price and load and Vermont wind and HQ load.

INTRODUCTION

There is much interest in the potential for wind power in Vermont. A study was begun in late 2001 to examine technical and cost issues associated with installing wind and biomass plants on the Green Mountain Power system and other electric power systems in Vermont. This project supports the goals and strategies under the U.S. Department of Energy's (DOE) Wind Powering America Initiative and other efforts to increase the use of wind and biomass energy in the U.S. through targeted regional efforts. The project results will be of use to a wide range of stakeholders in Vermont who are interested in understanding the technical and cost issues, and the benefits, associated with adding more wind and biomass to the grid.

The four phases of work associated with the project were:

- Phase 1 - Wind and Biomass resource assessment;
- Phase 2 – Large-scale grid integration modeling analysis;
- Phase 3 - Distributed generation case studies; and
- Phase 4 - Transmission system impacts.

This paper reports on the approach and findings for Phase 2. It briefly summarizes the Phase 1 approach and findings, since they are critical inputs to Phase 2. The paper also briefly summarizes key findings for Phase 3.

Phase 1. Wind Potential Assessment

A poster presentation at WINDPOWER 2002 detailed the findings from this research phase. [1] Results of this assessment, including multiple color maps, are available at http://www.perihq.com. A geographic information system-based (GIS) screening approach was used to identify the universe of sites that could be developed under high penetration scenarios. The identification process considered the strength of the wind resource, proximity to the existing electric transmission and distribution (T&D) system, as well as several criteria to exclude environmentally sensitive and other non-compatible land use areas.

The resource assessment process was conducted with consideration for two distinct development perspectives.

> *Class A turbine strings* - Large wind power installations (greater than 6 MW) installed along the windiest ridge lines and interconnected directly to the existing electric transmission system (connected to grid facilities above 34 kV-class levels); and
>
> *Class B turbine strings* - Small installations (50 kW to 6 MW), generally at lower elevation sites where they could be either connected to the existing electric distribution or sub-transmission system (connected to grid facilities below 34 kV-class levels).

The state-wide peak load in Vermont is about 1,000 MW. The Phase 1 assessment found that there is more than enough potential wind resource to meet this study's target of "high penetration" on Vermont's grid from wind turbines connected to a combination of Vermont's transmission or distribution lines. There are comparable amounts of resource available for Class A (6,074 MW) and B (6,153 MW) strings. Even using much more severe land use exclusion criteria, i.e., restrictions for environmentally sensitive land, scenic vistas, etc., would leave enough resource available for a high penetration scenario. In other words, the state is not resource-constrained. However, the reader is cautioned that no conclusions were drawn by the study authors as to the feasibility or likelihood of future wind energy development in Vermont. Other issues, such as achieving public acceptance for siting wind energy facilities, will also have to be addressed for development to occur.

Phase 2. Large Integration Modeling and Analysis

Approach

This phase of the study assessed the impact of integrating a high level of wind generating capacity on the cost of the Vermont electrical system in year 2010. The study considers the addition of a large amount of wind capacity to the grid to determine technical limits without major changes or reinforcement of the grid over a period of several years. Our methodology uses, as a main building block, an existing hydro-thermal medium-term generation planning (MTGP) model available at the Hydro-Québec Research Institute (IREQ). This model was previously modified at the Institut National de la Rechereche Scientifique (INRS) for assessing wind penetration on Hydro-Québec's power system. The general purpose of such a model is to optimize power system operation for a period that includes hourly load profile cycles analyzed for a full year duration. The objective of the model is to minimize costs while taking into account the full set of actual system operational characteristics (e.g., generation levels, load patterns, and wholesale power prices).

The MTGP model was used to analyze the optimal operation of the Vermont generation system assuming 810 MW of wind power is located on the system, taking into account the interconnections with adjoining grids. [2] The choice of this exact number is a result of using the site characterization data developed in Phase 1 of the project to arrive at a capacity close to the state load and current generation capacity. It was assumed, for modeling purposes, that the Vermont generation system is operated in an optimal coordinated manner rather than in a

decentralized competitive manner. The goal of the analysis was to identify the least cost way to complement the wind generation. This "complementary" generation could be provided either through interconnections to neighboring grids or by existing and/or additional backup power generation units connected to the Vermont grid system. In all instances, the transmission line capacity and electricity generation costs are factored in for comparing scenarios.

Two general cases were investigated for operation of the Vermont grid. For Case I, Vermont was modeled to include energy exchanges with NEPOOL, and with Hydro-Québec only under current contractual conditions. That is, wind power is not allowed to be exported to Hydro-Québec in the model. For Case II, the model was extended to include export of wind power to Hydro-Québec, to measure the impact of this integration on the value of Vermont wind energy and on the optimization of the hydro reservoir, when wind is managed with relatively unlimited hydro storage capacities. [2] [3]

Correlations

For this study, NEPOOL hourly spot prices and load, and Vermont load and hourly wind resource characteristics (extrapolated from the Searsburg, VT wind plant site) are the key factors driving the value of wind generation. The value of wind power in the NEPOOL market is heavily influenced by how well Vermont wind correlates with NEPOOL prices over the year. In addition, the level of correlation between the wind and load in Vermont is key to the level of benefits wind can provide to constrained parts of the distribution system (i.e., delay, reduction, or avoidance of distribution system equipment upgrades or reinforcements). However, even without such correlation, distributed wind installations can provide benefits such as voltage support and reduction of line losses. Finally, if wind energy is exported to Hydro-Québec, then HQ's load and price must be added to the list of critical factors. The relationship and correlation between all of the factors mentioned above is a fundamental underpinning of the modeling for this study.

Wind Energy Supply Curve

Since the primary goal of this phase of the project is to estimate the costs of integrating wind generation in Vermont, an important element of the analysis is the estimation of the levelized cost of energy (COE) for each additional increment of wind power that could be added to the grid. A set of such costs versus capacity is known as a "supply curve." The wind resource GIS database developed in Phase 1 of this project was used to calculate the capacity factor and distance to transmission facilities for each wind plant location, the latter being used to calculate cost of interconnection for each wind plant. A topographic map layer was also used to identify terrain features that would add to installation cost for individual plant sites. The COE was then calculated by combining these inputs with assumptions for current "favorable" financial and technology characteristics. "Favorable" characteristics include various potential combinations of financial factors and approaches, including (1) current low financing rates; (2) balance sheet financing or portfolio financing, where collateral for the project is set against the entire balance sheet of the equity owner, or against a portfolio of projects, thereby lowering the risk of default, and consequently the cost of capital; and (3) use of the Federal Production Tax Credit (PTC) or public utility ownership, which can utilize tax-free debt for project financing.

Analysis and Results

Supply Curve

Figure 1 shows the entire estimated wind energy supply curve for the state in 2010. For the nineteen lowest cost projects on the state-wide wind energy supply curve, COE estimates were 4.9-5.6 cents/kWh. The average COE from these nineteen projects, 5.4 cents/kWh, was used for modeling purposes. It must be emphasized that these cost estimates were made for parametric analysis, NOT AS A DEFINATIVE ESTIMATE OR PROJECTION OF ACTUAL COSTS. These COE estimates are in one sense an optimistic boundary in that the first nineteen (lowest cost) points from the supply curve were used and the financing assumptions for the COE

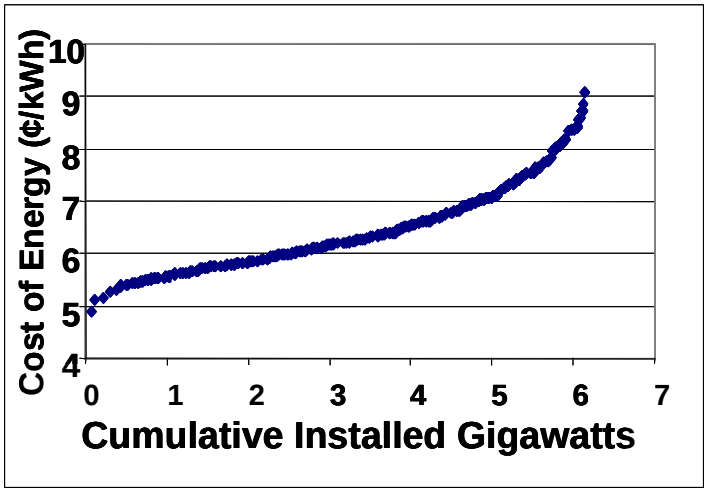

FIGURE 1. WIND ENERGY SUPPLY CURVE FOR VERMONT

calculation were "favorable," as described above. Cost estimates for the 19 projects did not include any individual siting feasibility analysis. However, there are several reasons why results may indeed be conservative (i.e., higher than what prices may actually be in year 2010). First, no attempt was made to reflect potential future cost reductions resulting from technology advances from R&D, which given the relatively young stage of the technology, historical patterns, and projected R&D funding levels, are likely to occur. Second, no cost reductions were assumed to occur from economies of scale, learning, or other benefits related to increased cumulative or annual manufacturing and installation volume that will occur, by definition, in Vermont, as well as surely in the U.S. and other countries. Third, if 810 MW were installed in Vermont by 2010, it is probable that development of such a large amount of capacity would imply elimination/reduction of socioeconomic barriers that currently add cost to projects by creating delays or uncertainty (e.g. siting, zoning, interconnection, etc.) and would have been addressed by policy actions. Given these competing characteristics, the supply curve was judged to form a reasonable baseline from which to perform parametric analysis. Therefore, readers will be able to use this analysis to apply their own assumptions concerning future wind energy costs and electric market spot prices.

The fact that the COE range is relatively small for the 19 lowest cost wind projects on the supply curve demonstrates that the curve is relatively flat up to at least 810 MW (as figure 1 confirms visually). In other words, the cost of adding each additional MW of wind changes relatively little up to at least 810 MW. This result assumes that each new increment of wind power capacity is installed in the next-most cost-effective location, based on wind resource, topography, and distance to transmission facilities. While in practice, such an installation pattern is improbable due to siting objections and other issues, i.e., cost is not the only criteria for siting. There is, in fact, much more than 810 MW of potential capacity at the low end of the supply cost curve.

Transmission Constraints

One of the important findings of this research is that there are no major system integration constraints to preclude wind power from becoming a large share of Vermont's power generation system. Assuming that neighboring markets will accept the energy surplus from wind plants, the results from the simulations indicate that no congestion is expected to occur on main internal and external ties of Vermont when 810 MW of wind capacity is installed within Vermont. Integrating such a capacity in the grid may seem considerable, but this finding is realistic in view of the fact that the Vermont power system is small compared to neighboring power systems. As such, Vermont relies on a set of important ties to NEPOOL in the eastern and southern regions, as shown in figure 2, to allow the load to be continuously adjusted over time. The four regions shown in the figure were developed for this study to facilitate the modeling process. They are based on load growth patterns, wind resource availability, and presence of transmission capacity.

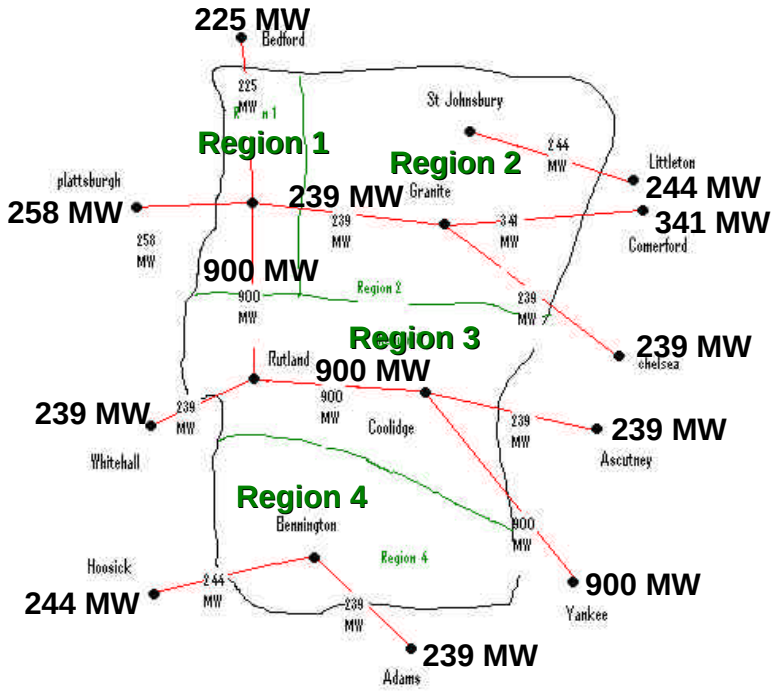

FIGURE 2. TRANSMISSION INTERTIE LINE CAPACITIES AND MODELING REGIONS

Correlations

Table 1 lists the correlations between Vermont load and wind, and NEPOOL load and price, based on 2000 data. The correlation between Vermont wind and load was found to be weak, especially for peak load hours. This is partially explained by the fact that the electrical load in Vermont is not driven by winter space-heating peaks, when the wind resource is the strongest (only a small percentage of space heating is from electricity). Likewise, the correlation between Vermont wind and NEPOOL price was found to be low. The only correlated parameters are Vermont and NEPOOL loads. It is possible that these findings represent a worst case, since they are based on wind characteristics from only one site (Searsburg) and one year of NEPOOL data. In addition, the analysis did not consider the stochastic nature of wind data, or the affect of geographic diversity, both of which could also improve the correlation. It would be worthwhile to reconfirm these results by using a wind database over a wider geographic area in Vermont, coupled with a stochastic treatment of the wind resource based on data from different locations.

TABLE 1. HOURLY CORRELATION FOR KEY PARAMETERS (PEARSON COEFFICIENT)

	Vermont Load	NEPOOL Load	NEPOOL Price	Vermont Wind
Vermont Load	1	0.75	0.07	-0.01
NEPOOL Load	0.75	1	0.12	-0.05
NEPOOL Price	0.07	0.12	1	-0.02
Vermont Wind	-0.01	-0.05	-0.02	1

Case I Results

Based on Searsburg wind data and 2000 NEPOOL spot prices, the correlation that exists between NEPOOL peak prices and Vermont wind output was found to be too low to provide wind energy projects with annual revenues greater than the average cost of energy from the pool. Using the wind cost supply curve developed earlier, modeling results from Case I (power exchange with NEPOOL, no export to Canada) indicate that, in a scenario where NEPOOL prices in 2010 are the same as in 2000, the additional cost ("cost premium") that would have to be paid by Vermont ratepayers for accepting 820 MW of wind capacity amounts to 1.3 cents/kWh. Table 2 shows this case (the entry for zero percent change in 2000 values of NEPOOL price and wind COE). A linear relationship was found between wind cost of energy and the additional cost determined by the model. Using this relationship, Table 2 shows that wind COE would have to drop 24% at current NEPOOL prices to eliminate the cost premium. Conversely, the NEPOOL price would have to increase by 32%, or 2.8 percent annually, at the assumed current wind price to eliminate the premium. The table also lists several intermediate cases.

TABLE 2. RESULTS OF CASE I ANALYSIS (NO EXPORT TO CANADA)

Change in COE Needed For Wind To Break Even In 2010 (cents/kWh, year 2000 dollars)			
Average Annual NEPOOL Wholesale Price - cents/kWh (% change from 2000 value)	Percent Change From 2000 Average Wind COE of 5.4 cents/kWh		
	-32%	-24%	0
3.9 (-10%)	0	0.4	1.7
4.3 (0.0%)	-0.4	0	1.3
5.7 (32%)	-1.7	-1.3	0

Case II Results

In a system where no correlation exists between load, electricity price and wind, where energy storage is unavailable, the wind generation value is derived exclusively from wind generation costs and electricity wholesale prices. This is clearly the worst case for valuing wind energy. However, there may be a number of additional areas from which wind can obtain value in Vermont. First, wind power can be used to diversify generation sources, providing a long-term hedge against electricity price fluctuations. Second, a premium on some of the power may provide additional revenue for its "green" aspects. Third, a cooperative management approach between mostly hydro-based Hydro-Québec and Vermont wind generation may be able to provide value by improving power supply synergies between the two jurisdictions. In contrast to the conditions in Vermont, there is a much better correlation between the Vermont wind resource and the load in Québec, because the higher winds occur during the winter when there is a higher load from predominantly electric space and water heating. Figure 3 demonstrates this strong correlation. Consequently, a second analysis case "Case II" was modeled to explore this potential additional value.

The objective of Case II was to calculate the gain for a "Québec+Vermont" system when wind generation added in Vermont is exported during periods of peak Québec demand. This strategy was implemented by synthesizing a strong price-load correlation in the Québec system. Such a relationship is present, despite the fact that the load peaks in winter due to heavy space heating demand, because when water flows are at their lowest. Figure 4 clearly demonstrates this relationship. In electrical grid systems where wind/load correlation exists and/or where some storage capacity exists, e.g., Québec or Scandinavia, wind generation is, in effect, backed-up by existing complementary sources such as hydroelectric generating units and it is found in these grids that spot prices are highly correlated to water level in the hydro system. For this analysis, 529 MW of wind projects were assumed to be in place in Vermont with the transmission capacity of the Québec-Vermont ties limited to 300 MW (225 MW through region 1 and 75 MW through New Hampshire).

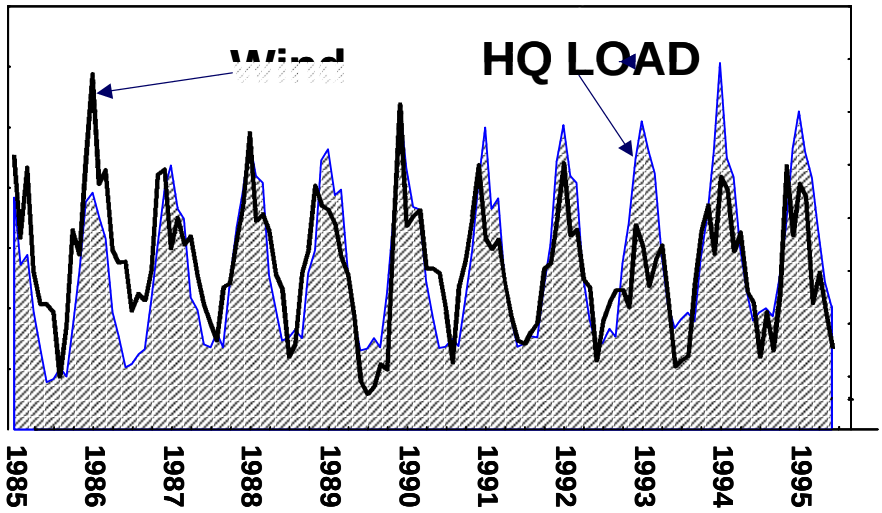

FIGURE 3. CORRELATION OF VERMONT WIND WITH HQ LOAD

Model results show that the presence of this correlation significantly improves the optimization of the hydro reservoir in Canada, thereby adding value to the wind power. Assuming a perfect correlation of HQ prices and load to produce an upper bound estimate, the value of Vermont wind power increased by 22 percent over the market value of wind if it were sold directly in the NEPOOL system.

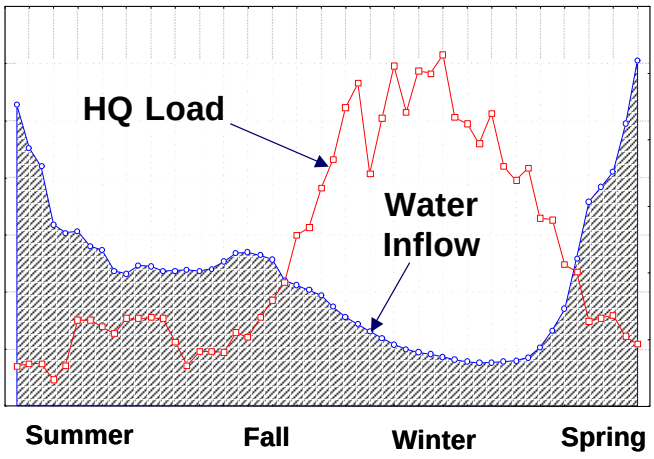

FIGURE 4. CORRELATION OF HQ WATER FLOWS AND LOAD

The results from these simulations show that under the specific system profile of Vermont and Québec, a significant added value can be attributed to wind. Under such a cooperative wind-hydro energy management scenario, wind generation produces measurable benefits to the "Québec + Vermont" system over a complete annual cycle.

DISTRIBUTED GENERATION CASE STUDIES

Although the focus of this paper is on the value of wind-hydro integration, a brief summary of Phase 3 is also given here. A complete discussion of this research is contained in the project final report and technical reference document. [4] Two case studies were conducted to examine the steady state and transient impacts of wind generation connected to a distribution grid. Detailed models of the local power system network were created using the Matlab modeling platform. Matlab, from Mathworks, is a commercial scientific/engineering calculation software package that incorporates modules suitable for such analysis. IREQ has developed a library of objects for that software, called SimPowerSystems, devoted specifically to the analysis of power systems/networks and components. Using that software, IREQ built detailed models of the two case study areas. The analysis included steady state stability, and affects of wind gusts, faults, and full-to-no generation.

The first case study selected was a ski resort area located at the end of a long radial combination 34.5/12.47 kV distribution circuit. Eight 1.5 MW wind turbines (12 MW total capacity) were modeled at this location. This application had a high level of interest to the project team for a number of reasons. First, the ski resort has plans for expansion and new electrical facilities would be proposed to serve the load increase. Also, the demand has already reached the loading limits of the existing electrical facilities and the ski area now falls under the definition of a constrained area. The high level of correlation between wind speed and winter peak loading periods makes the ski resort application potentially very attractive for wind power.

The second case study selected was also a recreational area, located in southern Vermont. Eleven 550 kW (6.05 MW) wind turbines were modeled. The case study added several new dimensions not found in the first case study. The participant is served by 12.47 kV distribution facilities served from 69 kV transmission facilities. In addition, there is other existing generation (hydro and wind) connected to the transmission system and the same electrical system model used for this analysis can also be used to look at expanding the existing wind farm at little additional cost.

Detailed data (load, electric line length/wire type/impedance, transformer nameplates, etc.) was collected from each case study site owner and its distribution company. Steady-state and transient analysis was conducted for the integration of 12 MW of wind power in the electric distribution network. Both recreational resorts have various motor loads such as snow-blowers, pumps and chair lifts, with a variety of resistive loads distributed along the distribution lines. The major findings from the case studies are:

- Wind generation provides significant *benefits* to the distribution system in steady state conditions. The benefits include an improved voltage profile and reduced energy losses from supplying load locally when wind is present.

- The wind turbines did not have a significant effect on the stability of the system for strong wind gusts (+/- 5 meters per second), faults or full-to-no generation events. When,

after fault clearing, an instability is observed, its cause is directly related to the low inertia constant of the motor load, not the wind turbines.

- Wind generation costs are lower than retail energy rates from Vermont distribution companies. This allows the consumer to reduce its overall power costs with self-generation.

- Wind generation cannot by itself defer the need for infrastructure improvements in constrained areas. Wind needs to be matched with other complementary generation (i.e., storage, hydro or diesel), interruptible load stragtegies, and/or aggressive demand side management to be able to defer infrastructure improvements.

ACKNOWLEDGEMENTS

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REFERENCES

1. Princeton Energy Resources International, Vermont Environmental Research Associates, "Wind and Biomass Integration Scenarios in Vermont, Summary of First Phase Research: Wind Energy Resource Analysis," Prepared under DOE project number DE-FG01-00EE10762, March 2002. Available for download at www.perihq.com.
2. Gaëtan Lafrance INRS University of Québec, Stéphane Krau, Bernard Saulnier, Hydro Québec Research Institute (IREQ), "Assessment of the Impact of Wind Power Penetration on the Vermon Electricity Grid," Technical Reference 1 of 3, under contract to Green Mountain Power Corporation, Vermont, a cost sharing contribution to U.S. Department of Energy project number DOE DE-00EE10722 "Wind and Biomass Integration Scenarios in Vermont," December, 2002.
3. Bernard Saulnier, Stéphane Krau, Richard Gagnon, Hydro-Québec Research Institute (IREQ), Gaétan Lafrance, INRS, Varennes, Energy management and grid stability aspects of Wind energy integration in the Power Market," CANWEA 2002 Conference, Halifax, N.S., October 20-23, 2002.
4. Richard Gagnon, Jean Lemay, Hydro-Québec Research Institute (IREQ), "Assessment of the Impact of Wind Power Penetration on the Vermon Electricity Grid," Technical Reference 2 of 3, under contract to Green Mountain Power Corporation, Vermont, a cost sharing contribution to U.S. Department of Energy

project number DOE DE-00EE10722 “Wind and Biomass Integration Scenarios in Vermont,” December, 2002.

Wind and Biomass Integration Scenarios in Vermont

Summary of First Phase Research: Wind Energy Resource Analysis

Prepared For
U.S. Department Of Energy
Office of Energy Efficiency and Renewable Energy

Prepared by
Princeton Energy Resources International, LLC

Subcontractors
Vermont Environmental Research Associates,
EPRO Engineering and Environmental Consulting, LLC

Cost Sharing By
Green Mountain Power Corporation
Vermont Department of Public Service

DOE Project #
DE-FG01-00EE10762

May 2003 (Updated from March 2002)

Introduction

There is much interest in the potential for wind power in Vermont. This project was undertaken to examine technical and cost issues associated with installing wind and biomass plants on the Green Mountain Power system and other electric power systems in Vermont. Results from the study are expected in mid-2002.

Specific objectives of the overall study are to evaluate the effects of high penetration levels of renewable energy on the grid of Vermont (and adjoining areas) by 2010, to determine: (1) transmission and distribution grid systems changes that would be needed, (2) grid operation and control issues, (3) the incremental cost of renewable energy capacity additions, (4) ways to minimize increases in the cost of energy to the consumer, and (5) potential reductions in regional CO_2 emissions. By achieving these objectives, this project will support the goals and strategies under U.S. Department of Energy's (DOE's) Wind Powering America Initiative and other efforts to increase the use of wind and biomass energy in the U.S. through targeted regional efforts.

To assist interested parties in the state before the overall project report is completed, results from the first phase of the study, an analysis of the wind resource in the state, are being released in this documentation report. The results include 4 maps and documentation on the process used to develop them. The analysis identifies both the amount and the corresponding location of wind resources throughout the state, after excluding locations based on several criteria such as environmental sensitivity. Resources are divided into amounts close to the transmission system (grid facilities above 34 kV-class levels), and amounts close to the distribution system (grid facilities below 34 kV-class levels). None of the study participants make any claim or conclusion from this analysis as to the feasibility or likelihood of projects at any of the identified locations, from the economic, technical integration, or siting perspectives. The purpose of the analysis is to supply data for the second phase of the study.

The second phase of the study will employ power system integration analysis to address technical, operational, and economic issues and realistic limits for installing up to 750 megawatts (MW) of wind plants, operating in conjunction with existing hydropower plants in Vermont, and up to an additional 40 MW of new biomass plants. Distributed generation applications will also be analyzed for using wind power in low power (hundreds of kilowatts (kW)) grid connected applications and isolated, off-grid applications, e.g., ski areas, with diesel engine generators. Technical requirements of this renewable energy portfolio on the power transmission and distribution system will be analyzed, including reinforcement options and associated costs necessary to permit the high renewable energy penetration. The study will also provide interested parties with a description of integration issues likely to be faced by a large number of potential wind and biomass projects, and identification of approaches and associated costs to address those issues.

This work is being performed under a grant from the U.S. Department of Energy, Office of Energy Efficiency and Renewable Energy, with cost sharing from Green Mountain Power Corporation (GMP) (including technical support from Hydro-Québec), and the State of Vermont Department of

Public Service (VT DPS). DOE and GMP are contributing close to 50 percent cost sharing each, with the remaining contribution coming from the VT DPS. Princeton Energy Resources International, LLC of Rockville, Maryland (PERI) is the prime contractor for analysis and project management, with assistance from subcontractors EPRO Engineering and Environmental Consulting, LLC (Vermont Office, Montpelier), and Vermont Environmental Research Associates (Waterbury). Project results are expected in the Summer of 2002.

For further information about the study, please contact:

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Wind Resource Assessment Approach

A geographic information system (GIS)-based screening approach was used to identify the universe of sites that could be developed under high penetration scenarios. Inputs to the GIS (MapInfo Professional Software) included spatial data on wind resources developed previously by the National Renewable Energy Laboratory (NREL) (Elliot 1999), the electric T&D system (34.5 kV and up) for Vermont's electric utilities (Vermont Electric Power Company 1991), along with environmentally sensitive areas and other land use (Vermont GIS Data Warehouse). The identification process considered the strength of the wind resource, proximity to the existing electric transmission and distribution (T&D) system, as well as several criteria to exclude environmentally sensitive and other noncompatible land use areas. Beyond the land exclusion criteria listed below, the analysis does not address siting issues that could prevent installation at specific locations.

The resource assessment process was conducted with consideration for two distinct development perspectives:

- *Class A turbine strings* - Large wind power installations (greater than 6 MW) installed along the windiest ridge lines and interconnected directly to the existing electric transmission system (connected to grid facilities above 34 kV-class levels); and

- *Class B turbine strings* - Small installations (50 kW to 6 MW), generally at lower elevation sites where they could be either connected to the existing electric

distribution or sub-transmission system (connected to grid facilities below 34 kV-class levels).

The process involved the following steps:

1) A base map was created to show county and town boundaries, roads, surface waters, population centers and similar broad-scale geographic information.

2) A digital version of the best existing wind power map (developed by NREL) (Elliot 1999) was prepared to represent wind resource areas broken into seven standard wind power classes. Wind data on this map has a resolution of 1 square kilometer (km^2). That is, each km^2 of land is assigned a designation of one of the seven standard wind power classes throughout its entire area. The resulting digital map may be thought of as a grid, broken into 1 km^2 squares. In a GIS system, the original map and each subsequent set of data overlain on the map is called a "layer." After creating the base wind resource map, the next layer to be developed was one for potential wind turbines sites. Because the windy areas in Vermont are primarily along the north-south oriented mountain ranges, "turbine strings" were first drawn roughly through each grid square with a wind power designation of class 3 or higher, and oriented perpendicular to the prevailing wind flow. The term "turbine s
the simplifying assumption was made that only one row of turbines, i.e., a "string", can be installed at any site. This turbine placement pattern will be typical in most of the ridge sights in Vermont. Then, to more accurately place the turbine strings closer to the actual ridge lines or hill tops, a more refined turbine string layer was created using a shaded relief topographic map overlay to distinguish prominent physical land features. After this process was performed for both Class A and B turbine strings, the following criteria were applied to further refine potential turbine locations.

- *Class A turbine strings* - Using a map of electric transmission lines as an overlay, Class A turbines strings were sited where a part of the string was within 3 miles of existing suitable transmission lines or a neighboring turbine string was 3 miles or less away. Suitable transmission lines were defined as those with a rating in the range of 34.5 to 120 kilovolts (kV). Emphasis was placed on identifying relatively long strings several miles in length, in the windiest areas that can support relatively large wind facilities.

- *Class B turbine strings* - Class B turbine strings were mapped based on their proximity to electric distribution lines. Since an electronic version of distribution lines is not available for all of Vermont, a map of all township-level roads and better (i.e., state and federal highways) was used as a proxy for distribution lines.[1] Electrical line

[1]Roads in the state are officially designated using the following classification system: Class 1 = federal highways, Class 2 = state highways, and Class 3 = town roads. Thus, all roads Class 3 and above were used for this effort. For wind, the term "Class" signifies a standard rating for wind power, which ranges from lowest (Class 1) to highest (Class 7).

maps were spot-checked to confirm the reasonableness of this simplifying assumption, although a quantitative correlation between the presence of roads and distribution lines was not established. Turbine strings that lie within approximately 0.25 miles of these roads were mapped. Emphasis was placed on identifying relatively short strings that could support up to several megawatts of installed capacity, that were generally on windy hilltops at lower elevations.

3) All turbine strings were then screened for general land use and environmental compatibility by applying the following criteria:

Proximity to the Appalachian and Long Trails. Turbine strings within approximately 0.5 miles to these trails or major side trails were eliminated.

Public lands with the highest protection level. Turbine strings that intersect public lands where wind development is prohibited were eliminated using the Vermont Conserved Land Database.

Green Mountain National Forest restrictive Management Areas. Turbine strings that intersect with federal land managed to be prohibitive or highly restrictive to wind power development were eliminated, including Green Mountain National Forest Management Areas 5.1, 6.2, 8.1, and 9.2 (GMNF Plan 1986).

Green Mountain National Forest restrictions for siting visually prominent facilities. Areas mapped by the GMNF as having the "highest" level of sensitivity to siting visually prominent facilities were eliminated (USFS Plan 1986).

Potential for conflicts with known rare, threatened, or endangered species. Turbine strings that fell within 0.5 miles of a rare, threatened or endangered species were subjected to individual scrutiny. If the turbine string could be shortened or moved to avoid the immediate vicinity of the species of concern, it was, otherwise it was eliminated.

4) Turbine strings that passed the exclusion screens were each assigned an average wind power class based on wind power density values for each km^2 cell in the wind power map (Elliot 1999) that they traversed. An average wind turbine net capacity factor for each turbine string was then assigned using a Vestas V47 (660 kW) wind turbine power curve considering air density, together with estimates for losses associated with availability (2 %), transmission (3 %), turbulence (3 %), icing (6 %), and in-line wakes (2 %).

5) The number of wind turbines and the installed capacity for each turbine string were estimated assuming a five-rotor diameter spacing requirement between wind turbines. The larger Vestas model V66 (1.65 MW) wind turbine is typical of the newest large wind turbines

used in commercial power plants and was used for this step because it results in the maximum potential estimated capacity. Combining the estimated capacity with the calculated net capacity factor for each string, annual energy production estimates were then determined. (The V47 turbine was chosen for estimating energy production because the study authors already had data from this turbine in the correct format. Although there is some difference between the capacity factors of the V47 and the V66, the error in resulting total energy production introduced by this assumption is dwarfed by the total energy production from all potential turbine strings.)

At the end of this report are four maps that were produced from the analysis described above. The maps show separate plots of turbine string Classes A and B plotted over 1 km^2 wind resource class cells and topographic features. Other data represented in the various GIS "layers" is also shown as indicated in the map legends. Table 1 summarizes the wind power generation potential for Class A and B turbine strings, and shows the impact of the land use exclusion screening process on limiting the "technical potential" for wind energy capacity levels. Technical potential is defined for this study as the level obtained after applying the land use exclusions, but NOT CONSIDERING economic, technical, or siting feasibility at any location. Note that the total potential capacity estimates for the Class A and Class B string approaches are NOT additive. That is, although they represent different approaches to siting and connecting wind turbines to the transmission and distribution system, they both utilize the same capacity of the system to handle additional power flow.

The state-wide peak load in Vermont is about 1,000 MW. The totals in Table 1 indicates there is more than enough potential "technical" wind resource to meet this study's target of "high penetration" on Vermont's grid from any combination of Class A and Class B turbine strings. Even using much more severe land use exclusion criteria would leave enough resource available for a high penetration scenario. In other words, the state is not resource-constrained. The table shows that there are similar amounts of resource available for Class A and B strings, i.e., just over 6,000 MW. However, the reader is cautioned again that no conclusions have been drawn to-date by the study authors as to what portion of the resource may be economically attractive, technically feasible, or possible from the perspective of gaining public acceptance for siting wind energy facilities. The final phases of this study will provide information on the first two aspects (economic and technical feasibility), but not on siting issues or constraints.

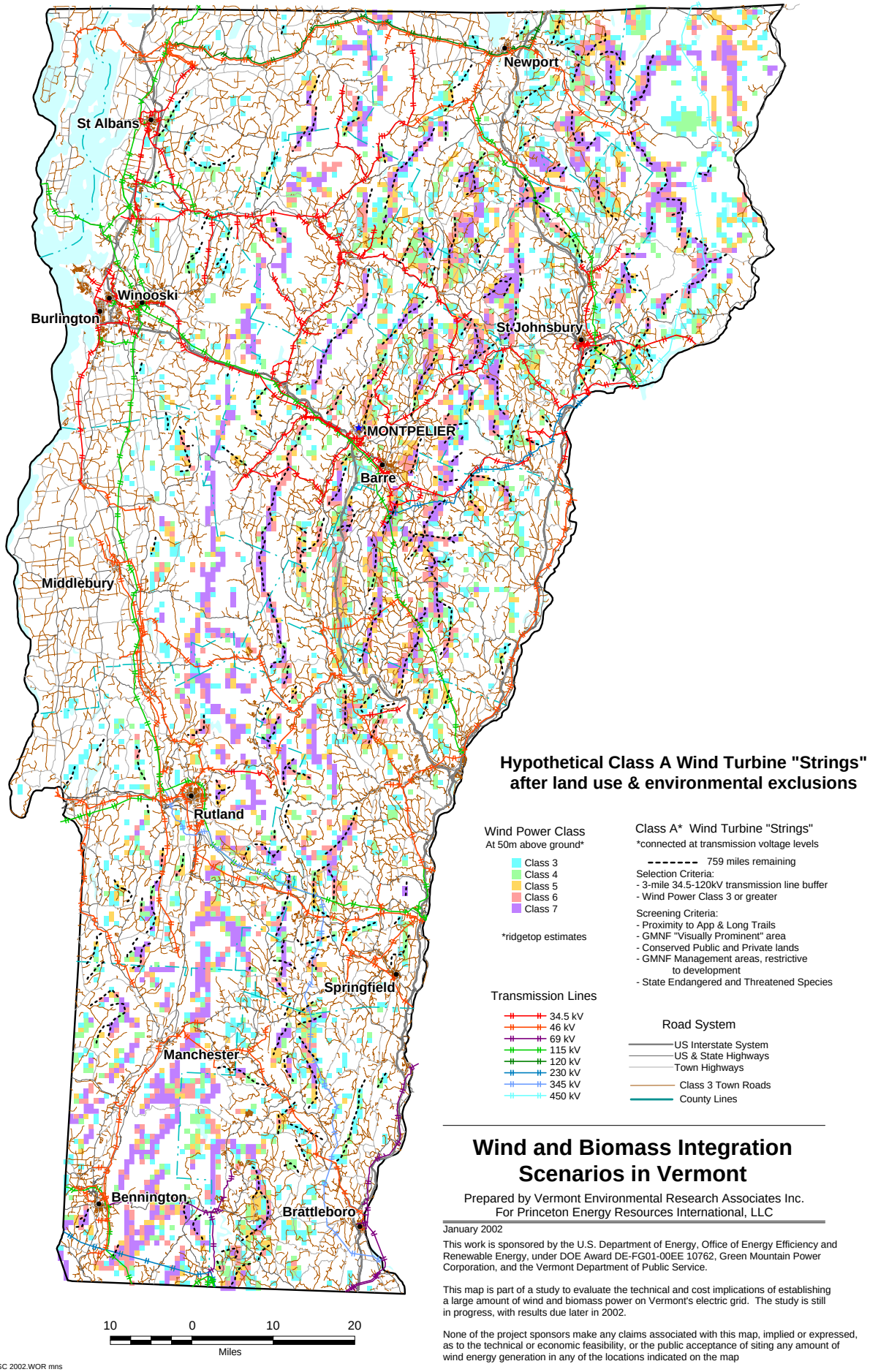
Table 1. Technical Potential of Wind Power Generation In Vermont (not considering economic, technical, or siting restrictions)

Wind Class	Miles of Turbine String Before Exclusions	Miles of Turbine String After Exclusions	Capacity Before Exclusions (MW)	Capacity After Exclusions (MW)	Net Energy Production Before Exclusions (TWh/yr)	Net Energy Production After Exclusions (TWh/yr)
Class A Turbine Strings						
3	122	97	976	773	2.2	1.7
4	122	102	976	816	2.5	2.1
5	149	114	1,192	914	3.3	2.6
6	307	222	2,456	1,773	7.7	5.6
7	469	225	3,752	1,798	15	7.2
Total	**1,169**	**759**	**9,352**	**6,074**	**30.7**	**19.1**
Class B Turbine Strings						
3	286	224	2,284	1,791	5.1	43
4	174	144	1,390	1,150	3.5	2.9
5	159	131	1,269	1,050	3.5	2.9
6	259	167	2,074	1,337	6.5	4.2
7	141	103	1,130	826	4.5	3.3
Total	**1,019**	**769**	**8,147**	**6,153**	**23.2**	**17.3**

1. Installed capacity based on Vestas V66, 1.65 MW wind turbines spaced 5 rotor diameters apart.
2. Energy production is based on annual estimated mean capacity factor for each wind power class. This was determined using the power curve for a Vestas V47 (hub height = 50 m) and the mean wind speed for each wind power class.

References

1. Elliott, D.; Schwartz, M.; Nierenberg, R. (1999). Wind Resource Mapping of the State of Vermont. 9 pp.; NICH Report No. CP-500-27507
2. Green Mountain National Forest Plan. 1986
3. Vermont Electric Power Company. Map of Electricity Transmission Lines and Utility Service Territories for the State of Vermont. 1991.
4. Vermont GIS Data Warehouse. (http://geo-vt.uvm.edu/cfdev2/warehouse_new/warehouse.cfm).



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Wind and Biomass Integration Scenarios in Vermont

Prepared by Vermont Environmental Research Associates Inc.
For Princeton Energy Resources International, LLC

January 2002

This work is sponsored by the U.S. Department of Energy, Office of Energy Efficiency and Renewable Energy, under DOE Award DE-FG01-00EE 10762, Green Mountain Power Corporation, and the Vermont Department of Public Service.

This map is part of a study to evaluate the technical and cost implications of establishing a large amount of wind and biomass power on Vermont's electric grid. The study is still in progress, with results due later in 2002.

None of the project sponsors make any claims associated with this map, implied or expressed, as to the technical or economic feasibility, or the public acceptance of siting any amount of wind energy generation in any of the locations indicated on the map

From: Skovira, Mary
Sent: Tuesday, February 26, 2013 12:16 PM
To:
Subject: Forwarding on behalf of Harry Chen

Please see attached Health Department recommendations re the Governor's Energy Generation Siting Policy Commission.

Mary Skovira
Office of the Commissioner
VT Department of Health

VERMONT

State of Vermont
Department of Health
Office of the Commissioner
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Agency of Human Services
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MEMORANDUM

To: Governor's Energy Generation Siting Policy Commission

From: Harry Chen, MD, Commissioner of Health

Date: February 25, 2013

RE: Recommendations to the Governor's Energy Generation Siting Policy Commission

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The Vermont Department of Health appreciates the opportunity to provide recommendations and comments to the Energy Siting Policy Commission. We strongly support the Commission's work to identify best practices for siting energy projects. In June 2011, the Institute of Medicine recommended that local, state and federal agencies consider the potential health impacts and the health costs of major legislation, regulations and policies relating to education, transportation, land use planning, and agriculture.[1] This concept of making "healthy" policy can be also be applied to energy planning. Decisions about specific energy policies and development of particular energy projects can have significant public health impacts, both positive and negative.

The Health Department recommends the following actions be taken to protect public health in our energy planning and project approval processes:

- Public Health Impact Assessments
  - Conduct a statewide public health assessment for each particular energy sector (e.g., wind, biomass, etc).
  - Require Applicant conduct a project-specific public health impact assessment pursuant to 30 V.S.A. § 248 (b)(5).[2]

- Require applicants to engage each affected community concerning the proposed development and potential health impacts prior to filing a Certificate of Public Good petition with the Public Service Board.

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[1] See http://www.iom.edu/~/media/Files/Activity%20Files/Environment/EnvironmentalHealthRT/2011-Nov-RT/132291.pdf

[2] "Before the public service board issues a certificate of public good as required under subsection (a) of this section, it shall find that the purchase, investment or construction: with respect to an in-state facility, will not have an undue adverse effect on esthetics, historic sites, air and water purity, the natural environment, the use of natural resources, *and the public health and safety*..." [Emphasis added.]

- Create a dedicated public health assessment evaluator position for such projects within the Health Department.

- Provide technical support to municipalities concerning public health.

- Require applicants to validate modeling with field measurements of actual impacts for a minimum of three years during operation.

- Require applicants to institute a 'Good Neighbor' policy concerning ongoing health issues as a result of projects.

Public Health Impact Assessments

In the same way that generation and transmission projects are evaluated for impacts to, among other things, aesthetics, historical resources and the natural environments, such projects should not be sited without a comprehensive evaluation of potential impacts on public health. It is especially important that impacts on vulnerable populations – including children, the elderly, people with chronic illnesses such as respiratory and cardiovascular disease, people with compromised immune systems and those who do not have adequate health care – be considered. It is critical, therefore, to conduct public health impact assessments both statewide (for each energy sector) and project-specific (for each energy project). These assessments would bring the science together with community values to improve the decision-making process.

A public health impact assessment can identify previously unrecognized benefits and costs, and potential modifications and controls to minimize adverse health effects. This knowledge may make another alternative more attractive, or lead to further efforts that eliminate or lessen concerns to make the original project more effective.

The essential elements of a public health impact assessment are:

- evaluations of the policy or project to determine its scope and complexity
- a description of potential health benefits and adverse effects
- characterization of the people likely to be affected
- identification of engineering or human controls that could be used to mitigate negative health impacts

Following the statewide health impact assessment for each energy sector, the Health Department would work with the relevant parties to develop public health criteria to be used as a guide for developers and the Public Service Board to evaluate potential public health impacts of a project.

To assure that potential health impacts have been considered in the design or development stages, a public health impact assessment must conducted by an independent consultant hired by the proponent of the project and subject to the evaluation of the Health Department, the Board and parties.

When potential health effects are identified, additional analysis will be needed to describe control systems such as site-specific modifications and post-installation operator training, component maintenance and system monitoring that could be used to mitigate the adverse effects. As assessments are undertaken, the information learned could be shared, thereby reducing the cost for future projects. Ultimately, a public health impact assessment is an up-front cost that allows us to avoid future public health consequences of poorly sited projects. The public health impact assessment is further described in Appendix 2 of Vermont's Comprehensive Energy Plan.

Community Engagement

Every community has environmental, population, and health characteristics and values that make it unique. Community engagement is a process by which people are enabled to become actively and genuinely involved in defining the issues of concern to them, in making decisions about factors that affect their lives, in formulating and implementing policies, in planning, developing and delivering services, and in taking action for change.

Stress can result from inadequate community engagement. When the values of a community are heard or considered, individuals may experience anxiety and stress that can lead to losing their sense of wellbeing.

Applicants/developers should be required to work early and continuously with community stakeholders to inform them about plans, listen to and consider their input, and report on changes and progress throughout the application and development process. This will ensure the best outcome for all, and will help to inform the public health impact assessment.

Public Health Assessment Evaluator

Create a new position of public health impact assessment evaluator within the Health Department to review and evaluate all public health impact assessments conducted during the course of energy generation sitings. The evaluator would be responsible for reviewing the petitioner's assessment for accuracy and comprehensiveness. The evaluator would also be responsible for communication and outreach to concerned parties regarding the project and public health.

Technical Support for Towns

The Health Department supports the Agency of Natural Resources' recommendation that technical support for municipalities be established and managed by the Public Service Board. The 'suite of experts' should include a public health professional who has expertise in environmental health and epidemiology. The public health professional would work with the public health impact assessment evaluator and hired third party contractors to review public health impact assessments.

Validate Modeling

Require applicants to pay for costs associated with pre-construction modeling and post-construction monitoring to ensure that public health is being protected. As suggested by the Agency of Natural Resources, the Public Service Board would hire and oversee a third party to conduct the monitoring. For example, noise monitoring could be conducted at homes near wind turbines to validate modeled sound levels and ensure that the levels fall below health department recommendations. The monitoring requirements (e.g., frequency and duration) should be established by the original modeling, taking into consideration the site specifics and ensuring potential peak exposure times are captured. Changes in topography and aging of components are just two examples of why periodic monitoring should continue to take place over the lifetime of the energy project.

Good Neighbor Policy

Require applicants to follow up on individual complaints and work with individuals on a case-by-case basis, recognizing there could be unique situations that require mitigation techniques. For example, with a wind project there may be some physical characteristics of the house or topography that causes observed sound levels to exceed modeled sound levels. Applicants should be required to work with neighbors of energy projects until the Public Service Board determines that a reasonable effort has been made to address the health concerns.

From: James F. Palmer
Sent: Friday, February 08, 2013 1:47 PM
To:
Subject: public comment for the Siting Commission

Dear Commissioners,

I was one of the landscape architects that met with the Siting Commission on Tuesday, February 5, 2013. For the record, I would like to
provide:
(1) A copy of my resume,
(2) An article I wrote that was referred to by both Vissering and Raphael about the public acceptance of the Searsburg Wind Project that employed pre- and post-construction evaluations by a randomly selected panel of residents in Searsburg and the surrounding towns, and
(3) An article evaluating the user intercept studies being employed as part of the scenic impact assessment studies for wind projects in Maine.
There are a number of additional studies that have been completed since this paper was drafted, but I have not had time to add them. Soon I hope.

(4) A draft review of how I understand scenic impact assessment is implemented by Maine's Wind Energy Act.

I believe that scenic impacts are among the most important effects of renewable energy development for the public. However, I also believe that human induced climate change is a re phenomenon, and there will be enormous visual change to Vermont's landscape if we and other states and countries fail to reverse the release of greenhouse gases. These changes may be occurring slowly, but our actions now will effect the landscape in 100 years.

The issue is a particularly thorny one. As I am sure you are hearing, any particular renewable energy project will have an infinitesimal effect on reducing climate emissions. So why do we need _this_ project?
I think the response is that we need to do everything we can do to reverse the release of greenhouse gases. I think it very unlikely that we will over react to this problem. On the contrary, the past three or four decades have demonstrated that we will most assuredly under react.

That being said, scenic impacts are also a real problem. I think that Vermont needs to conduct an inventory of the most scenic areas in the state--those of state or national significance--immediately. Then we should identify an expedited permitting area that avoids the most important SRSNS, similar to what was done in Maine. We should also insist on using recreation intercept surveys of actual users of SRSNSs to gauge the scenic impact of wind projects, how it will effect the enjoyment of SRSNSs and whether it will effect continued use of SRSNS. Finally, there should be post-construction surveys to evaluate the quality of the intercept survey results.

If I can be of any assistance to the Commission, please do not hesitate to contact me.

Sincerely,

James F. Palmer
Scenic Quality Consultants

JAMES F. PALMER, PhD, FASLA, FCELA

Dr. James F. Palmer has had a distinguished professional career in landscape architecture spanning 35 years, focusing on the assessment of landscape character and aesthetic quality. Knowledge about identifying, assessing and manipulating the landscape's visual character holds a prominent place in the practice of landscape architecture. Jim is among a handful of research landscape architects whose expertise has led the way in informing our scientific understanding of visual impacts, community landscape values, and other landscape aesthetics issues. Through publications, peer reviews, court expert testimony, and teaching he has raised the standards in the field by investigating the validity and reliability of landscape architectural research and professional practices.

EDUCATION

University of California at Santa Cruz, Kresge College, BA 1968–72
Double major in politics and environmental studies.

University of Massachusetts at Amherst, MLA 1972–76
Fields of study: landscape planning, environment and behavior, computer applications.

University of Massachusetts at Amherst, PhD 1976–79
Fields of study: natural resource management, landscape perception, survey methods.

PROFESSIONAL LICENSE

Vermont Licensed Landscape Architect Number 125.0080666 2011–

CURRENT POSITIONS

Scenic Quality Consultants. Sole Proprietor. Provide expert review, testimony, and other professional services related to landscape visual assessment. 2007–

Senior Landscape Architect. T.J. Boyle Associates. Provide part-time visual impact assessment support and project management. 2008–

Professor Emeritus, SUNY, College of Environmental Science & Forestry. 2006–
Consulting Editor, *Landscape Journal* (Univ. of Wisconsin Press)
Editorial Board, *Landscape and Urban Planning* (Elsevier)

PAST PRIVATE PRACTICE POSITIONS

President. Burlington Cohousing LLC, Burlington, Vermont. Facilitate the creation of a 32 unit cohousing community that is affordable, accessible, and environmentally friendly. 2005–2007

Consultant. Provide professional services related to landscape assessment. 1979–2007

PAST ACCADEMIC POSITIONS

Professor 2004–2006
Associate Professor 1992–2004
Senior Research Associate 1985–1992
Research Associate 1981–1985
Assistant Professor 1980–1981

Faculty of Landscape Architecture and Faculty of Environmental Studies, State University of New York, College of Environmental Science and Forestry. Taught a diverse range of course, maintained an active research program, and directed undergraduate and graduate programs.

SELECTED PROJECT EXPERIENCE

Hancock Wind Project. Provided Maine's Department of Environmental Protection expert review, analysis, and testimony concerning the scenic impacts of this 18 turbine 54 MW wind energy project. (DEP Applications).

Bowers Wind Project. Provided Maine's Department of Environmental Protection expert review, analysis, and testimony concerning the scenic impacts of this 16 turbine 48 MW wind energy project. (DEP Applications L-25800-24-A-N/L-25800-TE-B-N).

Visualization Study for Offshore North Carolina. Project Manager for T.J. Boyle Associates. Prepare highly accurate and realistic visual representation of off-shore energy facilities from 18 coastal North Carolina locations for BOEM. The products included 234 simulations with a 39° angle of view, 21 panoramic simulations with a 124° angle of view, 48 animations and 7 videos. T.J. Boyle presented these visualizations at public meetings hosted by BOEM. (BSEE BPA Call Order MI2PBOOOI2).

Canton Mountain Wind Project. Provided Maine's Department of Environmental Protection expert review, analysis, and testimony concerning the scenic impacts of this 8 turbine 22 MW wind energy project. (DEP Applications L-25558-24-A-N/ L-25558-24-TB-B-N). **Oakfield Wind Project**. Provided Maine's Department of Environmental Protection expert review, analysis, and testimony concerning the scenic impacts of this 50 turbine 150 MW wind energy project. (DEP Applications L-24572-24-E-A/ L-24572-24-C-N).

Bowers Mountain Wind Project. Provided Maine's Land Use Regulation Commission expert review, analysis, testimony and cross examination concerning the scenic impacts of this 27 turbine 69.1 MW wind energy project (Development Permit DP4889).

Bull Hill Wind Project. Provided Maine's Land Use Regulation Commission expert review, analysis, and testimony concerning the scenic impacts of this 19 turbine 34.2 MW wind energy project (Development Permit DP4886).

Saddleback Ridge Wind Project. Provided Maine's Department of Environmental Protection expert review, analysis, and testimony concerning the scenic impacts of this 12 turbine 33 MW wind energy project. (DEP Applications L-25137-24-A-N/ L-25137-TG-B-N).

Highland Wind Project. Provided Maine's Land Use Regulation Commission expert review, analysis, and testimony concerning the scenic impacts of this 48 turbine 128.6 MW wind energy project (Development Permit DP4862).

Spruce Mountain Wind Project. Provided Maine's Department of Environmental Protection expert review, analysis, and testimony concerning the scenic impacts of this 10 or 11 turbine 18 to 20 MW wind energy project. (DEP Applications L-24838-24-A-N and L-24838-2G-B-N). This is DEP's first application under the new Wind Energy Act which establishes new criteria for scenic impacts.

Kibby Expansion Wind Project. Provided Maine's Land Use Regulation Commission expert review, analysis, and testimony concerning the scenic impacts of this 15 turbine 45 MW wind energy project (Development Permit DP4860). This is LURC's first application under the new Wind Energy Act which establishes new criteria for scenic impacts.

FairPoint Communications Broadband. Project Manager for T.J. Boyle Associates. Prepare visual analyses, technical reports and testimony for ten wireless broadband towers and related facilities to provide service to Vermont.

Evaluation of the Methodologies for Visual Impact Assessments (VIA). Member of a four person team evaluating the Federal Highway Administration's VIA procedure, including what VIA procedures are used by state DOTs and how effective those procedures are thought to be. The project is funded by a grant from the National Cooperative Highway Research Program.

Berlin Solar. Project Manager for TJ Boyle Associates. Prepare visual analyses, technical reports and testimony for Green Mountain Power's 200kV Solar Power Project in Berlin, Vermont (VT PSB Docket No. 7601).

New York Regional Interconnect. Provided expert review and testimony for an opposing community consortium concerning the potential aesthetic impacts from a proposed 200-mile 400 kV high voltage direct current transmission line in New York State (NYS PSC Case 06-T-0650). The developer withdrew the application in 2009, after Public Service Commission evidentiary hearings.

Long Island Offshore Wind Park. Provided expert review to Mangi Environmental Group for the Minerals Management Service in preparation of the DEIS for the Long Island Offshore Wind Park. The proposal was for 40 off shore wind turbines to generate 140 MW of electricity. I successfully advocated that the visual assessment include a public acceptance study. Long Island Power Authority is currently reviewing whether to continue with the project.

Concept Plan for Plum Creek's Lands in the Moosehead Lake Region. Provided Maine's Land Use Regulation Commission expert review, analysis, and testimony concerning the scenic and related recreation impacts of Plum Creek's proposed development concept plan for their lands in the Moosehead Lake region (Zoning Petition ZP 707). The plan affects 400,000 acres and proposes nearly 1,000 residential lots, plus 1,000 units divided between two resorts. Since there was no scenic assessment at the time I was retained, I developed a work plan to characterize the scenic issues, focusing on scenic impacts along the shoreline. Based in part on my review, a new proposal was submitted one year latter. My review in the second phase focused on the scenic impacts of hillside development. In both phases I made significant contribution to scoping and evaluating vegetation clearing demonstrations for their effectiveness in screening proposed development. LURC staff proposed a revised concept plan that has been approved; the Decision incorporates numerous references to our work.

Redington Wind Power Project. In 2006 I was retained Maine's Land Use Regulation Commission to provide an expert review, prepared testimony, and testified before the Commission concerning the scenic and related recreation impacts of a 90 MW 30 wind turbine project on Redington and Black Nubble Mountains in Redington Township (Zoning Petition ZP 702). A smaller project only on Black Nubble Mountain was approved.

Cape Wind Project. In 2003 I was retained by the Alliance to Protect Nantucket Sound to provided an expert review, and prepare commentary concerning the scenic and recreation impacts associated with the construction of Cape Wind, a proposal to locate 130 wind turbines in Nantucket Sound to generate up to 420 MW of electricity. The US Army Corps of Engineers initially oversaw the preparation of the DEIS. The visual impact assessment did not follow the Corps' recommended procedures, and was clearly inadequate. Congress moved permitting authority for off shore alternative energy projects to the Minerals Management Service, Department of the Interior. The permitting process was reinitiated and I reviewed the new DEIS. This project is still under review.

Brookhaven Energy 580-megawatt Natural Gas-fired Electric Generating Plant. In 2002 I provided an expert review, prepared testimony, and testified before the New York State Public Service Commission concerning the visual impacts associated with the construction of a 580-megawatt Natural Gas-fired Electric Generating Plant in Brookhaven, New York (Case 00-F-0566). I was under subcontract to Spectra Environmental Group who represented the Town of Brookhaven.

Bangor Hydro-Electric 345 kV Transmission Line. In 2002 International Paper retained me to provide an expert review, prepared testimony, and testified before the Maine Board of Environmental Protection concerning the scenic and recreation impacts associated with constructing an 84-mile 345 kV transmission line from Orrington to Baileyville, Maine

(Application # L-17131-29-E-N and L-17131-31-F-N). The line would be primarily located in a new corridor on land owned by International Paper and cross several streams and rivers that were important Atlantic salmon spawning areas. Among other things, I advocated consolidating the transmission line in the existing Stud Mill road service corridor. The permit was deniedTwo years later Bangor Hydro-Electric submitted a revised plan based on the consolidated corridor that was approved. I provided minor advice on this second application.

Visioning Workshops for Forestport, Inlet, and Old Forge. Designed and conducted three visioning focusing on special community characteristics and how to preserve them in the face of development pressures. These workshops were sponsored by Central Adirondack Partnership for the 21st Century.

The Northern Frontier Special Resource Study. Managed the Special Resource Study to identify nationally significant historical, cultural, and natural resources associated with the area of New York known as the Northern Frontier during the period between the French and Indian War and the War of 1812. Nearly two hundred resources were identified, described, and mapped. Four alternative strategies to manage these resources were evaluated. The final report was submitted to the US Congress by the National Park Service.

Community Landscape Perceptions: Dennis, Massachusetts. Initially served as a survey consultant for a town study in the mid-1970s to determine the scenic values citizens assigned to different areas of their community landscape. Since then, I have conducted two independent surveys at ten year intervals that demonstrate the efficacy of scenic assessment methods, and the stability of the findings. These studies have been conducted in cooperation with the town planning department.

Public Acceptance of the Wind Power Project in Searsburg, Vermont. Survey consultant to Vermont Environmental Research Associates and Green Mountain Power. Prepared a questionnaire to evaluate knowledge and opinions concerning electric power generation, particularly wind turbines. The questionnaire incorporated visual simulations developed by a consultant. The survey was sent to a randomly sampled panel of residents in the region near a proposed wind power project in central Vermont. The study began prior to construction, and will track changes in perception as the project matures. Designed research plan, conduct the analysis and prepared project reports.

Community Needs Survey. Served as the survey consultant to the City of Rome, NY to establish priorities for their Comprehensive Planning Program. Worked with planning staff to conduct interviews of opinion leaders in order to identify possible community needs for which the City could plan. Prepared a questionnaire and random sample of residents. Conducted the data analysis, prepared project report and presented the results at a public meeting.

Aesthetic Impacts of Timber Harvesting on Middleground Vistas. Directed this study co-sponsored by the White Mountain National Forest and the North Central Forest Research Experiment Station, U.S. Forest Service. Supervised preparation of realistic color simulation depicting alternative clear cutting intensities, patterns and sizes from tow viewpoints. Field validated simulations. Developed a survey instrument to evaluate visual preferences and knowledge of forest practices. Conducted surveys of regional opinion leaders and random samples

of northern New Hampshire residents and northeastern Forest Service employees. Conducted statistical analysis, project reports and peer reviewed articles.

Public Recreation Use of Two Vermont Hydroelectric Projects. Served as survey consultant to Stetson–Harza, Utica, NY. Conducted recreation use studies for two FERC hydropower development license applications. Developed a survey plan for acceptance by both power companies. Prepared the questionnaires and random samples of residents. Conducted the analysis, wrote the project reports and presented the results at a public meeting.

Socio–cultural Assessment of Wetland Values. Co-directed (with R. Smardon) a study of human use and values associated with wetlands for the City of Juneau, Alaska. All new construction had been prohibited under Federal regulation until a wetland management plan was approved. Conducted fieldwork to prepare an experiential, visual classification of wetlands. Conducted interviews with local opinion leaders and conducted two public workshops to identify a range of human use values and issues associated with wetlands. This material was used to develop a questionnaire. Developed a random sample of Juneau residents. Conducted a survey of Juneau residents and workshop attendees. Conducted data analysis, prepared project reports and peer reviewed articles.

Allegany State Park Management Survey. Directed a study to identify public acceptance of management alternatives in Allegany State Park for the New York State Office of Parks, Recreation and Historic Preservation. The OPRH&P's proposed management plan was challenged for not identifying the public objectives for the park. Used a Delphi approach to identify management issues and alternatives through the mail. The results were used to prepare a questionnaire to evaluate management objectives. Conducted a survey of the park's advisory board, a random sample of park campers and a stratified random sample of residents within approximately 50 miles of the park. Completed the data analysis and prepared project reports.

SELECTED PUBLICATIONS

Palmer, J.F. 2008. The perceived scenic effects of clearcutting in the White Mountains of New Hampshire, USA. **Journal of Environmental Management** 89(3):167-183.

Palmer, J.F. 2004. Using spatial metrics to predict scenic perception in a changing landscape: Dennis, Massachusetts. **Landscape and Urban Planning**, 69(2-3):201-218.

Palmer, J.F., 2004. A multi-national study of the perception of visual impacts. **Landscape Review** 9(1):184-187.

Palmer, J.F., (project coordinator), et al. 2002. **The Northern Frontier Special Resource Study**. Boston, MA: Boston Support Office, National Park Service. 122 p.

Palmer, J.F. and R.E. Hoffman. 2001. Rating reliability and representation validity in scenic landscape assessments. **Landscape and Urban Planning**, 54(1-4): 149-161.

Palmer, J.F. 2000. Reliability of rating visible landscape qualities. **Landscape Journal** 19(1/2):166-178.

Twery, M.J., H.M. Rauscher, D.J. Bennett, S.A. Thomasma, S.L. Stout, J.F. Palmer, R.E. Hoffman, D.S. DeCalestra, E. Gustafson, H. Cleveland, J.M. Grove, D. Nute, G. Kim and R.P. Kollasch. 2000. NED-1: Integrated analysis for forest stewardship decisions. **Computers and Electronics in Agriculture** 27(1):167-193.

Palmer, J.F. 1999. Recreation participation and scenic value assessments of clearcuts. In Proceedings of the 1998 Northeastern Recreation Research Symposium, edited by H.G. Vogelsong. Gen. Tech. Rep. NE-255. Radnor, PA: USDA, Forest Service, Northeastern Forest Research Station. pp. 199-203.

Palmer, J.F. 1999. Mapping special places: Tool I-2. Taking a photographic sample of your community: Tool II-2. Using photographs to evaluate local visual resources: Tool II-3. Using slides to evaluate local visual resources: Tool II-4. Imaging the future: Tool III-5. In **O, Say Can You See: A Visual Awareness Tool Kit for Communities.** Washington, DC: Scenic America. 30 p.

Palmer, J., and J. Roos-Klein Lankhorst. 1998. Evaluating visible spatial diversity in the landscape. **Landscape and Urban Planning** 43(1-3): 65-78.

Palmer, J.F. 1997. Stability of landscape perceptions in the face of landscape change. **Landscape and Urban Planning** 37(1/2): 109-113.

Palmer, J.F., S. Shannon, M.A. Harrilchak, P. Gobster, and T. Kokx. 1995. Esthetics of clearcutting alternatives in the White Mountain National Forest. **Journal of Forestry** 93(5): 37–42.

Palmer, J.F. 1991. Representing error in GIS modeling. *In* K. Beard & B. Buttenfield (co-leaders) NCGIA Initiative Seven Position Papers: Visualization of the Quality of Spatial Data. Orono, Maine: NCGIA. 6 p.

Palmer, J.F., S. Alonso, K. Dong–hee, J. Gury, Y. Hernandez, R. Ohno, G. Oneto, A. Pogacnik, and R. Smardon. 1990. A multi–national study assessing perceived visual impacts. **Impact Assessment Bulletin** 8(4): 31–48.

Palmer, J.F. 1990. Aesthetics and quality of life. Appendix V. In Ecosystems and their Human Values (48th Meeting of the Chief of Engineers' Environmental Advisory Board, U.S. Army Engineer Waterways Experiment Station, Vicksburg, MS) pp. V1-V15.

Palmer, J.F. and R.C. Smardon. 1989. Measuring human values associate with wetlands. *In* L. Kriesberg, T. Northrup and S. Thorson (eds.) **Intractable Conflicts and Their Transformation**. Syracuse, NY: Syracuse University Press. pp. 156–179.

Smardon, R.C., J.F. Palmer, A. Knopf, K. Grinde, J.E. Henderson and L.D. Peyman–Dove. 1988. Visual Resources Assessment Procedure for US Army Corps of Engineers. Instruction Report EL–88–1. Vicksburg, Mississippi: US Army Engineer Waterways Experiment Station. 71 pp. plus appendices.

Palmer, J.F., T.R. Day, R.C. Smardon, A. Redway, and L. Reichardt. 1988. Simulating and evaluating management practices. In **Visual Preferences of Travelers along the Blue Ridge Parkway**, Science Publication Series No. 18, edited by F.P. Noe and W.E. Hammitt. Washington, DC: National Park Service. pp. 142–157.

Smardon, R.C., J.F. Palmer and J.P. Felleman (eds.). 1986. **Foundations for Visual Project Analysis**. New York: John Wiley & Sons. 374 pp. (Translated in 1998 into Chinese by Cribb, Wang and Chen. T'aipei, Taiwan: Garden City Publishing, Ltd.)

Palmer, J.F. 1983. Visual quality and visual impact assessment. In **Social Impact Assessment Methods**, edited by K. Finsterbusch, L. Llewllyn and C.P. Wolf. Thousand Oaks, CA: Sage Publications. pp. 263–284.

Zube, E.H., J.H. Crystal and J.F. Palmer. 1976. **Visitor Center Design Evaluation**. NPS Rep. No. 1024. Denver, CO: National Park Service. 70 pp.

PROFESSIONAL MEMBERSHIPS

American Association for the Advancement of Science, American Society of Landscape Architects (Fellow), Council of Educators in Landscape Architecture (Fellow), Environmental Design and Research Association, International Association for Landscape Ecology, Landscape Research Group (UK), Vermont Planning Association, Vermont Green Building Network

HONORS AND AWARDS

Merit Award, ASLA Professional Awards Program	2008
President's Award, Council of Educators in Landscape Architecture	2006
Elected Fellow, Council of Educators in Landscape Architecture	2006
Elected Fellow, American Society of Landscape Architects	2003
SUNY Chancellor's Award for Exemplary Contributions to Research	2002
Merit Award, ASLA Professional Awards Program	2000
Certificate of Appreciation, U.S. Department of Agriculture, for contributions to the NED-1 expert system.	1999
Merit Award, ASLA Professional Awards Program	1998
Visiting Fellow, Staring Centrum, Wageningen, The Netherlands.	1995
Outstanding Planning Project for Community Research in Comprehensive Planning American Planning Association, New York Upstate Chapter	1993
First Award, Environmental Design Research Association	1979
Citation, Progressive Architecture Awards Program	1977

Maine's Experience Evaluating When Scenic Impacts From Wind Energy Development Are Unreasonably Adverse

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Maine's Experience Evaluating When Scenic Impacts From Wind Energy Development Are Unreasonably Adverse

1. Introduction

On April 18, 2008, Governor John Baldacci signed *An Act to Implement Recommendations of the Governor's Task Force on Wind Power Development* (the Act). It establishes a favorable State policy encouraging grid-scale wind energy development in appropriate locations. In particular, it designates a large portion of the state for expedited grid-scale wind energy development. While most environmental impacts within the expedited area are evaluated in the same manner as previously, special provisions are made for scenic impacts.

Since passage of the Act, four visual impact studies for grid-scale wind energy projects have conducted surveys of users at a viewpoint within a scenic resource of state or national significance (SRSNS) where the proposed project's wind turbines are expected to have clear visibility. At a minimum, respondents were asked to rate the existing view, a photograph of the existing view and a photosimulation of the view with the project turbines using a rating scale of lowest to highest scenic value. Additional questions asked about how the proposed project would affect their recreation enjoyment at the viewpoint, and whether they would return to the area to recreate if the project is built. One survey included a photograph and photosimulation from a second viewpoint. An additional web-based survey for one project also included two impacted viewpoints as well as two additional photographs, but of course could not include ratings of the view in the field.

This paper presents the results of an independent analysis of the data from these user surveys conducted for grid-scale wind energy projects being permitted under the Act's Evaluation Criteria.

1.1 Evidence-based Decision Making

We are all familiar with using scientific approaches to develop evidence to be used in making important decisions that will have a significant impact on the public's welfare. For instance, the Food and Drug Administration evaluates the efficacy of new medical procedures and drugs, the Environmental Protection Agency sets national standards for environmental pollutants to assure public health, and the Underwriters Laboratories test the safety of consumer products. There is growing support for using evidence-based approaches to make major planning and design decisions that have the potential to significantly affect public welfare. The foundation of these approaches is that their reliability and validity[1] has been demonstrated and is regularly evaluated.

Anyone who has attended the technical hearing for a large proposed development, such as a grid-scale wind energy project, can observe that each party has hired an expert to attest to the rightness of their client's position concerning the potential scenic impacts from the development.

Normal practice is for these experts to conduct fieldwork and desk analyses using GIS and photosimulation technologies. There are several recognized approaches that experts could employ to evaluate the project's potential scenic impacts, including procedures developed by the Army Corps of Engineers (Smardon et al. 1988), the US Department of Agriculture's Forest Service (USDA 1974, 1995), the US Department of Interior's Bureau of Land Management (USDI 1984, 1986a and 1986b), and the US Department of Transportation's Federal Highway Administration (US DOT 1990). While these official procedures assert that they are reliable and valid (e.g., US DOT 1990, p. 47 and 53; USDA 1974, p. 2; 1995, p. 6 and 20), no supporting evidence is cited. What little research exists has found that the reliability and validity of these procedures as normally conducted do not meet the standards that one would expect to be employed for important decisions that affect the public landscape (Nassauer et al. 2010; Palmer 2000; Palmer and Hoffman 2001).

In contrast, there is an extensive literature demonstrating the reliability and validity of having the public rate photographs and photosimulations as a means to determine landscape scenic value or scenic impact (Nassauer et al. 2010; Palmer and Hoffman 2001; Stamps 2000). The value of having the public evaluate the potential scenic impacts of a proposed project is recognized by the federal agency procedures as particularly appropriate for large projects, such as grid-scale wind energy development (USDA 1995, ch. 3; US DOT 1990, pp. 12, 38-39; Smardon et al. 1988, 27-36).

1.2 Evaluation Criteria for Scenic Impacts

The Act acknowledges that "generating facilities are a highly visible feature in the landscape [and this] is not a solely sufficient basis for determination that an expedited wind energy project has an Unreasonable Adverse effect on the scenic character and existing uses related to scenic character."[2] It further specifies that "determination that a wind energy development fits harmoniously into the existing natural environment… is not required"[3] —harmonious fit being the traditional standard for judging scenic impacts in Maine.[4] The new standard is whether "the development has an Unreasonable Adverse effect on the scenic character or existing uses related to scenic character of the" SRSNS.[5] There are six Evaluation Criteria for evaluating whether the scenic impacts are Not Adverse, Adverse, or Unreasonably Adverse.[6] The full text describing the Evaluation Criteria is:

> **§ 3452. Determination of effect on scenic character and related existing uses**
>
> **3. Evaluation criteria.** In making its determination pursuant to subsection 1, and in determining whether an applicant for an expedited wind energy development must provide a visual impact assessment in accordance with subsection 4, the primary siting authority shall consider:
>
> A. The **significance** of the potentially affected scenic resource of state or national significance;
>
> B. The existing **character** of the surrounding area;
>
> C. The **expectations** of the typical viewer;

D. The expedited wind energy **development's purpose** and the **context** of the proposed activity;

E. The **extent, nature and duration** of potentially affected public uses of the scenic resource of state or national significance and the potential effect of the generating facilities' presence on the public's **continued use and enjoyment** of the scenic resource of state or national significance; and

F. The **scope and scale** of the potential effect of views of the generating facilities on the scenic resource of state or national significance, including but not limited to issues related to the number and extent of turbines visible from the scenic resource of state or national significance, the distance from the scenic resource of state or national significance and the effect of prominent features of the development on the landscape. [emphasis added]

A finding by the primary siting authority that the development's generating facilities are a highly visible feature in the landscape is not a solely sufficient basis for determination that an expedited wind energy project has an Unreasonable Adverse effect on the scenic character and existing uses related to scenic character of a scenic resource of state or national significance. In making its determination under subsection 1, the primary siting authority shall consider insignificant the effects of portions of the development's generating facilities located more than 8 miles, measured horizontally, from a scenic resource of state or national significance.

One of the innovations of the Act is to base a significant number of the Evaluation Criteria on typical viewers and users of the SRSNSs within 8 miles of the generating facilities; namely Criteria C and E. These Criteria require that the following information must be considered:

1. Typical viewer expectations at SRSNS.
2. The number of users at SRSNSs (i.e., extent).
3. The types of activities in which these users engage (i.e., nature).
4. The length of time users of specific activities will be exposed to views of the generation facilities (i.e., duration).
5. The effect of these views on enjoyment of these activities.
6. The effect of these views on continued use of the SRSNSs.

Criterion F also could benefit from information about how typical viewers perceive the landscape's scenic value with and without the proposed generating facilities. If we knew how users engaged in specific activities perceived the scenic value of views from of SRSNSs with and without the generating facilities, then we could better consider:

1. The effect of the number, extent (i.e., the horizontal angle the turbines occupy in a view) and distance of generating facilities on scenic value of views from SRSNSs.

This paper summarizes what has been learned to date from the user surveys conducted for grid-scale wind energy projects being permitted under the Act with these information needs in mind. The focus is on investigating the validity and reliability of these surveys, and how their results can be used to determine when a project will have an Unreasonable Adverse scenic impact.

2. User Surveys of the Visual Impact of Proposed Wind Energy Projects

A total of seven viewpoints have been evaluated in the user surveys, as identified in Table 1. Market Decision of Portland, Maine conducted the surveys for the Bull Hill, Saddleback Ridge and Spruce Mountain Wind Projects; Portland Research Group of Portland, Maine conducted the survey for the Highland Wind Project. The Bull Hill user survey evaluated two viewpoints, and a web-based survey of Highland also included two viewpoints of the project as well as two views away from the project area.

Table 2 describes the nameplate capacity of each project, the model of wind turbine evaluated, the number of turbines, and their height to the center of the turbine hub and to the tip of an upright blade.

Table 1. Maine Wind Energy Projects with Visual Impact Assessment User Surveys

Case: Project	Agency	Survey: Location	Simulation and Viewpoint
1. Bull Hill	LURC	Hikers: Black Mountain	Black Mountain (VP-3)
2. Bull Hill	LURC	Hikers: Donnell Pd parking lot	Donnell Pond--southern viewpoint (VP-4)
3. Highland	LURC	Hikers: Little Bigelow	Little Bigelow (AT VP-9D)
4. Highland	LURC	Web: Western Maine Hikers	Stewart Mtn. (AT VP-9D)
5. Highland	LURC	Web: Western Maine Hikers	Little Bigelow (AT VP-4)
6. Saddleback Ridge	DEP	Hikers: Mount Blue	Mount Blue (VP-1)
7. Spruce Mountain	DEP	Hikers: Bald Mountain	Bald Mountain (VP-3)

Table 2. Description of Maine Wind Projects' Turbines

Case: Project	Nameplate capacity (MW)	Turbine model	# Turbines in project	Height to hub (m)	Height to tip (m)
1. Bull Hill (Black Mtn)	34.2	Vestas V100	19	95	145
2. Bull Hill (Donnell Pd)	34.2	Vestas V100	19	95	145
3. Highland (Hikers@9D)	97.5	GE 2.5xl	39	85	135
4. Highland (Web@9D)	97.5	GE 2.5xl	39	85	135
5. Highland (Web@4)	97.5	GE 2.5xl	39	85	135
6. Saddleback Ridge	33.0	GE 2.75-100	12	85	135
7. Spruce Mountain	20.0	Gamesa G90	11	78	123

3. Representing Views of the Project for the User Surveys

All the images used in these surveys are based on photographs captured with high resolution digital cameras. Each photo was taken using a "normal" lens focal length, though some of the images used in the survey were panoramas created by stitching together two or more normal photos. Table 4 summarizes the information about the images used in the surveys

Several indicators that may be useful to understand the degree of scenic impact are listed in Table 5, including the number of turbines visible in the photosimulation, the horizontal angle from the viewpoint to the right and left-most visible turbines, the kilometers to the nearest and furthest turbine shown in the simulation, and the position of the viewer in relation to the turbines.

Table 3. Description of Visual Simulation Photography

Case: Project	Type	Print Size (mm)	Horizontal angle (°)	Camera	Lens	35mm lens equivalent
1. Bull Hill (Black Mtn)	panorama	496 x 251	63.5	Nikon D300	35mm	53.4mm
2. Bull Hill (Donnell Pd)	panorama	496 x 251	63.5	Nikon D300	35mm	53.4mm
3. Highland (Hikers@9D)	panorama	378 x 155	57.0	Nikon D300	35mm	53.4mm
4. Highland (Web@9D)	panorama	378 x 155	57.0	Nikon D300	35mm	53.4mm
5. Highland (Web@4)	normal	343 x 228	37.3	Nikon D300	35mm	53.4mm
6. Saddleback Ridge	normal	349 x 235	37.3	Nikon D70	35mm	53.4mm
7. Spruce Mountain	normal	350 x 236	41.7	Nikon D70	38mm	58.0mm

Table 4. Description of Visual Simulations from the User Surveys

Case: Project	Turbines visible (#)	Horizontal angle of turbines (°)	Closest (km)	Furthest (km)	Viewer position
1. Bull Hill (Black Mtn)	19	11	12.658	16.829	superior
2. Bull Hill (Donnell Pond)	11	5	12.520	16.877	normal
3. Highland (Hikers@9D)	25	8	8.124	12.754	superior
4. Highland (Web@9D)	25	8	8.124	12.754	superior
5. Highland (Web@4)	6	2	12.735	14.694	superior
6. Saddleback Ridge	11	4	11.868	14.389	superior
7. Spruce Mountain	11	20	2.884	4.908	inferior

4. Perception of Scenic Value and Scenic Impact

Most of the data analyzed here were collected by intercepting people engaged in recreation pursuits at or near the viewpoint being evaluated. The major exception is the web-based survey for Highland, which used a random sample of people from a marketing firm's panel of outdoor recreation participants in northern New England. Survey respondents were shown photographic representations of the existing condition and a photosimulation of the visual condition if the proposed project were built. They were instructed to view these representations from a specific distance, so that they would appear in proper perspective. Scenic evaluations were made using a standard 10-point rating scale in the Highland survey, while 7-point scales were used for the other surveys. In all cases, a rating of 1 is given to the lowest scenic value. A measure of scenic impact is obtained by subtracting the scenic value of the view without the project from the scenic value of the view with the project (i.e., Impact = Post-construction – Pre-construction).

The results of these ratings are summarized in Table 5. The meaning of the ratings and the raw impact values are difficult to compare since two different rating scales are used. In addition, the impact value provides no intuitive sense of when the impact is Unreasonably Adverse. The *t*-test shows that the perceived scenic impact due to constructing the proposed project is statistically significant, even for the web-based respondents. However, statistical significance does not necessarily mean that the impact is serious enough to be considered Unreasonably Adverse.[7]

These short comings are common to most scenic impact assessments. However, they can be overcome using the procedures described in the remainder of this section. First the reliability of the data that were collected is considered. Then two possible ways of describing change in scenic value are described: percent change has more intuitive appeal, while effect size has become the preferred way to report findings about change in the scientific literature.

Table 5. Scenic Value and Visual Impact Measured from the User Surveys

Case: Project	Pre- $\bar{x}$	Pre- *s*	Post- $\bar{x}$	Post- *s*	n People	*t*	*p*	Impact (raw)
1. Bull Hill (Black Mtn)	6.241	0.860	4.335	0.860	79	9.319	≤0.0001	-1.905
2. Bull Hill (Donnell Pd)	5.500		4.617		81	5.464	≤0.0001	-0.883
3. Highland (Hikers@9D)	7.514	1.480	5.405	1.480	37	5.742	≤0.0001	-2.108
4. Highland (Web@9D)	7.971		7.606		104	3.361	0.0009	-0.365
5. Highland (Web@4)	7.490		7.308		104	2.444	0.0151	-0.183
6. Saddleback Ridge	5.455	1.364	4.227	1.364	22	3.681	0.0014	-1.227
7. Spruce Mountain	4.533	1.024	3.633	1.024	15	3.473	0.0037	-0.900

Notes: Highland used a 10-point rating scale; the other three surveys used a 7-point rating scale. $\bar{x}$ is mean scenic value, and *s* is the standard deviation. Impact = Post-construction — Pre-construction.

4.1 Reliability

The first thing to consider is whether the respondents' scenic ratings are reliable—that is if another survey is conducted in a similar manner, how confident should we be that the results would be the same. Reliability can range between 0 and 1. Nunnally (1978) states that reliability coefficients of 0.70 or 0.80 are normally acceptable for research purposes, but that reliability should be 0.90 or higher in situations where the measurements are the basis of important decisions.

Table 6 reports the reliability for individual respondents, as well as for the group of respondents using intraclass correlation coefficients (Palmer and Hoffman 2001). The individual reliabilities are quite low—they average 0.30 for the intercept surveys and 0.01 for the web survey. However, reliability can be improved by averaging the responses for a group of respondents; normally the more respondents, the higher the reliability. The group reliability for the intercept surveys is quite high (0.91), though the average for the web surveys is still rather low (0.44). In general, the ratings with and without the proposed project from each viewpoint are very reliable for the intercept surveys, though it may be necessary to survey more than 35 respondents to reach reliabilities of 0.90 or higher.

The reliability of the web survey is very low, even though they included 104 respondents who indicated that they recreated in western Maine. In other contexts, web surveys have been shown by others to be an effective tool for public use to evaluate scenic impacts (Roth 2006, Wherrett 1999). However, web surveys do not provide an opportunity to experience the context within which the scenic change is viewed (i.e., realism validity). Nor can a web survey provide data useful to estimate the nature, extent and duration of use at a scenic resource, as does a survey that intercepts users at potential viewpoints.

Table 6. Scenic Value on 10-point Scale, Scenic Impact and Reliability

Case: Project	Pre– $\bar{x}$	Pre– *s*	Post– $\bar{x}$	Post– *s*	Individual Reliability	Group Reliability
1. Bull Hill (Black Mtn)	8.861	1.298	6.003	2.589	0.489	0.987
2. Bull Hill (Donnell Pd)	7.750	1.564	6.426	2.102	0.198	0.952
3. Highland (Hikers@9D)	7.514	1.426	5.405	2.204	0.385	0.959
4. Highland (Web@9D)	7.971	1.628	7.606	1.867	0.017	0.643
5. Highland (Web@4)	7.490	1.790	7.308	1.981	0.003	0.243
6. Saddleback Ridge	7.682	2.095	5.841	3.033	0.188	0.836
7. Spruce Mountain	6.300	1.590	4.950	1.565	0.251	0.834

Notes: Scenic value is transformed to a 10-point rating scale. $\bar{x}$ is mean scenic value, and *s* is the standard deviation. Impact = Post-construction — Pre-construction.

4.2 Linear Transformation

The 7-point rating scale responses can be mathematically transformed to their equivalent values on a 10-point scale, as shown in Table 7. This makes it possible to compare the impact value among all of the viewpoints. However, it does not address the problem of knowing when an impact is Unreasonably Adverse.

4.3 Percent Change

One way to understand the seriousness of a possible scenic impact is to consider the percent change from the existing condition that will occur if the project is constructed. This measure has intuitive appeal since we are accustomed to thinking about change in terms of percent. Another advantage is that it is comparable across all the viewpoints because percent change is not affected by the rating scale used, though the same scenic impact value will have a higher percentage change if the existing scenic value is low than if it is high.

The average change from Table 7 in scenic value identified by respondents for the five viewpoints evaluated in the intercept surveys is -28.3 percent; for the two viewpoints used in the web-based survey respondents it was only -4.0 percent. This result suggests that respondents actually engaging in recreation activities at potentially affected SRSNSs appear to be more sensitive to scenic impacts than people responding to an online survey in an unrelated environmental setting. This difference appears to be rather large, suggesting that intercept surveys should be the primary source of information about how users of SRSNSs may be affected by a proposed project.

4.4 Effect Size

The current best practice in scientific analysis and reporting is to use effect size as a way to report the strength of the relationship between the means of two variables measured on the same scale (e.g., APA 2010, p. 33).

The statistic used in this paper is Hedges' (1985) *g*, which estimates the effect size based on the difference between means.[8] Effect size is also comparable across all viewpoints because it is not affected by the rating scale. The average effect size from Table 7 for the intercept surveys is -1.21; for the web survey it is -0.27. Again the result suggests that respondents at the viewpoint are much more sensitive to the potential scenic impact than are the respondents to the web survey.

Stamps (1997, 2000) describes how to conduct a study investigating scenic impacts, and how a local Development Review Board might use the effect size results to determine whether or not these impacts are acceptable. After investigating thousands of paired landscape scenes, Stamps (2000, page 162) has adopted the effect size thresholds suggested by Cohen (1988, pages 24-27): when $d = 0.2$ it is too small to be noticed, $d = 0.5$ is a medium effect size that is "large enough to be visible to the naked eye," and $d = 0.8$ is large enough to be "grossly perceptible."[9] However,

Cohen warns that "the terms 'small,' 'medium,' and 'large' are relative, not only to each other, but to the area of behavioral science or even more particularly to the specific content and research method being employed in any given investigation" (Cohen 1988, page 25). Fortunately we have measures for two of the Act's criteria that can be used to appraise these thresholds for how the scenic impact might affect the enjoyment of using a SRSNS or the continued use of SRSNSs.

Table 7. Three Measures of Scenic Impact

Case: Project	Pre– $\bar{x}$	Post– $\bar{x}$	Pooled *s*	Impact (10-pt.)	% Change	Effect size
1. Bull Hill (Black Mtn)	8.861	6.003	2.048	-2.859	-36.4	-1.395
2. Bull Hill (Donnell Pd)	7.750	6.426	1.853	-1.325	-19.6	-0.715
3. Highland (Hikers@9D)	7.514	5.405	1.857	-2.108	-32.4	-1.136
4. Highland (Web@9D)	7.971	7.605	1.751	-0.365	-5.3	-0.209
5. Highland (Web@4)	7.490	7.308	1.888	-0.183	-2.8	-0.097
6. Saddleback Ridge	7.682	5.841	2.606	-1.842	-27.6	-0.706
7. Spruce Mountain	6.300	4.950	1.577	-1.350	-25.5	-0.856

Notes: Scenic value is transformed to a 10-point rating scale. $\bar{x}$ is mean scenic value. Pooled *s* is the pooled standard deviation. Impact = Post-construction — Pre-construction. % Change = (Post-Pre)/Pre. Effect Size is Hedges *g*.

5. Effect on Enjoyment

The Act requires that permitting agencies consider "the potential effect of the generating facilities on the public's… enjoyment of the scenic resource of state or national significance."[10] On a 10-point scale, a mean response of 5.5 indicates that the presence of the turbines would have no effect on the enjoyment of the scenic resource. The mean values for the four viewpoints where this question was asked are reported in Table 8. The mean value for all four studies is 5.055, indicating that on average the presence of the wind turbines would have a slight negative effect. This effect is more negative (and statistically significant) for the respondents to the Bull Hill and Highland surveys than it is for those to the Saddleback Ridge and Spruce Mountain surveys.

Table 8 also reports the correlation (Pearson's *r*) between scenic impact and anticipated effect on enjoyment. The relationship is very weak at Spruce Mountain, but at the other three sites it averaged a respectable 0.609.

Using these data, it is possible to demonstrate how one might establish a scenic impact threshold based on when the effect on enjoyment is unacceptable. However, four data points is admittedly quite limited for this task, particularly when none of the viewpoints has been clearly evaluated as an Unreasonable Adverse scenic impact. Nonetheless, it is still instructive to demonstrate the procedure and consider the results.

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Table 8. Effect of the Wind Project on Enjoyment and Correlation with Scenic Impact

Case: Project	Effect on enjoyment $\bar{x}$	Effect on enjoyment *s*	*n*	*t*	*p*	*r*
1. Bull Hill (Black Mtn)	4.638	1.876	80	-4.112	≤0.0001	0.642
2. Bull Hill (Donnell Pd)						
3. Highland (Hikers@9D)	4.757	1.877	37	-2.409	0.0212	0.557
4. Highland (Web@9D)						
5. Highland (Web@4)						
6. Saddleback Ridge	5.432	2.095	22	-0.153	0.8801	0.627
7. Spruce Mountain	5.393	1.496	14	-0.268	0.7929	0.161

Notes: Effect on enjoyment is transformed to a 10-point rating scale. $\bar{x}$ is mean scenic value, and *s* is the standard deviation.

5.1 Regression Analysis

The statistical procedure used is linear regression analysis. Figure 1 shows a scatter plot where the x-axis is effect on enjoyment and the y-axis is, percent change or effect size. Regression analysis determines the line that best fits the data points in these plots. There is an equation that describes this line in the form of:

$$Y = (b*X) + a$$

"Y" is the dependent variable and the equation will be used to determine unknown values for it. The dependent values are percent change or effect size. "X" is the independent variable that is used to determine the unknown value of Y for a known value of X. The independent variable is effect on enjoyment (and in the next section continued use). "b" is the beta coefficient or slope, and it describes the amount of change in Y for one unit of change in X. "a" is the constant or y-intercept, and it is the value where the line intersects the y-axis when the value of x is zero.

The two regression equations that describe the lines plotted in Figure 1 are:

Percent Change = (11.2 * Effect on Enjoyment) – 87.1

Effect Size = (0.7 * Effect on Enjoyment) – 4.6

There is a strong relationship between effect on enjoyment and both percent change (adjusted R^2 = 0.858) and effect size (adjusted R^2 = 0.875). Though there are only six data points, such a high relationship strongly suggests that there is a valid connection between scenic impact, as measured by percent change or effect size, and the effect on enjoyment of a SRSNS.

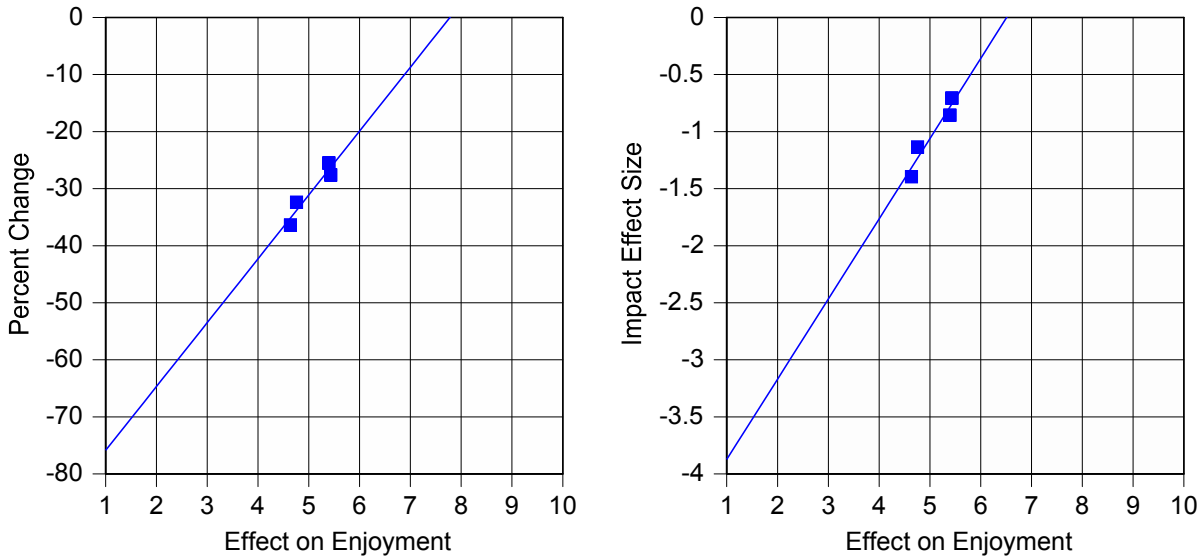

Figure 1. The relationship between effect on enjoyment and two measures of scenic impact.

These equations can be used to determine the values of percent change and the effect size for specific values of effect on enjoyment, as shown in Table 9. The Act does not provide guidance for when a negative effect on enjoyment is unacceptable. Must the mean rating be 1.5, or could it be 2.0 or 3.0? However, if 3.0 is established by the permitting agency as the appropriate threshold on a 10-point scale, then the threshold for an Unreasonably Adverse scenic impact would be a -53.5 percent change in scenic value or a size effect of -2.5.

Table 9. Values of Percent Change and Effect Size for Thresholds of Effect on Enjoyment.

Enjoyment	Extremely Negative (1.5)	Very Negative (2.0)	Negative (3.0)	No Effect (5.5)	Positive (8.0)
Percent change	-70.3	-64.7	-53.5	-25.5	2.5
Effect size	-3.5	-3.2	-2.5	-0.7	1.0

6. Continued Use

The Act requires that permitting agencies consider "the potential effect of the generating facilities on the public's continued use… of the scenic resource of state or national significance."[11] On a 10-point scale, a mean response of 5.5 indicates that the presence of the turbines would have no effect on the likelihood that a respondent would continue to use the scenic resource. The mean values for the six viewpoints[12] where this question was asked are reported in Table 10. The mean value for the intercept surveys is 5.504, indicating that the presence of the wind turbines would have essentially no effect on respondents' continued use. However, this effect is substantially greater (and statistically significant) for the respondents to the Highland web survey, who indicate that they would be more likely to return if the project were built ($\bar{x}$ = 7.1). Table 10 also reports

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the correlation between scenic impact and anticipated continued use. The average relationship is a moderate 0.544 for the intercept surveys, and 0.413 for the web survey.

Table 10. Effect of the Wind Project on Continued Use and Correlation with Scenic Impact

Case: Project	Continued Use $\bar{x}$	Continued Use *s*	*n*	*t*	*p*	*r*
1. Bull Hill (Black Mtn)	5.350	1.502	80	-0.893	0.3744	0.581
2. Bull Hill (Donnell Pd)	5.386	1.476	79	-0.686	0.4948	0.331
3. Highland (Hikers@9D)	5.162	1.788	37	-1.15	0.2579	0.332
4. Highland (Web@9D)	7.125	2.112	104	35.520	≤0.0001	0.529
5. Highland (Web@4)	7.029	1.732	104	9.003	≤0.0001	0.297
6. Saddleback Ridge	5.909	1.502	22	0.7808	0.4436	0.583
7. Spruce Mountain	5.386	1.476	14	0.520	0.6115	0.702

Notes: Continued use is transformed to a 10-point rating scale. $\bar{x}$ is mean scenic value, and *s* is the standard deviation.

6.1 Regression Analysis

Regression analysis is used again to identify the thresholds where the percent change and effect size of the scenic impact become Unreasonably Adverse as indicated by users' ratings of whether they would continue to use the SRSNS. The scatter plots and regression lines are shown in Figure 2. There are now 7 points and they are more dispersed along the line. However, this analysis must still be treated more as a demonstration of the approach rather than a definitive establishment of thresholds.

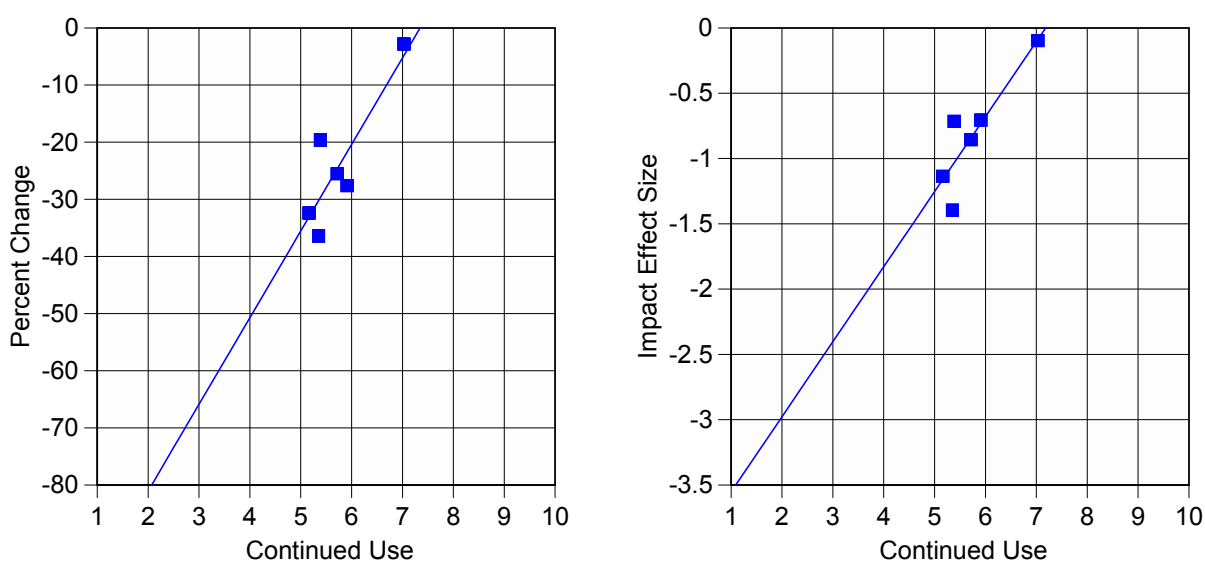

Figure 2. The relationship between continued use and two measures of scenic impact.

The two regression equations that describe the lines plotted in Figure 2.

Percent Change = (14.58 * Continued Use) –108.15

Effect Size = (0.52 * Continued Use) – 3.84

There is a strong relationship between continued use and both percent change (adjusted R^2 = 0.785) and effect size (adjusted R^2 = 0.782). Though there are only six data points, such a high relationship strongly suggests that there is a valid connection between scenic impact, as measured by percent change or effect size, and the continued use of a SRSNS.

These equations can be used to determine the value of percent change and the effect size for specific values of continued use, as shown in Table 11. If 3.0 is established as the appropriate threshold on a 10-point scale where the Act considers the negative effect on the likelihood of returning to be Unreasonably Adverse, then the threshold for an Unreasonably Adverse scenic impact would be a -64.4 percent change in scenic value or a size effect of -2.3.

Table 11. Values of Percent Change and Effect Size for Thresholds of Continued Use.

Continued Use	Extremely Negative (1.5)	Very Negative (2.0)	Negative (3.0)	No Effect (5.5)	Positive (8.0)
Percent change	-86.3	-79.0	-64.4	-28.0	8.5
Effect size	-3.1	-2.8	-2.3	-1.0	0.3

7. Discussion

These results present an opportunity to discuss when the scenic impacts from grid-scale wind energy projects create an Unreasonable Adverse scenic impact. The threshold where the scenic impact becomes Unreasonably Adverse appears to be approximately a 60.0 percent decrease in scenic quality or a -2.5 effect size.[13]

These values are admittedly higher than one might expect as the beginning point for such a discussion. For instance, Stamps (2000) suggests that an effect size threshold of 1.1 be used to identify very large scenic impacts, and the effect size recommended by this study is much larger than that. However, they are based on the judgments of people actually using the affected SRSNSs, and the data appear to be both statistically reliable and valid.

On the other hand, it is acknowledged that there are relatively few data points and these thresholds will need to be recalculated as more surveys are conducted. In addition, it is necessary to include scenic evaluations where the impacts are clearly Unreasonably Adverse. The thresholds suggested here are based on data from viewpoints where users of SRSNS did not think the scenic impact was Unreasonably Adverse.[14]

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As more intercept studies targeted to the Act's scenic impact evaluation criteria are conducted, a conscious attempt needs to be made to investigate a wider range of users of SRSNSs. Criterion E requires that the "nature" of the use be considered—hikers may be more or less sensitive to scenic impacts than snowmobilers or people fishing.[15] Criterion E also requires that the "duration" of use, and therefore the length of time they are potentially exposed, be considered. To date, all the intercept surveys have evaluated the scenic change at specific viewpoints. It may be that the cumulative exposure to multiple views of wind energy development during a day's outing will result in Unreasonably Adverse threshold levels that are higher or lower than those identified here.

A word of caution about the use of intercept studies may be prudent at this point. While there can be little doubt about the validity of a well conducted intercept study, there is the potential to introduce bias into this method. It is important that the selection of respondents to intercept studies continue to represent the people typically found using SRSNS. To date the intercept studies have been conducted over a weekend, or perhaps a couple consecutive weekends. It is advisable to increase sampling throughout the season of use at specific SRSNSs. In addition, it is also important to be vigilant that interest groups not learn of the dates and places of the intercept surveys, since if they do it may result in a "call to action" that in effect results in stuffing the ballot box. If this situation occurs, the respondents would no longer represent the evaluations of "typical" SRSNS users and the results should be discounted.

8. Summary Conclusions

This paper has demonstrated how to identify when users of a SRSNS find a scenic impact to be Unreasonably Adverse, based on user ratings of (1) a photograph of the actual view, (2) a photosimulation of how the view will appear if the wind development is constructed, (3) how the wind development will affect enjoyment of their use of the SRSNS, and (4) whether the wind development will affect their continued use of the SRSNS. Specifically, these data can be used to:

1. Evaluate the reliability of the scenic value ratings.
2. Calculate the percent change of the potential scenic impact.
3. Calculate the effect size of the potential scenic impact.
4. Determine the threshold of Unreasonable Adverse scenic impact based on an assumed level where the project's effect on enjoyment of the SRSNS is unacceptable.
5. Determine the threshold of Unreasonable Adverse scenic impact based on an assumed level where the project's effect on the continued use of the SRSNS is unacceptable.
6. Integrate the results of surveys conducted for separate wind energy projects into a database which can be used to further evaluate appropriate thresholds for an Unreasonable Adverse scenic impact.

The data from four intercept surveys were reanalyzed, and their results were found to be both valid and reliable. A web-based survey was also reviewed and the reliability of the responses was lower than for the intercept surveys. However, the web survey does provide an opportunity for a more diverse public to contribute to the scenic impact assessment process. It is recommended that the effectiveness of using web-based surveys be further evaluated.

This paper is intended to initiate a discussion on how to identify the threshold between Adverse and Unreasonably Adverse scenic impacts. While the results appear impressive, they are based on relatively few data points. Future applications for wind energy development should include intercept surveys from more viewpoints that provide a greater range in the scope and scale of visible generation facilities, and are frequented by people engaged in a greater diversity of activities. Methods also need to be developed and validated to evaluate the effect of multiple exposures to scenic impacts while using SRSNSs. Intercept surveys should also be conducted in a manner that provides for estimating the extent, nature and duration of use at a viewpoint.[16] Web surveys might be used to supplement intercept studies at locations with very few users, where there is the expectation of great controversy, or other situations where the scenic impact evaluation would benefit from a greater number of responses from potential users.

Finally, it is recommended that post-construction studies be conducted to monitor the actual scenic impact. In particular, intercept surveys should be conducted at the same locations as reviewed in this paper and include an evaluation of the perceived veracity of the photosimulations as a tool for evaluating scenic impacts.

9. References

American Psychological Association. 2010. *Publication Manual of the American Psychological Association*. (6th ed.) Washington, DC: APA.

Cohen, Jacob. 1988. *Statistical Power Analysis for the Behavioral Sciences*. Second edition. New York: Psychology Press.

ESRI. 2010. *ArcGIS Desktop*. Version 10. Redlands, CA: ESRI

Expedited Permitting of Grid-Scale Wind Energy Development. MRSA Title 35-A, Chapter 34-A. http://www.mainelegislature.org/legis/statutes/35-A/title35-Ach34-A.pdf (accessed February 23, 2010).

LandWorks. 2011a. *Visual Impact Assessment for the Proposed Bowers Wind Project*. Middlebury, VT: LandWorks. 54 p. plus maps, photo inventory, and visual simulations.

Mildner, Curtis, and Jennifer MacBride. 2010. Research Report: Mt. Blue-Saddleback Ridge Wind Power Project Intercepts. Portland, ME: Market Decisions.

Mildner, Curtis, and Jennifer MacBride. 2010. Spruce Mountain Wind Project Intercepts Research Report. Portland, ME: Market Decisions.

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Nassauer, Joan Iverson, James F. Palmer, Carys Anne Swanwick, and Craig Churchward. 2010. Evaluating Methodologies for Visual Impact Assessment, Task One Report: Literature Review. Discussion draft. NCHRP Project 25-33. Submitted to National Cooperative Highway Research Program, Transportation Research Board, National Research Council.

Nunnally, J.C. 1978. *Psychometric Theory*. Second Edition. New York: McGraw-Hill.

Palmer, J.F. 1983. A visual character approach to the classification of backcountry environments. *Landscape Journal* 2(1):3-12.

Palmer, J.F. 2000. Reliability of rating visible landscape qualities. *Landscape Journal* 19(1/2):166-178.

Palmer, J.F. 1999. Recreation participation and scenic value assessments of clearcuts. In *Proceedings of the 1998 Northeastern Recreation Research Symposium*, edited by H.G. Vogelsong. Gen. Tech. Rep. NE-255. Radnor, PA: USDA, Forest Service, Northeastern Forest Research Station. pp. 199-203.

Palmer, J.F. and R.E. Hoffman. 2001. Rating reliability and representation validity in scenic landscape assessments. *Landscape and Urban Planning* 54(1-4):149-161.

Portland Research Group. 2011. Highland Wind Project Survey of Hikers March 11: Report of Trail Intercept and Web Survey Research Conducted Summer and Fall 2010. Portland, ME: Portland Research Group.

Portland Research Group. 2011a. *Bowers Mountain Wind Project Outdoor Activities Users Research Telephone Survey*. Portland, ME: Portland Research Group. 40 p.

Portland Research Group. 2011b. *Bowers Mountain Wind Project Outdoor Activities Users Research Snowmobiler Survey*. Portland, ME: Portland Research Group. 32 p.

Robertson, Brian, and Jennifer MacBride. 2010. Research Report: Bull Hill Wind Power Project Intercepts. Portland, ME: Market Decisions.

Roth, Michael. 2006. Validating the use of Internet survey techniques in visual landscape assessment—An empirical study from Germany. *Landscape and Urban Planning* 78:179–192.

Sheppard, Stephen R.J. 1989. *Visual Simulation: A User's Guide for Architects, Engineers, and Planners*. New York: Van Nostrand Reinhold.

Smardon, Richard C. , James F. Palmer, Alfred Knopf, Kate Grinde, Jim E. Henderson, and Linda D. Peyman-Dove. 1988. *Visual Resources Assessment Procedure for US Army Corps of Engineers*, Instruction Report EL-88-1. Vicksburg, MS: US Army Corps of Engineers, U.S. Army Engineer Waterways Experiment Station.

Stamps, Authur E. 2000. *Psychology and the Aesthetics of the Built Environment*. Boston: Kluwer Academic Publishers.

Stamps, Authur E. 1990. A paradigm for distinguishing significant from nonsignificant visual impacts: Theory, implementation, case histories. *Environmental Impact Assessment Review* 17:249-293.

Stamps, Authur E. 1990. Use of photographs to simulate environments: a meta-analysis. *Perceptual and Motor Skills* 71(3): 907-913.

Terrence J. DeWan & Associates. 2010. *Highland Wind Project Visual Impact Assessment*. Yarmouth, ME: TJD&A.

Terrence J. DeWan & Associates. 2010. *Visual Impact Assessment Spruce Mountain Wind Project.*

Terrence J. DeWan & Associates. 2010. *Visual Impact Assessment: Bull Hill Wind Project, Carthage, Maine*. Yarmouth, ME: TJD&A.

Terrence J. DeWan & Associates. 2010. *Visual Impact Assessment: Saddleback Ridge Wind Project, Carthage, Maine*. Yarmouth, ME: TJD&A.

US DOT, Federal Highway Administration, Office of Environmental Policy. 1990. *Visual Impact Assessment for Highway Projects*. Washington, DC: US DOT, Federal Highway Administration, Office of Environmental Policy. Original edition, 1981.

USDA, Forest Service. 1974. *National Forest Landscape Management: The Visual Management System*. Vol. 2, Ch. 1, Agriculture Handbook 462. Washington, DC: USDA, Forest Service.

USDA, Forest Service. 1995. *Landscape Aesthetics : A Handbook for Scenery Management*. Rev. ed, Agriculture Handbook 701. Washington, DC: USDA, Forest Service.

USDI, Bureau of Land Management. 1984. Visual Resource Management. BLM Manual H-8400. Washington, DC: USDI, Bureau of Land Management.

USDI, Bureau of Land Management. 1986a. Visual Resource Inventory. BLM Manual H-8410-1. Washington, DC: USDI, Bureau of Land Management.

USDI, Bureau of Land Management. 1986b. Visual Resource Contrast Rating. BLM Manual H-8431-1. Washington, DC: USDI, Bureau of Land Management.

Wherrett, JoAnna R. 1999. Issues in using the Internet as a medium for landscape preference research. *Landscape and Urban Planning* 45:209-217.

10. Notes

[1] Reliability means that independent evaluators using the same procedure obtain the same result. Validity means that the procedure measures what it purports to measure.
[2] 35-A MRSA, § 3452, sub-§3
[3] 35-A MRSA, § 3452, sub-§1

[4] Maine's Site Location Of Development Law 38 MRSA, § 484, sub-§3, Maine's Department of Environmental Protection Site Location of Development Rules Chapter 375.14, and the Land User Regulation Commission's *Land Use Districts and Standards*, Chapter 10.24(3).
[5] 35-A MRSA, § 3452, sub-§1
[6] 35-A MRSA, § 3452, sub-§3
[7] Statistical significance means that the results are unlikely to have occurred by chance, not that the magnitude of the difference is large enough to be important or even noticeable in the everyday world.
[8] Hedges $g = (\bar{x}_{post} - \bar{x}_{pre}) / s_{pooled}$ where $s_{pooled} = [(n_{post} - 1)(s_{post})2 + (n_{pre} - 1)(s_{pre})2] / [n_{post} + n_{pre} - 2]$, $\bar{x}$ is the mean scenic value, s is the standard deviation, and n is the sample size. Hedges g is used to estimate the size effect instead of Cohen's d because d requires knowledge of the population parameters.
[9] "Grossly" has a variety of meanings, but I believe the intent here follows the online Oxford English Dictionary's seventh definition: Indelicately, indecently.
[10] 35-A MRSA, § 3452, sub-§3(E)
[11] 35-A MRSA, § 3452, sub-§3(E)
[12] Highland viewpoint 9D is used in both the intercept and web surveys.
[13] This is based on the assumption that a mean rating of 3.0 for effect on enjoyment and continued use is the threshold for unacceptability. It may be that 1.5 or 2.0 is more appropriate.
[14] The mean ratings for effect on enjoyment and continued use were near 5.5.
[15] 35-A MRSA, § 3452, sub-§3(E)
[16] A required by Criterion E.

Maine's WEA and the Evaluation of Scenic Impacts

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February 8, 2013

On April 18, 2008, Governor John Baldacci signed *An Act to Implement Recommendations of the Governor's Task Force on Wind Power Development* (the Wind Energy Act or WEA). It establishes a favorable State policy encouraging grid-scale wind energy development in appropriate locations. In particular, it designates a large portion of the state for expedited grid-scale wind energy development. While most environmental impacts are evaluated in the same manner as previously, special provisions are made for scenic impacts.

While the provisions of the WEA can be viewed as an effort to simplify and clarify visual impact assessments, questions of interpretation still remain. There are several major determinations that effect how a visual impact assessment is to be conducted. This Q&A presents my understanding of the WEAs' approach to scenic impact evaluation.

What is the significance of the expedited permitting area for scenic evaluations?
By establishing the expedited area the legislature determined that wind energy development was a suitable land use within this area as long as it met the permit requirements. This is a statewide permitting district, analogous to a state-wide zoning overlay district. It has the practical effect of removing from consideration the appropriateness or compatibility of grid-scale wind energy development as a land use. Within the expedited area, the permitting agency's review of scenic impacts from generation facilities is limited to views from scenic resources of state or national significance using the WEA's criteria in place of those developed for the Natural Resources Protection Act[1] or Site Location Law.[2] The WEA only regulates the state permitting review; local governments may adopt local regulations controlling wind energy development, and the Maine State Planning Office has provided a model ordinance for this purpose.[3]

What is the standard of scenic impact evaluation?
The standard is "whether the development significantly compromises views from a scenic resource of state or national significance such that the development has an unreasonable adverse effect on the scenic character or existing uses related to scenic character of the scenic resource of state or national significance."[4] The WEA does not provide guidance for establishing the threshold between a reasonable and unreasonable scenic impact. However, it does state that being "a highly visible feature in the landscape is not a solely sufficient basis for determination that [it is] unreasonable adverse,"[5] and a determination that it "fits harmoniously into the existing natural environment" is explicitly not required.[6]

[1] 38 MSRA, § 480-D (1)
[2] 38 MRSA, § 484(3)
[3] Model Wind Energy Facility Ordinance, August 27, 2009
[4] 35-A MRSA, § 3452, sub-§1
[5] 35-A MRSA, § 3452, sub-§3
[6] 35-A MRSA, § 3452, sub-§1

Two questions that are useful to contemplate are: "What does an unreasonable scenic impact look like?" and "What thresholds can be used to determine that it is unreasonable?"

Is this standard applied to all proposed facilities?
It is clear that this standard applies to "generating facilities"—turbines and transmission lines—within the expedited permitting area. However, there is the possibility of an exception for certain "associated faculties," making it somewhat less clear how to approach them.[7] Associated facilities include "elements of a wind energy development other than its generating facilities that are necessary to the proper operation and maintenance of the wind energy development, including but not limited to buildings, access roads, generator lead lines[8] and substations."[9]

> If the primary siting authority determines that application of the standard [unreasonably adverse, not harmonious fit] to the development may result in unreasonable adverse effects due to the scope, scale, location or other characteristics of the associated facilities"[10] then "the primary siting authority shall evaluate the effect of associated facilities of a wind energy development in terms of potential effects on scenic character and existing uses related to scenic character in accordance with Title 12, section 685-B, subsection 4, paragraph C or Title 38, section 484, subsection 3, in the manner provided for development other than wind energy development.[11]

This provision is frankly confusing. However, the Land Use Regulation Commission (LURC) released a procedural order further clarifying the difference between generating and associated facilities. They found that the "transmission lines that run between the turbines, collecting power…are immediately associated with the wind turbines and are generating facilities. …a so-called express collector line that runs … from the summit of the project to the substation… is not immediately associated with the wind turbines, is more like a generator lead line, and therefore is an associated facility."[12] Associated facilities also include "turbine pads, which are the cleared, leveled areas around each turbine, all roads used to access the turbines, the generator lead line, the meteorological towers, as well as the operations and maintenance building and the substation."[13] They went on to describe a framework to determine which standard should be applied to associated facilities.

> Accordingly, if the Commission were to apply the Wind Energy Act standard to associated facilities, two factors are relevant for the Commission's consideration. First, the Commission would not consider the scenic impacts of the associated facilities on locally significant scenic resources. Second, with respect to views of the associated facilities from scenic resources of state or national significance, the Commission would not consider whether the associated facilities fit harmoniously into the natural environment. Thus under the analytical framework

[7] 35-A MRSA, § 3452, sub-§2
[8] A generator lead line is constructed and owned by the generator to transmit power from the generating facility to the transmission grid.
[9] 35-A MRSA, § 3451, sub-§1
[10] 35-A MRSA, § 3452, sub-§2
[11] 35-A MRSA, § 3452, sub-§2
[12] LURC, Bowers Wind Project DP 4889 Second Procedural Order, April 21, 2011, p. 3.
[13] LURC, Bowers Wind Project DP 4889 Second Procedural Order, April 21, 2011, p. 3.

provided by 35-A M.R.S. § 3452(2), the Commission must ultimately consider: whether (because of their scope, scale, location or other characteristics) the associated facilities may result in (because the above two factors would not be taken into consideration) unreasonable adverse effects.[14]

In other words, if the primary siting authority determines that limiting the scenic evaluation of associated facilities to the WEA standard may result in unreasonably adverse impacts to locally significant scenic resources or a failure to fit harmoniously into the natural environment, then it shall use the traditional standard. While DEP is now responsible for the state permit review of all grid-scale wind energy projects, it seems reasonable to accept LURC's interpretation until is superseded by an order from DEP.

What evaluation criteria are to be used?
The WEA lists six scenic evaluation criteria: [15]

A. **"The significance of the potentially affected scenic resource of state or national significance;"** The WEA does not explicitly describe how significance should be determined or considered. One approach would be to review the designation documents to determine the scenic resource's significance and establish the role of scenic quality in the designation. For instance, the *Maine's Finest Lakes* and *Maine Wildlands Lake Assessment* studies explicitly determine whether the resource has significant or outstanding scenic quality and the detailed evaluation data are available in the *Scenic Lakes Evaluation for the Organized Towns in Maine* and the *Scenic Lakes Evaluation for the Unorganized Towns in Maine* respectively. In contrast, landscape scenic quality is not considered in the nomination forms for most sites listed on the National Register of Historic Places, and most are identified as having only local historical significance. Most of the text used in the WEA to describe SRSNS is directly taken from the Natural Resource Planning Act's Chapter 315 rule, which provides a practical approach to determining the significance of a scenic resource.

> A scenic resource visited by large numbers who come from across the country or state is generally considered to have national or statewide significance. A scenic resource visited primarily by people of local origin is generally of local significance. Unvisited places either have no designated significance or are "no trespass" places.[16]

Both methods are well established in Maine's approach to managing and protecting scenic resources. It seems reasonable that they should both be considered in determining a scenic resource's significance.

B. **"The existing character of the surrounding area;"** It is not obvious what is intended by this criterion. Visual impact assessments often begin with an assessment of regional landscape character (perhaps extending beyond 8 miles from a project), which identifies the visual attributes that create a "sense of place." The attributes that have the greatest

[14] LURC, Bowers Wind Project DP 4889 Second Procedural Order, April 21, 2011, p. 4.
[15] 35-A MRSA, § 3452, sub-§3
[16] CMR, Chapter 315 § 10

influence on scenic value will change as landscape character changes—what makes a Great Pond scenic will be different from what makes a National Historic Place scenic. A character assessment may also determine a landscape's scenic integrity—the degree of intactness of a particular area, or conversely the level of visual disruption. A landscape character assessment includes a photographic inventory along with interpretive text and graphics (e.g., maps, illustrations of key terms, etc.) that constitute a context for assessing project specific scenic impacts. Care must be taken to present an accurately balanced description of the common character and any important but less common features. Systematic procedures of measurement or observation that can be replicated and verified may be helpful.

C. Landscape provides the setting for a wide range of user activities. Recreation managers and planners have developed the Recreation Opportunity Spectrum (ROS)[17] and Water Recreation Opportunity Spectrum (WROS)[18] as tools linking landscape setting with appropriate activities and the quality of recreation experience. Using the landscape character assessment and ROS/WROS principles provides useful information to establish appropriate recreation activities, the quality of recreation experience, and the recreation carrying capacity for specific SRSNS and the surrounding area. Interpreting this criterion in this way seems compatible with the intent and purpose of the WEA.

D. **"The expectations of the typical viewer;"** Viewers may have certain expectations for the visible character of certain scenic resources. For instance, they may expect that views from a particular state park or hiking trail be predominately natural appearing. However, it is reasonable to question the appropriateness of viewer expectations, such as when people describe lands intensively managed for timber as "wilderness." It may be useful to use ROS/WROS as a way to establish a realistic range of expectations for particular SRSNS.

An additional consideration is that viewer expectations change in reaction to changed circumstances. A few turbines may be approved because the project is small—once built people's expectations change, making it acceptable to build additional turbines. Consideration of this incremental cumulative change may be relevant in the context of the next criterion.

E. **"The expedited wind energy development's purpose and the context of the proposed activity;"** The WEA makes it clear that the Legislature believes tapping the state's wind resource is necessary for the public good, and has set substantial wind energy generation goals.[19] In addition, the Legislature recognizes that "wind turbines are potentially highly visible landscape features that will have an impact on views."[20] It seems reasonable that the Legislature intended that areas determined to be suitable for grid-scale wind energy development be utilized to their full capacity. This criterion may require consideration of

[17] More, Thomas A., et al. *Extending the Recreation Opportunity Spectrum to Nonfederal Lands in the Northeast: An Implementation Guide*, 2003.
[18] USDI Bureau of Reclamation, *Water Recreation Opportunity Spectrum Users' Guidebook*, July 2004.
[19] 35-A MRSA, § 3402, sub-§2
[20] 35-A MRSA, § 3402, sub-§2(C)

the wind energy potential of the surrounding context, and evaluating the potential cumulative scenic impacts of fully building-out the area's capacity to produce wind energy. It is expected that the greatest impact comes from the initial wind turbines built in an area; additional turbines will add a smaller incremental scenic impact, making it very difficult to determine where to stop further development.[21] This is because only the incremental scenic impact added by a proposed project can be considered in the permitting process. Therefore, it may be most responsible to consider potential cumulative wind development impacts to an area as part of an initial proposal.

On the other hand, there is wide agreement that clustering or concentrating grid-scale wind energy development is preferable to dispersing it evenly throughout the state.[22] The intentional identification of areas to concentrate wind development has not yet happened; rather concentration is occurring because of decision made by developers. The incremental project-oriented nature of the permitting review process has made it difficult for the public to engage developers and regulators in a discussion about this issue. It may have been the legislature's intension that Criterion D provides the permitting agency an opportunity to recognize areas suitable for wind energy development concentration.

F. **"The extent, nature and duration of potentially affected public uses of the scenic resource of state or national significance and the potential effect of the generating facilities' presence on the public's continued use and enjoyment of the scenic resource of state or national significance;"** This evaluation criterion says that we need to consider what activities are occurring at significant scenic resource sites, how many people engage in these activates, for how long, and what the impact of seeing the project will have on the enjoyment of these activities.

The first part of this criterion focuses on simple recreation use measures: "extent, nature and duration." These measures can be used to estimate viewer exposure to wind energy developments. Viewer exposure can be further modified by considering the importance of scenic quality to different user activities, and their sensitivity to scenic impacts. Conventional wisdom is that the most sensitive activities are back-packing and paddling while the least sensitive activities are riding ATVs or power boating, though there is little research explicitly connecting scenic quality to recreation experience.[23] Intercept surveys and observational studies could be designed to estimate the number and location of users and their sensitivity to scenic impacts. It seems possible that these values could be combined in a GIS with potential visibility measures to model potential scenic impact.

All other things being equal, it is generally assumed in visual impact assessments that higher use contributes to a greater concern for scenic impact, and lower use results in less

[21] For an investigation of this phenomenon applied to timber harvesting, see Palmer, J.F. 2008. The perceived scenic effects of clearcutting in the White Mountains of New Hampshire, USA. *Journal of Environmental Management* 89(3):167-183.

[22] Report of OEIS Assessment of Cumulative Visual Impacts from Wind Energy Development, February 21, 2012, Appendix 2, page 19.

[23] Palmer, J.F. 1999. Recreation participation and scenic value assessments of clearcuts. In Proceedings of the 1998 Northeastern Recreation Research Symposium, edited by H.G. Vogelsong. Gen. Tech. Rep. NE-255. Radnor, PA: USDA, Forest Service, Northeastern Forest Research Station. pp. 199-203.

concern. However in their deliberations the LURC Commissioners noted that this presents a logical dilemma for designated "remote" areas. It is "The Commission's long-standing policy, embodied in its CLUP2 and regulatory standards, to value remoteness and related low levels of public use." As a result, they determined that when reviewing the scenic impact from wind energy projects, SRSNS where "remoteness and associated low levels of use is integral to the experience of the "typical user," low use may be judged to contribute to the value of the resource."[24] DEP is not responsible for planning or managing "remote" areas, it is therefore expected that those agencies with such responsibilities (e.g., LURP or BPL) will make their concerns known during DEP's conformance review for a wind energy project.

The fundamental measures of recreation use can also be used to estimate the economic benefit of recreation resources (e.g., SRSNS).[25] If one were able to estimate how the scenic change from constructing a grid-scale wind energy project would affect continued use, then one could estimate the possible economic impacts from the change.

The second part of this criterion focuses on "the potential effect of the generating facilities' presence on the public's continued use and enjoyment of the SRSNS." The WEA is very specific that the experience of actual users of SRSNS within 8 miles of generating facilities be considered, and not some hypothetical population of users. It has become the accepted practice to conduct intercept surveys of users at representative SRSNS that present at least 4 questions:[26]

1. On the 1-to-7 scale, where 7 is the highest scenic value and 1 is the lowest scenic value in Maine, how would you rate scenic value of this [the existing] view?

2. On the 1-to-7 scale, where 7 is the highest scenic value and 1 is the lowest scenic value in Maine, how would you rate scenic value of this view [with the simulated project]?

3. Now I'd like you to think about how your enjoyment of coming here today would be affected by a change in the current view to the one in the image [simulating the project]. On a scale of 1-7, where 7 is a very positive affect and 1 is a very negative affect on your enjoyment how would your enjoyment be affected? A "4" means that it would not change your enjoyment at all.

4. Please think about how a change from the current view to the one in the image [simulating the project] would affect your likelihood of returning to [the SRSNS]. On a scale of 1-7 where 7 means you are more likely to return and 1 means you are less likely to return, how likely are you to return to [the SRSNS], given the

[24] Samantha Horn Olsen, September meeting item: Evaluating Scenic Impacts Under the Wind Energy Act, August 30, 2011.
[25] John Loomis. Updated outdoor recreation use values on National Forests and other public lands. 2005.
[26] The particular wording of these questions is taken from the intercept surveys of the Spruce Mountain and Saddleback Ridge Wind Projects by Market Decisions.

change in the view? A '4" means the change in the view would have no effect on your return.

A review of the results from the first four intercept surveys indicates that there is a substantial range of responses among the different projects, suggesting the importance of investigating the effect on users at representative SRSNS for each project.[27] Some might argue that it would be more efficient to use a web-based survey of potential users of SRSNS. However when this was done for one wind energy project, it was found that respondents intercepted in their use of a SRSNS were significantly more sensitive to scenic impacts than those responding to the survey on a computer at home or work. This finding is in keeping with other recreation research that has found satisfaction ratings during and immediately after engaging in a recreation activity are higher than they are three and nine months later.[28]

G. **"The scope and scale of the potential effect of views of the generating facilities on the scenic resource of state or national significance, including but not limited to issues related to the number and extent of turbines visible from the scenic resource of state or national significance, the distance from the scenic resource of state or national significance and the effect of prominent features of the development on the landscape"** The issue is whether the generating facilities become dominating elements in the landscape, primarily because of their number, the horizontal angle they occupy in the visual field (extent), and their proximity to the viewer (distance). These three factors—number, extent and distance—interact with visibility to determine the visual magnitude of the project. The relation of a wind energy project's visual magnitude to scenic impact has been explored, however it was based on ratings made by students while sitting in a darkened room rather than the judgments of people recreating at SRSNS.[29] A sufficient number of intercept surveys have been conducted in Maine that it should be possible to investigate the relationship of turbine numbers, extent and distance to scenic impact. Such research could provide useful guidance to establish thresholds for siting guidelines.

What constitutes a significant scenic resource?

The WEA has two requirements of a SRSNS: (1) it must be "owned by the public or to which the public has a legal right of access," and (2) it must be on a list of qualifying designated resources. The importance of this definition is that it provides predictability to the scenic impact assessment process. Both developers and their opponents now know that the public must have access to the viewpoints that are evaluated—the view from my backyard will not be considered. These areas also must be designated and listed, which further reduces the uncertainty of the process. Here are the areas that qualify as SRSNS, with annotations about where to find them listed and any concerns there may be with the category.

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[27] James F. Palmer, Maine's experience evaluating when scenic impacts from wind energy development are unreasonably adverse. 2012.

[28] Stewart, W. P. and R. B. Hull IV. 1992. Satisfaction of what? Post hoc versus real-time construct validity. *Leisure Science*, 14:195-209.

[29] Shang, H. and Bishop, I. D. (2000) Visual thresholds for detection, recognition and visual impact in landscape settings. *Journal of Environmental Psychology* 20, 125-140.

A. **A national natural landmark, federally designated wilderness area or other comparable outstanding natural or cultural feature**. The federal government administers both the National Natural Landmarks (NNLs) Program and the Wilderness Preservation System; all designated areas are of national significance.

NNLs are listed online, and there is also a map interface.[30] They contain the best remaining examples of specific biological or geological features—scenic value is not a consideration, though the areas many be very scenic they may also be quite ordinary. NNLs are managed by a variety of land stewards to preserve natural features; the public may not have access to a particular NNL.

Wilderness areas are listed online, and there is also a map interface as well as maps and data for download.[31] They are typically large land areas with little visible human presence (e.g., no mechanized vehicles or forest harvesting). Scenic value is recognized as one of several wilderness benefits, though it is not required for designation. All Wilderness areas are publicly owned.

The most significant ambiguity in identifying SRSNS comes from the phrase "or other comparable outstanding natural or cultural feature." First of all, it is unclear what "comparable outstanding" means, though the level of significance is clearly intended to be very high (i.e., simply being a "significant" feature of state-wide importance may not be sufficient). In addition, it is ambiguous because NNLs and Wilderness areas are outstanding examples of natural not cultural features. The National Register of Historic Places would seem to be the obvious place to find "outstanding…cultural features."

B. **A property listed on the National Register of Historic Places**. The National Register of Historic Places (NRHP) maintains a current database online,[32] and there are also spatial data for download.[33] Maine's nomination forms do not appear to be online, but they may be obtained from the Maine Historic Preservation Commission.[34] It is important to review the nomination documents and conduct a site visit to determine the nature of public access. In addition, the nomination forms will identify the level of significance (local, state or national) and whether scenic quality was a significant attribute.

C. **A national or state park**. National Parks are all listed online with a map interface.[35] This resource includes location of National Park Service activity, such as the National Register of Historic Places. The Maine Division of Parks and Public Lands provides an online Find Parks & Lands service that includes a map interface.[36] However, this page lists state lands that are not State Parks, and experience has shown that not all State Parks are listed, so use it with caution. Maine Office of GIS maintains an interactive online map with

[30] http://www.nature.nps.gov/nnl/nation.cfm
[31] http://www.wilderness.net
[32] http://nrhp.focus.nps.gov/natreghome.do?searchtype=natreghome
[33] http://nrhp.focus.nps.gov/natreg/docs/Download.html
[34] http://www.state.me.us/mhpc/
[35] http://www.nps.gov/findapark/index.htm
[36] http://www.maine.gov/cgi-bin/online/doc/parksearch/index.pl

includes all state conservation lands, though it is sometimes difficult to locate a particular property and determine its status (e.g., whether it is a state park or public reserve land).[37] The conservation land data are also available for download to ArcGIS.[38] This is easily searched, but requires ArcGIS software.[39]

D. **A great pond identified as having outstanding or significant scenic quality in the *Maine's Finest Lakes* study or *Maine's Wildlands Lake Assessment*.** A great pond is any natural inland body of water that is in excess of 10 acres, or any artificially formed inland body of water that is in excess of 30 acres.[40] The public has a right of access by foot across unimproved land to any great pond in Maine.[41] Both *Maine's Finest Lakes* and *Maine's Wildlands Lake Assessment* are available as PDF documents,[42] though the information is not available as a spatial or searchable database. These reports evaluate several natural resource values, including scenic value, for Maine's great ponds. The more detailed investigations upon which these reports are based are not readily available.[43]

E. **A segment of a river or stream identified as having unique or outstanding scenic attributes in the *Maine Rivers Study*.** The *Maine Rivers Study* is available online as a PDF document,[44] though the information is not available as a spatial or searchable database. The report evaluates several natural resource values, including scenic value, for stretches of Maine's rivers and major streams. The public has the right to use a boat on any stream that will support its passage. However, the boat must be put in at a point of public access.[45]

F. **Viewpoints from state public reserve land or on a trail that is used exclusively for pedestrian use, as designated by the Department of Conservation**. The Department of Conservation designated state public reserve lands and trails that were SRSNS by adopting rule 04 056 on March 29, 2010. A copy is available online as a DOC file.[46] Some of the identified areas may be surrounded by private land and the public may not have legal access. Maine Office of GIS maintains an interactive online map that includes all state conservation lands, though it is awkward to search for specific properties.[47] The

[37] http://www.maine.gov/doc/parks/gis/
[38] http://www.maine.gov/megis/catalog/shps/state/conserved_landss.zip
[39] http://www.esri.com/software/arcgis/explorer
[40] MRSA 38, § 436-A
[41] MRSA 17, §3860
[42] http://www.maine.gov/doc/mfs/windpower/
[43] Jones, J. J. 1986. Scenic lakes character evaluation in Maine's unorganized towns. Maine Department of Conservation. and Parkin, D. and J. Lortie. 1989. Scenic lakes character evaluation in Maine's organized towns. Maine State Planning Office.
[44] http://www.maine.gov/doc/mfs/windpower/
[45] Hermansen, K. E. and D. R. Richards.1995. Maine principles of ownership along water bodies. *Maine Law Review* 47:35-68. p. 41.
[46] http://www.maine.gov/sos/cec/rules/04/056/056c003.doc
[47] http://www.maine.gov/doc/parks/gis/

conservation land data are also available for download to ArcGIS.[48] This is easily searched, but requires ArcGIS software.[49]

G. **Scenic turnouts on scenic highways constructed by the Department of Transportation**. Brochures and PDF maps of Maine's Scenic Byways can be accessed online.[50] The "scenic turnouts" are "constructed by the Department of Transportation pursuant to Title 23, section 954," which is titled "Picnic areas" and primarily concerns the construction of accessible rest facilities. No known list of scenic turnouts exists, though they are normally easy to identify in the field.

H. **Scenic viewpoints located in coastal areas that are ranked as having state or national significance in terms of scenic quality in inventories published by the Executive Department, State Planning Office**. Those coastal scenic resource assessments that have been completed are available online as[51] PDF documents. The Maine Coastal Program published the *Scenic Assessment Handbook* to guide the creation of future coastal scenic resource assessments.[52]

While a major step toward specificity, it is anticipated that interpretation of some of these sources will be contested. For instance, this list includes resources typically designated for non-scenic reasons (e.g., NNLs or historic place on the NRHP), and only minor portions of resources that are designated for scenic reasons (e.g., only the turnouts on a Scenic Byway). In addition, determining if the "the public [has] a legal right of access" [53] may not always be easily determined. For instance, does the public have a legal right of access to a NRHP listed historic church or is it realistic that someone could paddle several miles up a small stream to reach an impacted viewpoint? Finally, all stakeholders would benefit by a searchable spatial database that listed all potential SRSNS. For instance, it is inexcusable that the resource ratings for ponds and river segments, or <u>all</u> State Parks are not available.

What is the area of potential effects (APE)?

The WEA presumes that potential scenic impacts to scenic resources must be evaluated within 3 miles of generating facilities (i.e., turbines and transmission lines running between the turbines). The primary siting authority may also require the evaluation of potential scenic impacts to state and nationally significant scenic resources located between 3 and 8 miles from generating facilities if there is substantial evidence that it is needed.[54] Interested parties have 30 days after the acceptance of the application to submit such information.[55] The WEA states that scenic impacts from generating facilities located 8 or more miles from a scenic resource are "insignificant."[56] As a matter of practice, all VIAs conducted to date have use an 8 mile APE.

[48] http://www.maine.gov/megis/catalog/shps/state/conserved_landss.zip
[49] http://www.esri.com/software/arcgis/explorer
[50] http://www.maine.gov/mdot/pga/byways/
[51] http://www.maine.gov/doc/nrimc/mcp/publications.html
[52] http://www.maine.gov/doc/nrimc/mcp/downloads/scenic/ScenicAssessmentRpt_LowRes.pdf
[53] 35-A MRSA, § 3451, sub-§9
[54] 35-A MRSA, § 3452, sub-§4
[55] 35-A MRSA, § 3452, sub-§4
[56] 35-A MRSA, § 3452, sub-§3

What is the Process of Conducting a Visual Impact Assessment?
While the WEA has identified specific resources from which views are to be considered and established criteria and a standard for their evaluation, there is no apparent reason that the process by which a visual impact assessment (VIA) is conducted would be changed. While there are slight variations, a professionally conducted VIA includes the following:

1. **Project Description**. The foundation of any VIA is an accurate and complete description of the visible attributes of all project elements—their location, dimensions, form, color, reflectance, surface texture, etc. It is also important to describe the surrounding site and how it will change. For instance, accurate information must be provided about the location and heights of trees that may screen the project, and the extent of site clearing and regrading. The purpose and context of the project must be described, as it is one of the evaluation criteria.[57]

2. **Landscape Character**. The description of the landscape character establishes the context for evaluating any visual change from introducing the proposed development.[58] What is the visual character of the landform and vegetation? What is the visual character of the settlement pattern and road network? Are there other built or proposed wind energy projects in the area (e.g., within 20 miles)? How does the project site relate to the larger regional landscape context—is it unusual or mundane? The US Forest Service describes landscape character this way:

   > Landscape Character descriptions are a combination of the objective information contained within ecological unit descriptions and the cultural values that people assign to landscape. Together they help define the meaning of "place", and its scenic expression (USDA FS 1995, page 1-1).

   The regional landscape character is described first. Often there are several distinct landscape units to describe. The character (e.g., ecological zone) and scenic attractiveness (e.g., vividness, intactness, unity) of each landscape unit is summarized (USDA FS 1995, page 1-15). A somewhat more detailed description is given for the project site and its APE.

3. **Visibility Analysis**. A visibility or viewshed analysis identifies those areas with potential views of the proposed development. The minimum professional standard is to map the topographic viewshed for the highest point of each major project element. This shows those areas that have a potential view of the tip of an upright turbine blade if all land cover were removed. Since it is possible that views to a project could be opened by the removal of land cover, a topographic viewshed is considered a useful conservative assessment of the maximum area of potential project visibility.

   Typically, a second visibility analysis includes the screening effect of forest cover. However such analyses should be used with caution and carefully field checked, since vegetation data can change quickly. The three forest classes (deciduous, evergreen and

[57] 35-A MRSA, § 3452, sub-§3,criterion D
[58] 35-A MRSA, § 3452, sub-§3, criterion B

mixed) of the National Land Cover Database are most commonly used. Forest height is typically set to a regionally appropriate 40 feet for the analysis, though the minimum tree height for an area to be classified as forest is 16 feet. This use of generalized rather than location specific tree heights is another reason to use the vegetated visibility analysis with caution.

Additional visibility analyses might show how many turbines are visible, or the viewshed for larger portions of each project element (i.e., the nacelle rather than the upright blade tip). Current practice has been to only evaluate visibility of the turbines, but the transmission line must also be considered. It may also be appropriate to include associated facilities, such as access roads, substation, maintenance building and other structures.

Normally only views from scenic resources within the topographic viewshed are evaluated in detail (though the accuracy of the analysis must field checked).[59] A visibility analysis may also be helpful in describing the potential number, extent, and distance of visible turbines.[60]

4. **Significant Scenic Resources**. Identify the state or nationally significant scenic resources within the APE, based on the list in the WEA.[61] A description of each identified scenic resource needs to be presented in sufficient detail that the criteria for evaluating scenic impacts can be applied.[62] Each scenic resource will be documented as part of the fieldwork, include the general scenic character of the resource, the "worst case" potential views of the proposed development, and perhaps other views. While it may not be necessary to prepare simulations or an impact assessment from SRSNSs that the topographic visibility of blade tips indicates will have no visibility, it is important to have a description of their characteristics. This will assist the evaluator in understanding the density of SRSNS in the area and whether there are reasonable alternatives for displaced users.

5. **Public Use and Expectations**. The extent, number and duration of public uses of the identified SRSNS, and the expectations of the "typical viewer" must be described.[63] It is desirable to have systematically gathered data specific to each SRSNS, it may be an unrealistic expectation. Fieldwork may provide indications about the use of SRSNS. In addition, the apparent ROS[64] or WROS[65] Class may be useful to infer the appropriate intensity of use and user expectations.

[59] For instance, Maine Historic Preservation Commission does not require assessing listed properties that will be screened by topography.
[60] 35-A MRSA, § 3452, sub-§3, criterion F
[61] 35-A MRSA, § 3451, sub-§9
[62] 35-A MRSA, § 3452, sub-§3, criterion A
[63] 35-A MRSA, § 3452, sub-§3, criteria E and C
[64] More, Thomas A., et al. *Extending the Recreation Opportunity Spectrum to Nonfederal Lands in the Northeast: An Implementation Guide*, 2003.
[65] USDI Bureau of Reclamation, *Water Recreation Opportunity Spectrum Users' Guidebook*, July 2004.

It has become common to conduct user intercept surveys from one or two of the SRSNS. At a minimum, users must be asked to (1) describe their expectations,[66] (2) rate the scenic quality of the existing conditions photograph (3) rate the scenic quality of the simulated condition,[67] (4) rate the potential effect of the visual change on their enjoyment,[68] and (5) rate the potential effect of the visual change on their continued use of the SRSNS. [69] It has become standard practice that users are asked what they think are Maine's most and least scenic views. These questions help users establish the endpoints for rating scenic quality in Maine. In addition to the numerical ratings, users are asked to explain their responses in their own words. These data are invaluable for interpreting the results. Ideally, the interview would be conducted at the location of one of the simulations, though this is not always practical. This provides an opportunity to rate the scenic quality of the actual view also. Comparing the ratings of the actual view and the existing conditions photograph is one way to test the validity of the simulations.

6. **Evaluation of Potential Impacts**. The findings from applying each of the criteria for evaluating scenic impacts should be reported for each SRSNS.[70] While appropriate quantitative information about each criterion should be presented and evaluated when available, appropriate qualitative data should also be presented. The evaluation of each criterion should be summarized for each SRSNS. It is suggested that the following levels of severity be used:

   None. The Evaluation Criterion makes no contribution to scenic impact. For some criteria a rating of None means that there is No Adverse Impact (e.g., there are no people present at possible viewpoints—Criterion E, or the project is not visible—Criterion F).

   Low. The severity of the contribution is low. While the scenic impact may be Adverse, it appears to be within the acceptable range for any type of development (e.g., a site listed on the National Register of Historic Preservation is identified as having only local significance and no scenic value—Criterion A, or only one or two turbines will be partially visible at a distance of nearly 8 miles—Criterion F).

   Medium. The severity of the contribution is medium, which is Adverse but typical of wind energy development, and within the range of impacts that the Wind Energy Act anticipates (e.g., wind turbines visible and contrast highly with the surrounding landscape,[71] but are not visually dominant).

   High. The severity of the contribution is high from this criterion, which in association with other criteria may make the overall scenic impact Unreasonably

[66] 35-A MRSA, § 3452, sub-§3, criterion C
[67] Subtracting the scenic quality rating of the proposed from the existing condition provides a direct measure of scenic impact. While the criteria do not require measurement of scenic impact, the standard is "unreasonable adverse effect on the scenic character or existing user related to scenic character of SRSNS." 35-A MRSA, § 3452, sub-§1
[68] 35-A MRSA, § 3452, sub-§3, criterion E
[69] 35-A MRSA, § 3452, sub-§3, criterion E
[70] 35-A MRSA, § 3452, sub-§3
[71] 35-A MRSA, § 3452, sub-§3

Adverse (e.g., the significance of the Appalachian Trail is high—Criterion A or the several turbines dominate a view from less than ¼ mile and require the viewer to tilt her head back to see the turbine hub—Criterion F).

A summary of the criteria ratings for each SRSN should be presented in tabular form as part of the VIA conclusion. It is recommended that the ratings not be represented as numbers, but as None, Low, Medium and High, since it is clear that arithmetic should not be used with them.

No satisfactory systematic framework for synthesizing all of the criteria ratings for a SRSNS into an Overall Scenic Impact rating has been determined; nor has one been provided for synthesizing the ratings across all the SRSNS. It is clear that the relationship among the criteria is too complex for simply converting the ratings to numerical values and averaging them. For instance, if the project is not visible from a SRSNS (i.e., as determined in Criterion F Scope and Scale), then the other criteria are irrelevant—without visibility there can be no scenic impact. Similarly, it is unclear that because one of the criteria for an individual SRSNS reaches a High level of severity, then the overall rating would be High. For instance, Criterion F Scope and Scale might be High, but Criterion E.1 Extent, Nature and Duration found that is no indication that visitors ever access the viewpoint, and is therefore None—without the possibility of viewers there can be no scenic impact. Or Criterion A might be Low—the SRSNS is a stone cattle corral of identified as being locally significant and with no indication that it has scenic value, but it is listed on the National Register of Historic Places. Another issue for SRSNS that occupy a large area (e.g., great ponds or state parks) is how to weigh a High scenic impact in a limited area against no visibility or Low scenic impact from most of the SRSNS. In all VIAs prepared under the WEA, the Overall Scenic Impact has been a matter of professional judgment without documentation of a systematic framework that could be applied by others.

No satisfactory synthesis framework for combining the Overall Scenic Impact ratings for individual SRSNS into a determination of whether the collective impact is Unreasonably Adverse or not has been presented either. For instance, it seems clear that a Medium Overall Scenic Impact to three SRSNS would not cross the threshold to be an Unreasonable Averse. However, what if the Medium Overall Scenic Impacts were for 8 great ponds that were SRSNS and these ponds provided visibility from a quarter of the area within 8 miles of the generating facilities? Can the extensiveness of Medium impacts be so great that they cross the threshold of Unreasonable Adverse scenic impacts? It is not even clear if the Overall Scenic Impact to a single SRSNS is High that the threshold of Unreasonably Adverse scenic impact would always be crossed. Again, current practice is to use professional judgment to determine when this threshold is crossed; no systematic framework that can be reliably applied by others has been proposed.

7. **Mitigation**. It is normal in a professional VIA that the approaches taken to mitigate adverse effects are described. Typically, if Unreasonably Adverse scenic impacts were found, approaches to further mitigation would be discussed. This might include revisions to project siting or design, or screening at impacted viewpoints. However, mitigation is

not one of the evaluation criteria for scenic impacts.[72] The Attorney General's Office has advised both DEP that it does not believe mitigation can be required for scenic impacts—if scenic impacts are Unreasonably Adverse, the project should be denied, otherwise it should be approved.

How are simulation viewpoints selected?
The selection of viewpoints for the visual simulations is frequently a source of controversy. Opponents are likely to want simulations that represent "worst case" views, while the developer and other proponents will argue that "typical views" provide a fairer representation. Worst case views are closer, show larger portions of the project, and represent situations where the project appears less compatible with its surroundings. Typical views normally do not show the project at its worst, but are at viewpoints that might have may viewers, or that are selected to represent a diversity of viewing conditions (e.g., distances from the project, types of screening, and levels of incompatibility). It is very unusual for a scientific method (i.e., probability sampling) to be used to select the typical viewpoints—normally they are simply declared "typical" by the analyst. Both types of simulations are useful to decision makers. However, it is difficult to imagine why they would not want to be aware of the very worst case situations

How much detail must a visual simulation represent?
Wind projects can extend across a large part of a view; however they are always composed of individual turbines. Visual simulations must have sufficient resolution and clarity to represent the detail of turbines (e.g., the blades) that viewers can see under good viewing conditions. One approach would be to establish the minimum resolution of a visual simulation based on the standard of "normal vision."

"Normal vision" is based on recognition acuity, which is measured by the familiar Snelling eye chart.[73] The eye chart is composed of letters that subtend 5-minutes of arc in overall size, with lines and gaps that subtend a 1-minute arc. Though the human eye is capable of detecting smaller elements under very good viewing conditions, "normal vision" seems like an appropriate standard to specify a photograph's resolution if it is going to adequately represent visual conditions.

Conceptually, a digital photograph must have one pixel for each minute of arc. However, the pixels will not always lineup with the actual elements in the landscape (e.g., a blade tip), so the widely used rule of thumb is that the image needs twice the resolution of the target to adequately capture the desired information.[74] This means that there needs to be two pixels for every minute of arc in the lens' view.

[72] 35-A MRSA, § 3452, sub-§3
[73] It should be noted that under ideal conditions, the eye may resolve a line that subtends 30-seconds of arc, or even less. However, the Snelling eye chart provides a better approximation of recognition acuity in the everyday landscape.
[74] This is based on information sampling theories developed by Harry Nyquist and Claude Shannon.

Figure 1. The effect of higher pixel density for capturing image detail.

Table 1 shows how large a digital photograph take with a 35 mm, 50 mm or 70 mm full-frame equivalent lens needs to be to capture the resolution of "normal vision." The results show that if the so-called "normal lens" is used, the size of the image should be 15 MP; an 8 MP camera should be using the equivalent of a 70 mm lens and stitching together panoramic photographs to represent the surrounding context.

Table 1. Image size required to represent resolution of "normal vision."

Full-frame Lens	Horizontal Angle	Number of Pixels (30 sec arc)		Image Size (mega-pixels)
		Horizontal	Vertical	
70	28.8	3,456	2,304	8.0
50	39.6	4,752	3,168	15.1
35	54.4	6,528	4,352	28.4

However, standing at the Baskahegan Lake boat launch, where the closest turbine is 9.3 miles distant, on a clear day it is possible to clearly see the Stetson Wind Project turbine blades turning.[75] What would the image resolution need to be to represent this level of detail—a rotating blade tip—in a visual simulation?

Assume that the tip of a turbine blade is 1 meter across, and the viewer is 8 miles (12,875 meters) distant.[76] At this distant, the blade tip will subtend 0.004450 degrees of arc (0.267 minutes or 16 seconds). Incorporating the rule of thumb that two pixels are needed to capture the full detail of an image element, each image pixel must subtend no more than 8 seconds of arc horizontally or vertically. This information can be used to calculate the necessary image size for different focal length lenses.

Table 2 shows that a "normal lens" has a horizontal angle of approximately 40 degrees. If each pixel were to subtend 8 seconds, each image would be 17,000 by 11,880 pixels or 212 MP. This is simply unrealistic for contemporary digital cameras. This result suggests that photographs and simulations do not have sufficient resolution to capture the detail that viewers may actually be seeing. This may be the reason for complaints that simulations of wind projects are not representing the turbines' actual visual impact.

[75] Kleinschmidt. 2012. *Baskahegan Lake User Survey*. Page 4.
[76] The WEA limit of potential scenic impact. 35-A MRSA, § 3452, sub-§3

A solution is to stitch together photographs taken with a telephoto lens to create a composite image, thus increasing the total number of pixels in the simulation. The results for several telephoto lenses are included in Table 2, but it is necessary to use the equivalent of at least a 135 mm or 170 mm lens to bring the image size within the range of commonly available digital cameras.

Table 2. Image size required to represent a blade tip at 8 miles.

Full-frame Lens	Horizontal Angle	Number of Pixels (8 sec. of arc)		Image Size (MB)
		Horizontal	Vertical	
50	39.6	17,820	11,880	212
70	28.8	12,960	8,640	112
105	19.5	8,775	5,850	51
135	15.2	6,840	3,090	21
170	12.1	5,445	3,090	17
200	10.3	4,635	3,090	14

If we come to agreement on the appropriate resolution of a visual simulation, the next issue to consider is how to portray the simulation. A high resolution computer monitor may be 1,920-by-1,200 pixels, which is inadequate for viewing the full detail of any standard being considered here. If we assume that the simulation represents 40 degrees horizontally (i.e., equivalent to a 50mm “normal lens”), there are 17,820 pixels horizontally to print. The sampling rule of thumb applies here too—in order to assure that all of the detail is represented the resolution of the print is twice that of the digital file. An image with 600 pixels per inch would produce a 30 inch wide print and the printer’s resolution should be set to 1,200 dots per inch (i.e., two horizontal printer dots to represent each image pixel). The current practice is not to print simulations at this size—most people do not have printers capable of printing files this size. Even if simulations were created with this resolution, there is not a convenient way to reproduce them.

DRAFT

PUBLIC ACCEPTANCE STUDY OF THE SEARSBURG WIND POWER PROJECT: YEAR ONE POST-CONSTRUCTION

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EXECUTIVE SUMMARY

The public acceptance study of the Searsburg Wind Power Project is somewhat unique because it is designed to compare public attitudes before and after the project's construction. This executive summary presents the most important results from the 1996 pre-construction and 1997 one year post-construction surveys.

Sources of Information about the Searsburg Wind Power Project
Since all 345 respondents participated in the pre-construction survey, they were all aware of the Searsburg Wind Power Project. During the year and a half construction period they learned about the project from multiple sources. Nearly 90 percent had read *Wind Power News*, and a fifth had attended Wind Energy Day on August 16, 1997. Forty percent indicated they had been to the site to see how it works. The most common reaction was a sense of "awe" or expression of "amazement," while others found the rotating turbines "calming." For some the experience was "almost spiritual."

Attitudes towards Wind Power

The advantage or disadvantage of ten general perceptions about wind power were evaluated before and after the Searsburg Wind Power Project's construction. A plot of the change in attitudes is shown in Figure 1 with the operational phrase from each statement. Eight of these characteristics were seen as significantly more advantageous after the project's construction. The increased acceptance is particularly great relative to possible visual and sound impacts of turbines in the landscape. There was no significant change in two characteristics: wind power's relative cost, and the possibility of using land under the turbines. This pattern is essentially the same for Searsburg residents compared to residents of the other towns.

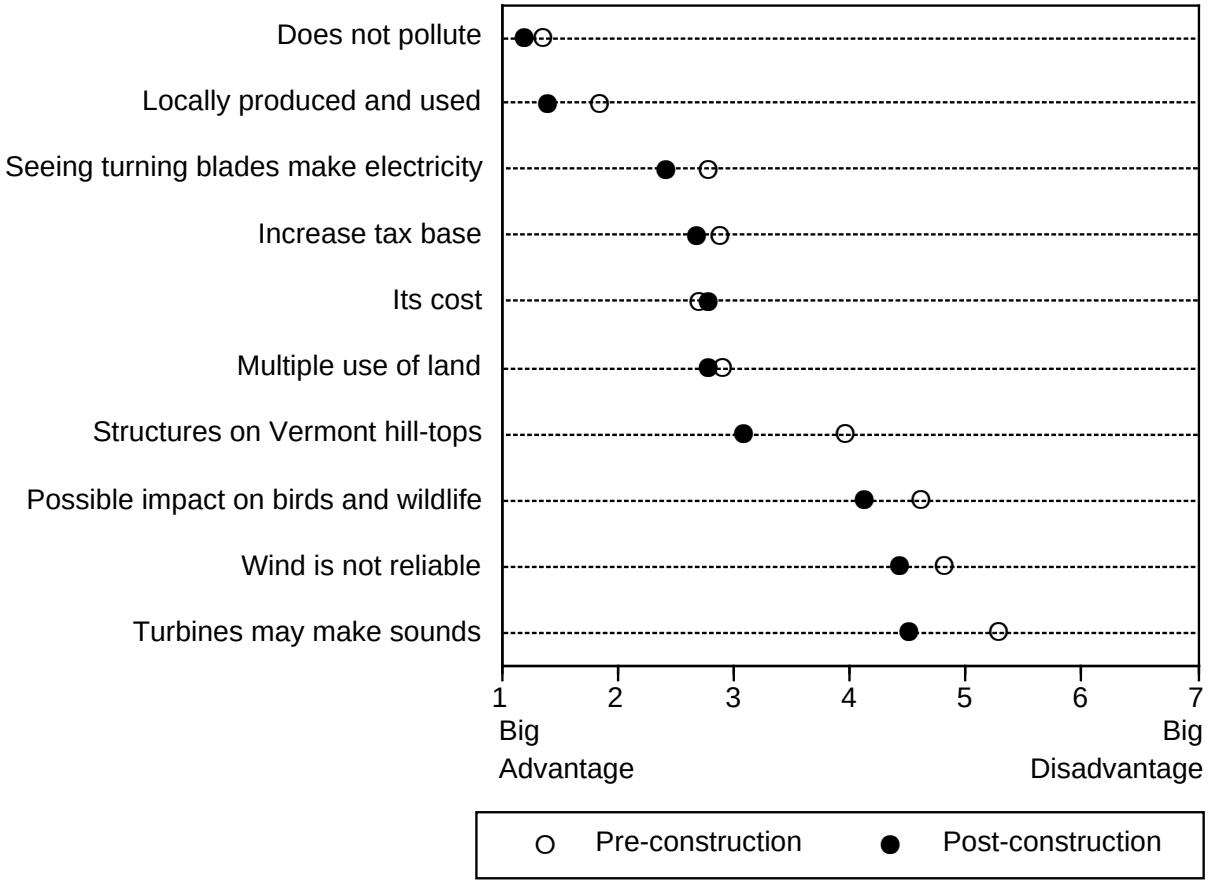

Figure 1. Change in the public's attitude towards wind power plants expressed before and after construction.

Support for the Searsburg Wind Power Project
Respondents were asked four questions in 1996 and 1997 to gage their support for the Searsburg Wind Power Project. The results plotted in Figure 2 show a substantial increase in support for the project. However, this positive shift is not as strong among Searsburg residents.

Clearly, a large portion of this positive shift is based on the respondents' assessment of the completed project rather than the expectations they had prior to construction. As one person wrote, "I think once the turbines were up that people's initial doubts or fears lessened. There is nothing like seeing them 'in the flesh.' Anyone I've talked to thinks they're great." People seem appreciative of Green Mountain Power's efforts to explain the project and what possible impacts it would have on them. "Keep the approach and process, it's good public relations," was one of the comments.

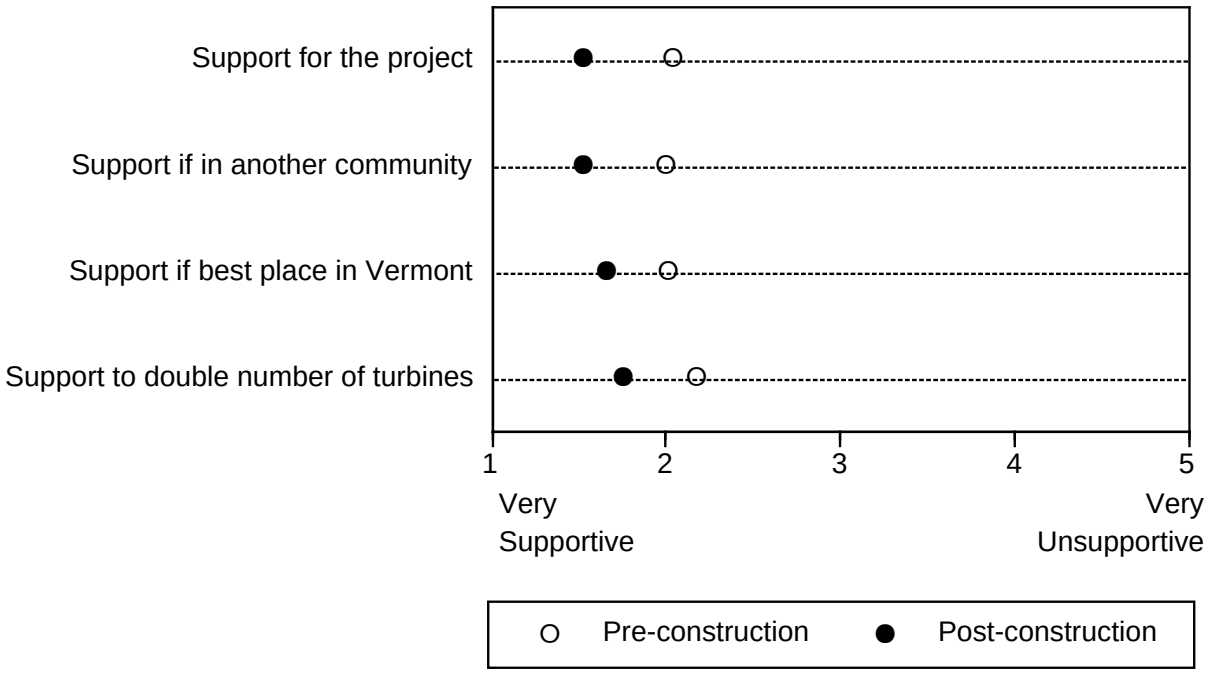

Figure 2. Change in support for the Searsburg Wind Power Project as expressed before and after construction.

Visual Quality of the Searsburg Wind Power Project
As part of both surveys, respondents evaluated the scenic quality of 4.5-by-6.5 inch monochrome images of the Searsburg site seen from 1.25 and 4 miles away, before and after the turbines were constructed. The evaluation of the site without the turbines remained virtually unchanged over the intervening year and a half. In both surveys, the turbines have a statistically significant negative visual impact on the scene. However, this perceived impact is much reduced in the second survey. This is yet another indication of increased acceptance of the project following its construction. The evaluation by Searsburg residents is the similar as that made by residents in other towns.

There is very strong support for the truthfulness of these simulations. Nearly half of the respondents judged them to be very accurate, and less than 5 percent indicated they were inaccurate. Many indicated that simulating the movement of the turbine blades and adding color would be an improvement. As one respondent wrote, "I think these are a valuable tool in the initial presentation of the concept. They are essential to making a reasonable decision about the impact of the installation."

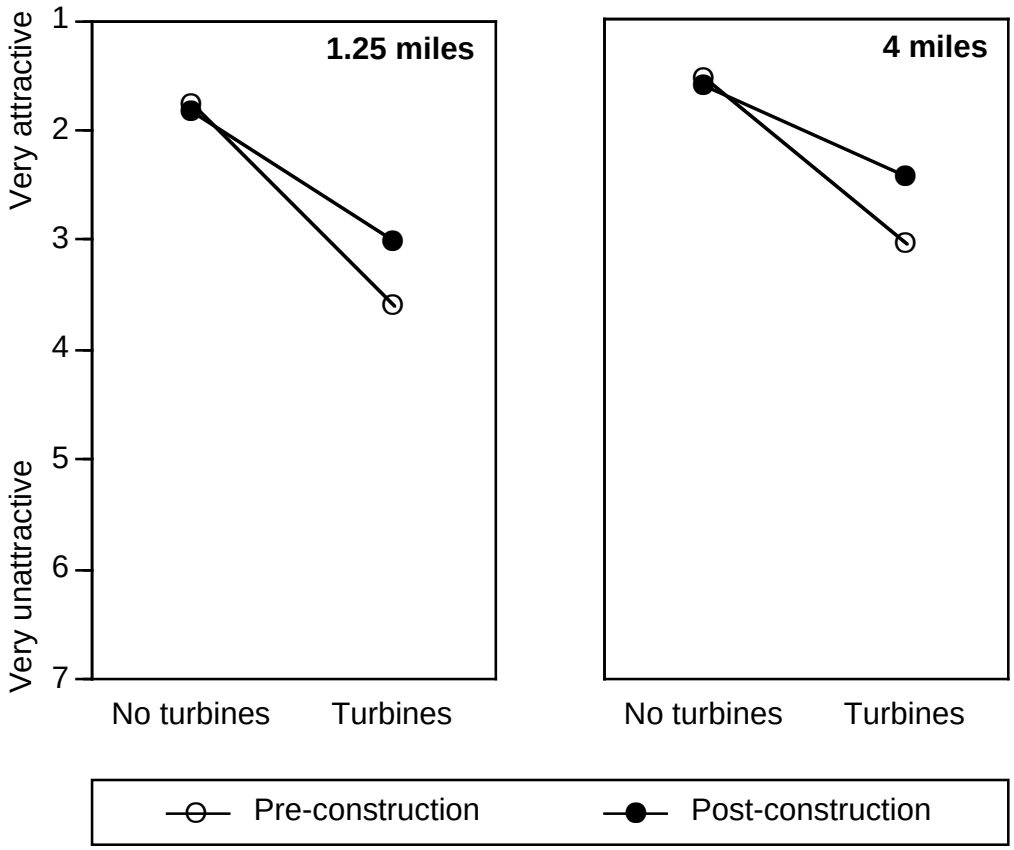

Figure 3. Change in visual quality ratings of the Searsburg Wind Power Project site made before and after construction.

Construction-related Effects of the Searsburg Wind Power Project

The assessment of the construction-related effects by residents of Searsburg compared to residents in the neighboring towns is shown in Figure 4. All effects were judged to be insignificant. The assessment of effects to wildlife and erosion are virtually identical for the two groups. The local Searsburg residents judged the effects to be more significant than other respondents.

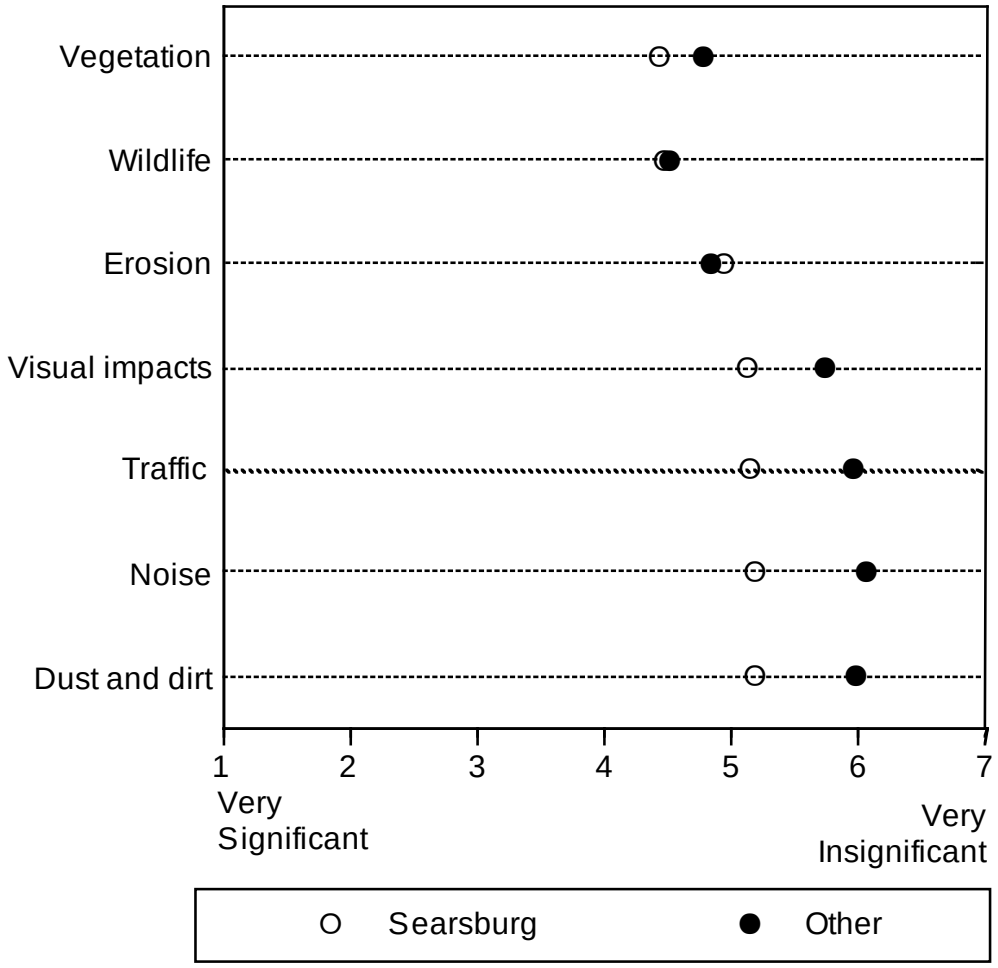

Figure 4. Comparison of ratings made by Searsburg and other respondents of the impacts related to construction of the Searsburg Wind Power Project.

Influence of Pre-construction Support for Wind Power
The Searsburg Wind Power Project is the largest wind power facility east of the Mississippi River. Vermont is a state noted for sensitivity to environmental issues and its landscape qualities. When this study began, the public's reaction to the project was uncertain.

Support for wind power in general was mixed at the time of the pre-construction survey. Approximately 30 percent of the respondents were big supporters of wind power, 36 percent were moderate supporters, and 35 percent were not supporters. This section summarized how this initial level of support for wind power influenced changes in attitudes found in the post-construction survey.

Support for wind power grew in the year and a half between the two surveys. Over half of the respondents are big supporters after completion of the Searsburg project, 30 percent were moderate supporters and less than 20 percent are non-supporters. In general, people tended to retain their level of support or move up one level. Level of support fell for only a few respondents.

Support for Searsburg Wind Power Project. In the pre-construction survey, level of support for wind power appears to determine the level of support for the Searsburg Wind Power Project. This support increased in the post-construction survey so that initially big and moderate supporters of wind power now have similar assessments of the Searsburg project. Their support is still significantly stronger than that from the survey respondents who did not support wind power before construction of the project began.

Scenic value. Initial level of support for wind power has a large effect on the post-construction scenic evaluations. As initial level of support for wind power increases, higher scenic ratings are given to all scenes. However, the ratings of big and moderate supporters are somewhat similar, and they are both significantly higher than non-supporters.

Construction related effects. There is no apparent relationship between initial level of support for wind power and judgments about the significance of impacts experienced from the construction of the Searsburg project.

INTRODUCTION

This report presents the findings of the second in a projected three phase study of public acceptance of the Searsburg Wind Power Project. The full study is designed to investigate the change of public attitudes related to the project from the time prior to construction, through installation, and finally after a couple of years of normal operation. This project was constructed by Green Mountain Power Corporation during the late-summer and fall of 1996. It is located on a hill top to the east of State Route 8 in Searsburg, Vermont. The most visible aspect of the project is eleven 550 kilowatt wind turbines. However, a new substation and approximately 1.5 miles of 69 kilovolt transmission line connecting it to the power grid were also constructed. Capable of providing 6 megawatts of power, this is the largest wind power facility in the eastern United States.

The 1997 post-construction study was conducted after the Searsburg Wind Power Project was constructed and producing power. The study has four primary objectives:

1. Assess the nature and degree of the public's acceptance of the Searsburg Wind Power Project.
2. Measure and assess any changes in the public's attitudes towards the Searsburg Wind Power Project from those measured before construction..
3. Assessment of environmental effects associated with the construction phase of the project.
4. Evaluation of how visible the project is and how well the simulations represented the project's visual qualities.

Summary of Pre-construction Survey
The pre-construction survey used a mailed questionnaire sent in April 1996 to all Searsburg residents, and a random sample of residents in the 4 towns bordering Searsburg. Sixty-three percent of the sample completed the survey. These same 345 respondents also agreed to be part of a panel to complete future surveys about the project.

The study investigated public attitudes, preferences and opinions about (1) environmental and related energy issues, (2) power generation fuels, (3) wind power plants in general, (4) the Searsburg Wind Power Project specifically, and (5) the visual quality of the Searsburg project. Following are the general findings from the pre-construction survey.

Environmental and energy. There was very strong agreement about the need for environmental protection and energy conservation. However, there was no sense of crisis and no one appeared willing to pay significantly more to make things change. In the context of these questions, wind power is clearly an acceptable alternative in Vermont.

Power generation fuels. Overall, there was a desire to increase the amount of wind and hydro produced electricity within the overall mix of fuels. Natural gas and burning municipal waste were without change from their present use. A decrease was indicated for wood, nuclear, oil and coal.

Wind power plants. The highest rating in this survey was given in support of wind power plants for not polluting the air or water. Another big advantage was that it is a source of power that can be produced and used locally. More modest advantages were its cost, the potential for multiple land use, and local tax payments. It was a slight disadvantage that turbines must be placed on hill-tops, that they may injure birds, that the wind does not always blow, and that neighbors may hear them.

Searsburg Wind Power Project. There was clearly solid support for the project. This was so whether the project is in Searsburg or some other location in Vermont. While there is positive support for doubling the number of turbines at the Searsburg location, it is not as strong as support for the current project.

Visual quality. There was a significant visual impact from the introduction of the turbines.

In addition to reporting results for the complete group of respondents, three ways of subdividing the responses were also considered: (1) seasonal and year-round residents, (2) Searsburg and neighboring residents, and (3) the degree of supportiveness of the Searsburg project.

Seasonal and year-round residents. Forty percent of the respondents were seasonal residents, many of whom have permanent addresses outside of Vermont. Forty-one percent of the seasonal residents knew about the survey prior to receiving the questionnaire, compared to 79 percent of the year-round residents.

Both groups of respondents had similar attitudes towards environmental issues. However, the seasonal residents were more sensitive to the presence of wind turbines and their visual effects to Vermont's landscape. Seasonal residents were also less concerned about tax benefits from a local power facility, or other local benefits. Seasonal residents were much less likely to support the Searsburg project than year-round residents.

Searsburg and other residents. Fourteen percent or 47 of the respondents lived in Searsburg. Ninety-one percent of the Searsburg residents were aware of the project prior to receiving the questionnaire, compared to fifty-nine percent of the other respondents. Overall, the pattern of responses for these two groups was very similar, including the perceived benefit of wind power to the environment, its cost relative to other power sources, and its contribution to the local tax base. However

the Searsburg respondents were slightly more critical of how well wind power facilities visually fit into the landscape.

Supportiveness of the Searsburg project. The respondents were divided roughly into thirds, those who were very supportive of the Searsburg project, those who were supportive, and those who were uncertain or unsupportive. The more supportive the respondent, the more likely that they knew about the project before receiving the questionnaire in the mail. All three groups have similar opinions about the need for environmental protection. However, level of support for the project is directly related to the belief that greater energy conservation is needed. A more positive attitude towards wind energy in general was also directly correlated with support for the project. All three groups gave similar visual quality ratings to the two pre-construction views. However the most supportive group saw the presence of the wind turbines as having little or no visual impact, while the least supportive saw it as having as adverse visual impact.

METHODS

Questionnaire

A questionnaire was developed for the year one post-construction study to investigate changes is public perceptions relative to the five substantive themes. The first section focuses on the extent to which 12 characteristics of wind power projects are judged to be advantageous or disadvantageous. Ten of these questions are repeated from the 1996 pre-construction survey. The second section seeks to gauge the degree of support for the Searsburg project by using 4 questions from the 1996 survey. The third section asks respondents about how they were effected by the Searsburg Wind Power Project's construction. The fourth section focuses on visual quality issues. It identifies how frequently they see the Searsburg project, as well as from where and in which season they can see it. Respondents then rate the attractiveness of the Searsburg site with and without the wind project, as seen from 1.25 and 4 miles away using the same simulations included with the 1996 survey. This time they also are asked to evaluate the effectiveness of these simulations in portraying how the Searsburg project actually looks. They are encouraged to describe any reactions to the project, how it looks, or the simulations. The final section collects information about the respondents. It includes a profile of their outdoor recreation participation and how they have continued to keep informed about the project.

The survey mailings consisted of:

- a cover letter from John Zimmerman, President of Vermont Environmental Research Associates,
- the four page questionnaire,
- pre and post-construction half tone images of the turbines from two views,
- an address card for future mailings,
- a post-paid return envelope for the questionnaire.

Copies of these materials are included in the appendix accompanying this report.

Sample

The 1996 pre-construction survey indicated that respondents would be invited to participate in two follow-up surveys. The original survey went to every house in Searsburg and a random sample of households from the other four populated towns surrounding the wind power project site. An accompanying letter introducing the survey invited the adult most recently celebrating his or her birthday to complete the questionnaire and participate in a follow-up survey. There was a 63 percent response rate to the pre-construction survey. A total of 345 households responded to the pre-construction survey. An additional six responses were returned after the cut-off date for inclusion in the pre-construction survey report. These six responses were added to the pre-construction survey data base for future analysis.

Questionnaires were mailed to these 351 addresses on September 18, with a follow-up postcard reminder sent to those not responding by September 29, 1997. The response statistics for the year one post-construction sample are summarized in Table 1. Twelve of these questionnaires could not be delivered because the respondent had moved without leaving a forwarding address, or was unavailable for some other reason. A total of 250 responses were received by November 21, for a response rate of 73.7 percent.

Table 1. Sample related aspects of the 1997 post-construction survey

Sampled addresses	351
Not deliverable	12
Total Usable Sample	339
Responses	250
Response Rate	.737

An attempt was made to telephone a sample of 30 non-respondents on Tuesday, November 25 to determine why they chose not to participate. Twenty-six or 86.7 percent could not be contacted because there was no answer, or the phone was disconnected. Two or 6.7 percent indicated they did not receive the survey in the mail or knew nothing about it. Another 6.7 percent indicated they had moved from the area and felt it inappropriate to respond.

Notes on Statistical Usage
The report makes use of some basic statistics that may not be familiar to all readers. Therefore a short explanation may be helpful to some. The actual calculations of the statistics used in this report were done with Data Desk (Vellman 1995), an exploratory data analysis program for Macintosh and Windows95 computers.

Comparing counts. Frequency counts are reported in the tables as percentages. Readers are warned that percents may not total to exactly 100 because of rounding error. When the frequency distributions of groups are compared, the X^2 (chi-squared) statistic is used. It tests for the probability (p) that the observed differences could be explained by random variation within the data.

Comparing means. Often the results of an analysis are reported as an average or mean value for a group. When the mean ratings of two groups are compared, a t -test is used to determine if they are sufficiently different from one another as to be unlikely to have occurred by chance. A paired t-test is used when means from the same individuals are being compared, such as comparing rating made before and after the project's construction.

An analysis of variance F statistic is used to test whether the difference among several groups' means is greater than the variation within each group would suggest.

Statistical significance. The statistical significance of these three tests are reported as a probability or p value. A probability of .500 indicates that there is a 50 percent chance that the relation could occur from random variation. A value smaller than .050 is generally accepted by statisticians as being significant. It means that the observed pattern or value would be expected to occur once in twenty times from random variations in the data alone. The reader is cautioned not to blindly accept results based on statistical significance, which are simply a statement of probability. The importance of results must rely on the interpretation of the reader.

YEAR ONE POST-CONSTRUCTION

Respondents' Profile

Background characteristics. The demographic information gathered from the post-construction survey is abbreviated, since the targeted respondents had participated in the pre-construction survey. As shown in Table 2, just over 60 percent of the respondents are men. The average age of the group is 55 years.

Table 2. Background characteristics of respondents: 1997

		Percentage
Gender:	Male	61.9
	Female	38.1
Age:	18 to 24 years	0.0
	25 to 34 years	5.4
	35 to 44 years	19.6
	45 to 54 years	24.2
	55 to 64 years	24.6
	65 to 74 years	19.6
	over 75 years	6.7

Notes: n = 247.

Outdoor recreation participation. Each respondent was asked to provide a profile of how frequently they engage in 12 outdoor recreation activities. The responses are shown in Table 3. Most respondents hike or walk for recreation; 40 percent do it frequently. Nature study and downhill skiing are occasional activities, followed by fishing and motor boating. More occasional activities include camping, cross-country skiing, picking edible plants, snowmobiling, and hunting. The least common activity involves off-road vehicles, which are never used by 80 percent of the respondents.

Table 3. Recreation participation: 1997

	Percentage			
Recreation activity	Frequently	Occasional	Never	Mean
Hiking or walking	39.5	52.8	7.7	1.68
Nature study or bird watching	18.1	45.6	36.3	2.18
Downhill skiing	27.4	23.4	49.2	2.22
Fishing	12.5	43.5	44.0	2.31
Power or motor boating	16.9	31.5	51.6	2.35
Camping	10.5	34.7	54.8	2.44
Cross-country skiing	12.5	29.8	57.7	2.45
Picking edible plants	7.7	28.2	64.1	2.56
Canoeing or kayaking	6.0	29.4	64.5	2.58
Snowmobiling	11.7	18.5	69.8	2.58
Hunting	11.7	13.3	75.0	2.63
Off-road vehicles or ATVs	8.1	11.7	80.2	2.72

Notes: n = 248. Means are calculated using 1 = frequently, 2 = occasionally, and 3 = never.

Sources of Information about the Searsburg Wind Power Project
All the respondents were aware of the Searsburg project because they had responded to the pre-construction survey and were subsequently placed on the mailing list to receive Green Mountain Power's newsletter, *Wind Power News.* During the past year and a half, 40 percent indicated that they had been to the project site to see how it works and what it looks like. However, they were asked how they had heard about the Searsburg Wind Power Project since the last questionnaire (April 1996). Their responses are listed in Table 4.

Close to 90 percent identified *Wind Power News* as a source of information about the project. Almost 60 percent also kept up on the project's progress through newspaper or radio reports. Approximately half saw some construction activity and 37 percent learned about it from friends. On August 16 Green Mountain Power held Wind Energy Day, an open house for the public to visit the site and learn about the project and other energy topics. Over 20 percent of the respondents indicated that Wind Energy Day was a source of information for them.

Table 4. Sources of information about the Searsburg Wind Power Project during past year: 1997.

Source	Percent
Newsletter from Green Mountain Power	88.5
Newspaper or radio report	58.8
Saw construction activity	51.0
From friends or acquaintances	37.4
Wind Energy Day activities (August 16, 1997)	21.8
Some other source	6.2

Attitudes towards Wind Power Plants

The respondents' attitudes towards wind power was gauged by asking how much they agreed or disagreed with twelve statements commonly cited as advantages or disadvantages of wind power. Table 5 summarizes their responses.

Almost 90 percent of the respondents think that a big advantage of wind energy is that it does not pollute the air or water. Eighty-one percent see health safety as also being a big advantage. That it is a locally produced source of energy is identified as a big advantage by three-quarters of the respondents.

Wind power turbines also receive solid support for several other characteristics. There is strong support among 60 percent of the respondents for being able to see the wind turbines producing power. Over half of the respondents find the clustering of wind turbines in several places is preferable to building a large conventional power plant. Of less importance are the project's contribution to the local tax base, its cost relative to other energy sources, and the possibility of finding other compatible uses for land surrounding the turbines. The need for wind turbines to be placed on ridges, making them highly visible, was perceived to be a slight advantage.

Three attributes were generally considered to be disadvantageous. Forty-six percent of the respondents expressed concern about possible noise from the turbines. The fact that the wind does not blow all the time was also identified as a concern by 46 percent of the respondents. Possible impacts to wildlife were a possible concern for 31 percent of the respondents. However, large percentages of the respondents also indicated that they were unsure about the advantage or disadvantage of these three characteristics.

Table 5. Attitudes towards wind power: 1997.

Statement	Percentage							Mean Rating
	Big Advantage	Advantage	Slight Advantage	Unsure	Slight Dis-advantage	Dis-advantage	Big Dis-advantage	
It does not pollute either the air or water.	88.4	7.2	2.0	1.2	0.0	0.8	0.4	1.21
Wind energy is safe for my healthy and my family's.	80.6	13.8	2.0	3.2	0.0	0.0	0.4	1.30
It's an energy source that can be produced and used locally.	74.6	16.9	3.6	4.4	0.0	0.0	0.4	1.40
I like seeing wind turbine blades turning, knowing they are producing electricity our community is using.	41.5	19.1	16.7	12.2	4.4	3.7	2.4	2.43
Small clusters of wind turbines can be located in several places to produce as much power as a conventional power plant in one place.	34.8	21.6	16.8	19.6	2.8	1.2	3.2	2.50
The wind power facility will increase the local tax base and lower property taxes.	27.7	15.7	19.3	35.3	0.4	1.2	0.4	2.70
Its cost relative to other sources.	31.7	10.4	14.9	37.8	1.6	1.6	2.0	2.80
Land under wind turbines can be used for some other purposes.	23.7	21.2	20.4	26.5	4.9	1.2	2.0	2.80
Wind turbines must be on hill-tops to intercept strong winds resulting in man-made structures on the Vermont landscape.	35.5	14.1	9.1	11.6	15.3	5.4	9.1	3.10
Wind turbines' impact on birds and wildlife (which is not well understood, and may be negative).	5.6	5.2	14.5	43.8	13.7	10.4	6.8	4.13
Wind power is not reliable because the wind does not blow all the time.	1.7	3.7	18.3	30.3	27.0	10.4	8.7	4.43
Wind turbines may make sounds heard by neighboring residences.	2.4	3.2	12.5	35.7	23.3	13.7	9.2	4.52

Notes : n = 250 Means are based on ratings with 1 = a big advantage and 7 = a big disadvantage.

Attitudes towards the Searsburg Wind Power Project
Four questions were asked to gage the support for the Searsburg Wind Power Project. The results in Table 6 show that two-thirds of the respondents are very supportive of the Searsburg Wind Power Project, and another 23 percent are supportive. Only 11 percent indicate some uncertainty or level of unsupportiveness. These figures remain virtually unchanged when the question is whether such a project would be in a community other than their own. When asked about their support if their community were the only suitable location for such a wind power project, 58 percent would be very supportive and 28 percent supportive. Fifty-nine percent of the respondents are very supportive of doubling the number of turbines at the Searsburg site if it becomes a demonstrated success; an additional 21 percent are supportive.

Table 6. Support for the Searsburg Wind Power Project: 1997.

	Percentage					
Statement	Very Supportive	Supportive	Uncertain	Unsupportive	Very Unsupportive	Mean Rating
From what you know about this wind power project, how supportive of it are you?	66.3	22.8	6.1	1.6	3.3	1.53
If this project were located in or near a community other than your own, how supportive would you be of it?	64.5	23.4	8.5	2.0	1.6	1.53
Assuming that there are no other places in Vermont better suited for a project of this type, how supportive would you be of this project in your community?	58.0	27.8	7.8	2.9	3.7	1.67
If the project is technically successful, how supportive would you be of doubling it's output from 11 to 22 turbines?	58.9	21.0	11.3	3.2	5.6	1.76

Notes : n = 248. Mean are based on ratings with 1 = very supportive and 5 = very unsupportive.

In their own words. The 100 respondents who had been to the project site to see how it works and what it looks like were asked to share what they thought. Of the seventy-eight offering responses, 19 percent were negative and 81 percent were positive. Their responses fall into five general categories, as summarized in Table 7.

Two-thirds of the aesthetic responses were positive, while a third were negative. Most found them "very attractive," and "fascinating to watch--works of art."

Others found them an "ugly reminder of commercialism" that "ruins the view" and is a "ghostly intrusion on the natural landscape." Sound was mentioned by a few people. Most indicated that the turbines were "pretty quiet," but one wrote that "it's OK, but I hear them at night and it is sort of disturbing to listen to since we are in such a desolate area."

Emotional responses that seem to express feelings rather than a judgment are by far the most common. Of these, over 90 percent are positive. Many report feeling a sense of "awe" and express "amazement," while others find them "calming." For one respondent the experience was "surreal--similar to seeing Yankee Rowe for the first time many ears ago--all that technology working quietly in the woods." For another it was "almost spiritual." Only 9 percent of the emotional responses are negative, such as "[I feel] annoyed" and "I live close enough to know I don't like them."

Just over half of the environmental comments were positive. Most indicated that the project seemed to "do as little damage as possible to the area" and that they were "eco-friendly." Negative comments concerned the "removal of vegetation," and possible "disruption to wildlife." One respondent was left to "wonder what the moose in the area think of it?"

Ninety percent of those commenting on the technology had positive observations. They commented on the "impressive workmanship," and interest in it as an "engineering achievement." The only negative comment indicated concern with their "viability in our climate."

All the utilitarian comments were positive. These people were pleased to "see nature at work" and think of it as a "good way to produce power."

Table 7. Summary of comments from those who visited the site.

	Percent
Aesthetic	16.7
Emotional	43.6
Environmental	14.1
Technological	15.4
Utilitarian	10.3

Construction-related Effects of the Searsburg Wind Power Project
During the eighteen months between the 1996 and 1997 surveys some of the respondents saw the construction and testing of the Searsburg Wind Power Project. This year one post-construction survey sought to determine whether the respondents thought there were any significant environmental effects from this construction activity. The results in Table 8 indicate all the construction effects were judged to some extent to be insignificant.

Respondents seem most uncertain about disturbance to wildlife during construction. They also are most uncertain about damage to vegetation and construction related erosion. The other construction effects were clearly thought to be insignificant. Forty-four percent found the visual effects of the construction activity to be very insignificant. Half found the increased traffic congestion to be very insignificant. Fifty-two percent indicated that the increased dust and dirt from construction activity was very insignificant. Noise associated with construction activity was very insignificant for 54 percent of the respondents.

Table 8. Significance of Searsburg project construction impacts.

	Percentage							
Statement	Very Significant	Significant	Slightly Significant	Unsure	Slightly Insignificant	Insignificant	Very Insignificant	Mean Rating
Disturbance to wildlife during construction.	6.5	4.5	8.1	40.7	9.8	12.2	18.3	4.52
Removal or damage of vegetation during construction.	4.5	3.7	11.4	32.5	10.6	17.1	20.3	4.74
Erosion resulting from construction activity.	3.7	3.7	5.7	39.0	9.4	15.4	23.2	4.86
Visual effects from construction activity.	3.3	4.1	4.9	11.1	7.8	24.3	44.4	5.67
Increased traffic congestion or delays.	1.6	2.0	4.1	11.8	12.2	18.7	49.6	5.85
Dust and dirt from construction activity.	2.4	2.4	4.1	11.4	6.5	21.1	52.0	5.89
Noise from construction activity.	2.8	1.6	3.7	11.0	5.7	21.1	54.1	5.95

Notes: n = 246. Mean are based on ratings with 1 = very significant and 7 = very insignificant.

Visual Quality of the Searsburg Wind Power Project

Visibility. Respondents were asked how often they normally noticed the Searsburg Wind Power Project. The results are listed in Table 9. Eighteen percent indicated that they noticed the wind turbines at least daily. Another 44 percent indicated that they noticed them at least a couple times during the week. Thirty-eight percent indicated that they noticed them only once a month or even less frequently.

When asked how frequently they recreated in areas where the Searsburg Wind Power Project was visible, 28 percent responded frequently, another 49 percent responded occasionally, and 23 percent responded never.

Table 9. How often respondents notice the Searsburg Wind Power Project.

Frequency	Percent
Many times a day	6.2
Once or twice a day	11.9
Couple times a week	18.9
Couple times a month	24.7
Once a month	7.8
Not even once a month	30.5

Since the wind turbine towers had been installed for a year at the time of the post-construction survey, it was possible for the respondents to identify how frequently they see the project, during which season it is visible, and from where. Table 10 summarizes the responses to these questions. Whether it is summer or winter, the great majority of respondents cannot see the project from their home, the home of friends or relatives, or the place where they work. However, it is a clearly visible to half the respondents when they drive around the area, and a little visible to an additional third.

Table 10. Where respondents can see the Searsburg Wind Power Project.

		Percentage			
Season:	Location	Not visible	A little visible	Clearly visible	Mean
Summer:	Your home	86.3	3.3	10.4	1.24
	Friend or relative	74.7	12.0	13.3	1.39
	Your place of work	92.1	2.9	5.0	1.13
	While driving in the area	16.2	36.5	47.3	2.31
Winter:	Your home	83.7	4.4	11.9	1.28
	Friend or relative	71.8	12.8	15.4	1.44
	Your place of work	90.7	3.5	5.7	1.15
	While driving in the area	15.4	30.0	54.6	2.39

Notes: n = 241 in summer and 227 in winter. Means are calculated using 1 = not visible, 2 = a little visible, and 3 = clearly visible.

Scenic quality. Respondents used black and white simulations to evaluate the visual quality of the project site both without and with the wind turbines at a distance of 1.25 and 4 miles from the project. The results in Table 11 show a clear preference for the site before construction of the project, though it is still judged an attractive landscape with the turbines clearly visible.

A two-way analysis of variance (ANOVA) indicates that the longer view is more attractive ($F = 18.3$, $p < .0001$), and the presence of the wind turbines has a significant negative impact on attractiveness($F = 113.8$, $p < .0001$). There is a mild tendency for the visual impact being less severe for the far view than for the near view. However, this interaction between the distance of the view and the presence of the wind turbines is not statistically significant ($F = 3.1$, $p = .078$).

Table 11. Scenic ratings of Searsburg Wind Power Project simulations.

	Percentage							
View	Very Attractive	Attractive	Slightly Attractive	Unsure	Slightly Unattractive	Unattractive	Very Unattractive	Mean Rating
View A: 1.25 miles away, no turbines	55.9	23.5	11.8	3.4	2.5	1.3	1.7	1.84
View B: 4 miles away, no turbines	62.8	24.4	8.5	1.7	0.9	0.4	1.3	1.60
View C: 1.25 miles away, with turbines	23.8	25.4	19.6	8.8	9.6	5.4	7.5	3.01
View D: 4 miles away, with turbines	30.7	34.9	16.0	6.7	4.6	4.2	2.9	2.44

Notes : n = 240. Mean are based on ratings with 1 = very attractive and 7 = very unattractive.

Simulation quality. With completion of construction, respondents are able to share their judgment of how well the visual simulations used in the surveys represent the way the Searsburg project actually looks. As reported in Table 12, 47 percent of the respondents thought the simulations were very accurate, and an additional 40 percent thought they were somewhat accurate. Fifty-three of the respondents responded to our request to verify their judgment of accuracy by going someplace where they could see the simulations, while the remaining 168 responded from memory. There is no significant difference between those who went someplace where they could see the wind turbines to check the simulations' accuracy and those who made their judgment from memory (t = .08, p = 0.933).

Table 12. Accuracy of the visual simulations when compared to the actual project.

		Checked outside?	
Frequency	Percent	Yes	From memory
Very accurate	46.6	50.9	47.6
Somewhat accurate	40.3	39.6	41.1
Uncertain	8.5	1.9	7.1
Somewhat inaccurate	3.4	5.7	3.0
Very inaccurate	1.3	1.8	1.2
Number of responses	236	53	168

Notes: 24% checked accuracy in the field, the remainder responded from memory. There is no significant difference between these two groups ($X^2 = 2.95$, $p = 0.566$, $df = 4$).

A more difficult question is how well any static medium, such as a photograph, can represent a dynamic feature, such as the Searsburg wind turbines. The results reported in Table 13 show that 48 percent think it is unimportant to show the movement of the wind turbines, while 39 percent think that the movement is an important characteristic that should be represented by the simulations.

Table 13. Importance that visual simulations show the wind turbines moving.

Frequency	Percent
Very important	10.9
Somewhat important	28.2
Uncertain	13.0
Somewhat unimportant	24.8
Very unimportant	23.1

Respondents were also invited to share any comments about the simulations or their use to explaining the project to the public. Almost everyone agrees that the simulations are very accurate. However, several indicated that "people should see and hear for themselves before drawing any conclusions."

There seemed to be substantial support for the use of simulations. "They are an excellent tool!" "They were a valuable tool in the initial presentation of the concept; essential to making a reasonable decision about the impact of the installation." "Keep the approach and process. It is good public relations."

The most common criticism is that the simulations are black-and-white rather than color. Several commented that a view closer than a mile away should have been included. A couple of people also indicated that they thought movement would be an important addition, perhaps through a video simulation. A couple of people also thought that the turbines "look bigger in real life."

An artifact of photographs is that they draw attention to aspects of our environment that fade into the background as we become accustomed to them. For instance, several people commented about the overhead wires in the pre-construction views. However, one respondent indicated that this was an unfair representation, since "when actually on the road, the wires are not as noticeable to the viewer." Similarly, another respondent wrote "the reality is that I don't see or think about the turbines while driving from Wilmington to Bennington."

COMPARISON OF PRE- AND POST-CONSTRUCTION RESPONSES

A primary objective of the one year post-construction survey is to investigate how the public's attitude towards the Searsburg Wind Power Project may have changes from just before construction commencing until just after placing it in service. Five themes were investigate in both the 1996 pre- and 1997 post-construction surveys: (1) respondent background characteristics, (2) sources of information about the project, (3) attitudes towards wind power, (4) attitudes towards the Searsburg Wind Power Project, and (5) pre- and post-construction scenic value of the project.

Respondents' Profile

Background characteristics. Two demographic characteristics were requested the 1997 survey. As shown in Table 14, slightly more females responded to the second than the first survey. There were more respondents from the first survey in the over 75 years old age group, compared to the second survey. In the second survey, it was the 35 to 44 years old group that was larger than expected.

The design of this study assumes that the same person responds to both surveys. Taken together, these two demographic attributes indicate that 24 respondents to the second survey were not the same person who responded to the first survey. While this accounts for 10 percent of the respondents, it is not likely a cause for serious concern. Members of the same household are more likely to share opinions concerning social issues than are people from different households. While a change in the household member responding to the survey does introduce potential error, it is not anticipated that it will bias the results.

Table 14. Comparison of respondents characteristics: 1996 and 1997.

		Percentage	
		1996	1997
Gender:	Male	64.7	61.9
	Female	35.3	38.1
Age:	18 to 24 years	0.9	0.0
	25 to 34 years	6.5	5.4
	35 to 44 years	6.5	19.6
	45 to 54 years	22.2	24.2
	55 to 64 years	26.9	24.6
	65 to 74 years	19.1	19.7
	over 75 years	17.9	6.7

Notes: Respondents in 1996 n = 331, and in 1997 n = 247.

Sources of Information about the Searsburg Wind Power Plant
In 1996, prior to the commencement of construction, one-third of the respondents had not heard of the Searsburg Wind Power Project. The results in Table 15 show how people kept informed about the project and wind power has changed in the year and a half between the two surveys. Almost 90 percent of the respondents read *Wind Power News*, the newsletter from Green Mountain Power, while only a third read it before the construction began. Also, half of the respondents saw construction activity during the past year and a fifth went to the Wind Energy Day activities. Virtually no one had seen activity on the site prior to commencement of construction. Awareness through the news media and discussions with friends have also increased, though not as much as one might expect. No public meetings were held concerning the project in the past year and a half, so this was not a source of information in 1997.

Table 15. Changes in sources of information about the Searsburg Wind Power Project: 1996 and 1997

	Percent	
Source	1996	1997
Newsletter from Green Mountain Power	37.7	88.5
Newspaper or radio report	44.2	58.8
Saw construction activity	0.4	51.0
From friends or acquaintances	29.0	37.4
Wind Energy Day activities (August 16, 1997)	- -	21.8
Public meeting	8.7	- -
Some other source	5.2	6.2
Not heard	36.8	- -

Attitudes towards Wind Power Plants

Ten statements about possible advantages or disadvantages of wind power were evaluated by respondents to both surveys. Table 16 shows the mean ratings in 1996 and 1997, as well as the results of a Paired-*t* test of the statistical significance of the change between surveys. Respondents gave their most favorable ratings in both surveys to the first two statements. There is a highly significant increase in their support of wind power because it does not pollute the air or water, and because it is a locally produced and used source of energy. Respondents also expressed a significantly greater appreciation for seeing the turbine blades turning and knowing that they are producing electricity for their community.

There is no significant change in their attitudes towards the next three statements: increased local tax base, cost relative to other sources, and potential for multiple-use of the land.

The changes in attitude towards the final four statements are statistically significant. During the first survey, respondents were clearly uncertain about the advantage or disadvantage of having to place wind turbines on highly visible ridge tops. After the project's construction, respondents came to see this overall as a slight advantage. The potential impacts to wildlife was seen as a slight disadvantage in 1996, but changed to an uncertain rating in 1997. Prior to construction, the unreliability of wind and the potential of noise from the turbines were seen as real disadvantages. In 1997, concern for these disadvantages was significantly reduced.

Table 16. Changes in attitudes towards wind power plants: 1996 and 1997

Statement	Mean 1996	Mean 1997	Paired *t*	*p*
It does not pollute either the air or water.	1.37	1.21	3.44	0.0007
It's an energy source that can be produced and used locally.	1.86	1.40	5.56	< .0001
I like seeing wind turbine blades turning, knowing they are producing electricity our community is using.	2.80	2.43	3.30	0.001
The wind power facility will increase the local tax base and lower property taxes.	2.89	2.70	1.64	0.102
Its cost relative to other sources.	2.72	2.80	– 0.63	0.528
Land under wind turbines can be used for some other purposes.	2.92	2.80	0.85	0.398
Wind turbines must be on hill-tops to intercept strong winds resulting in man-made structures on the Vermont landscape.	3.97	3.10	6.30	< .0001
Wind turbines' impact on birds and wildlife (which is not well understood, and may be negative).	4.63	4.13	5.07	< .0001
Wind power is not reliable because the wind does not blow all the time.	4.83	4.43	4.56	< .0001
Wind turbines may make sounds heard by neighboring residences.	5.29	4.52	7.69	< .0001

Notes : n = 250 Means are based on ratings with 1 = a big advantage and 7 = a big disadvantage.

Attitudes towards the Searsburg Wind Power Project

Respondents to the first survey expressed overall support for the Searsburg or similar wind power project. Table 17 reports the mean ratings and paired-*t* test for the 1996 and 1997 responses. As measured by each question, support has increased significantly in the year and a half. Respondents express strong support for the project, even if it was in their own community or were to double in size.

Table 17. Change in support for the Searsburg Wind Power Project: 1996 and 1997

	Mean			
Statement	1996	1997	Paired *t*	*p*
From what you know about this wind power project, how supportive of it are you?	2.05	1.53	8.38	< .0001
If this project were located in or near a community other than your own, how supportive would you be of it?	2.01	1.53	7.35	< .0001
Assuming that there are no other places in Vermont better suited for a project of this type, how supportive would you be of this project in your community?	2.02	1.67	4.95	< .0001
If the project is technically successful, how supportive would you be of doubling it's output from 11 to 22 turbines?	2.18	1.76	5.58	< .0001

Notes : n = 244. Mean are based on ratings with 1 = very supportive and 5 = very unsupportive.

Visual Quality of the Searsburg Wind Power Project

Overall, respondents in both 1996 and 1997 think that the project changes the attractiveness of the site. The mean scenic evaluations from the 1996 and 1997 surveys of the site pre- and post-construction are shown in Table 18. The ratings of the Searsburg site prior to construction of the project did not change meaningfully between 1996 and 1997. However, ratings of the scenic value of the site with the wind turbines in place improved markedly.

These results indicate that the basis of scenic judgments has remained stable -- ratings of the site without the project are stable. However, the significant reduction in perceived scenic impact provides another indication of increasing public acceptance of the project.

Table 18. Change in scenic ratings of the Searsburg Wind Power Project simulations: 1996 and 1997.

	Mean			
View	1996	1997	Paired *t*	*p*
View A: 1.25 miles away, no turbines	1.76	1.84	– 0.44	0.663
View B: 4 miles away, no turbines	1.53	1.60	– 0.53	0.596
View C: 1.25 miles away, with turbines	3.61	3.01	5.42	≤ 0.0001
View D: 4 miles away, with turbines	3.04	2.44	6.10	≤ 0.0001
Near visual impact (View A – View C)	-1.85	-1.61	-5.0	≤ 0.0001
Far visual impact (View B – View D)	-1.51	-0.84	-5.3	≤ 0.0001
Average visual impact	-1.68	-1.01	-5.3	≤ 0.0001

Notes : n = 226. Means are based on ratings with 1 = very attractive and 5 = very unattractive.

PROXIMITY PROJECT AND CHANGE IN ACCEPTANCE

The NIMBY or "Not in my backyard!" phenomenon has led to gridlock for all kinds of development proposals across the country. This study provides an unusual opportunity to investigate any differences between changes in the pattern of acceptance from those in whose backyard a project is located and other regional residents. There are 34 respondents who live in Searsburg. It is within their backyards that this project is located.

This section compares the post-construction ratings by Searsburg residents and other respondents of wind power, the Searsburg project, their experience with any impacts from the construction, and various questions about the project's visual quality. In addition, the pre-construction and post-construction responses are compared separately for the Searsburg residents and the other respondents. These comparisons over time are made for the questions that were included in both surveys: attitudes towards wind power, support for the Searsburg project, and the scenic value of the project site before and after the project's construction.

Attitudes towards Wind Power Plants

The post-construction survey found few differences between the Searsburg residents and the other respondents concerning attitudes towards wind power plants. Table 19 shows that the only statistically significant difference is a slightly less positive feeling among Searsburg residents about the health safety of wind power for the individual and their family. However, overall both groups rate health safety as one of the greatest advantages of wind power -- along with being pollution free and locally produced.

Table 19. Comparison of 1997 attitudes towards wind power plants by Searsburg and other residents.

Statement	Searsburg	Other	*t* - test (*p*)
It does not pollute either the air or water.	1.41	1.18	1.7 (.095)
It's an energy source that can be produced and used locally.	1.44	1.39	0.3 (.754)
Wind energy is safe for my health and my family's	1.55	1.26	2.0 (.044)
I like seeing wind turbine blades turning, knowing they are producing electricity our community is using.	2.18	2.46	0.9 (.362)
The wind power facility will increase the local tax base and lower property taxes.	2.44	2.74	1.3 (.212)
Small clusters of wind turbines can be located in several places to produce as much power as a conventional power plant in one place.	2.47	2.51	0.1 (.890)
Land under wind turbines can be used for some other purposes.	2.70	2.81	0.4 (.668)
Its cost relative to other sources.	3.03	2.76	1.0 (.337)
Wind turbines must be on hill-tops to intercept strong winds resulting in man-made structures on the Vermont landscape.	3.18	3.08	0.2 (.804)
Wind turbines' impact on birds and wildlife (which is not well understood, and may be negative).	4.03	4.15	0.5 (.650)
Wind power is not reliable because the wind does not blow all the time.	4.03	4.50	1.9 (.062)
Wind turbines may make sounds heard by neighboring residences.	4.12	4.59	1.9 (.059)

Notes : Means are based on ratings with 1 = a big advantage and 7 = a big disadvantage.

Table 20 shows how the attitudes of the Searsburg residents and the other respondents have changed over time. Overall, the ratings suggest that all respondents have a greater appreciation for the advantages of wind power than they did before the construction began. For both groups, the potential of wind power as a local source of energy is more appreciated. Now that the turbines are in operation, they are much less concerned that the blades will produce noise that disturbs the project's neighbors. They are also less concerned about potential danger to wildlife, and problems with reliability of the wind as a source of energy. Both groups, but particularly the Searsburg residents, are appreciative of being able to see the turbine blades turning and knowing that it is producing power for their community. The non-Searsburg residents are now much less concerned that placing the turbines along ridge-tops will create a visual problem. They are also more appreciative, since completion of the project, that wind energy does not pollute the air or water.

The single possible exception to this greater appreciation is the cost of wind power relative to other sources. While not statistically significant, both groups see cost as less an advantage now that the project is in operation than they did before construction began.

Table 20. Change in attitudes towards wind power plants by Searsburg and other residents: 1996 and 1997.

	Searsburg			Other		
Statement	1996	1997	Paired *t* (*p*)	1996	1997	Paired *t* (*p*)
It does not pollute either the air or water.	1.56	1.41	1.2 (.257)	1.34	1.18	3.2 (.001)
It's an energy source that can be produced and used locally.	1.88	1.44	2.8 (.008)	1.86	1.39	5.0 (≤.0001)
I like seeing wind turbine blades turning, knowing they are producing electricity our community is using.	3.12	2.18	4.0 (.0004)	2.75	2.46	2.4 (.018)
The wind power facility will increase the local tax base and lower property taxes.	2.76	2.44	1.1 (.299)	2.91	2.74	1.4 (.175)
Land under wind turbines can be used for some other purposes.	3.15	2.70	1.1 (.266)	2.88	2.81	0.4 (.696)
Its cost relative to other sources.	2.76	3.03	– 0.9 (.369)	2.72	2.76	– 0.3 (.738)
Wind turbines must be on hill-tops to intercept strong winds resulting in man-made structures on the Vermont landscape.	3.75	3.18	1.3 (.191)	4.00	3.08	6.2 (≤.0001)
Wind turbines' impact on birds and wildlife (which is not well understood, and may be negative).	4.79	4.03	2.4 (.023)	4.61	4.15	4.5 (≤.0001)
Wind power is not reliable because the wind does not blow all the time.	4.91	4.03	3.1 (.004)	4.82	4.50	3.6 (.0004)
Wind turbines may make sounds heard by neighboring residences.	5.32	4.12	3.9 (.0004)	5.28	4.59	6.7 (≤.0001)

Notes : Means are based on ratings with 1 = a big advantage and 7 = a big disadvantage.

Attitudes towards the Searsburg Wind Power Project
Searsburg residents are still significantly less supportive than are the other respondents of the Searsburg wind power project as proposed and constructed. However, as Table 21 shows their ratings for the project and alternative scenarios are all still solidly on the supportive side of the scale. While the non-Searsburg respondents are more supportive of the alternative scenarios, the difference is not statistically significant.

Table 21. Comparison of 1997 support for the Searsburg Wind Power Project by Searsburg and other residents.

Statement	Searsburg	Other	Paired *t* (*p*)
From what you know about this wind power project, how supportive of it are you?	2.00	1.46	3.1 (.002)
If this project were located in or near a community other than your own, how supportive would you be of it?	1.78	1.49	1.8 (.074)
Assuming that there are no other places in Vermont better suited for a project of this type, how supportive would you be of this project in your community?	1.74	1.65	0.5 (.648)
If the project is technically successful, how supportive would you be of doubling it's output from 11 to 22 turbines?	2.06	1.71	1.6 (.104)

Notes : Mean are based on ratings with 1 = very supportive and 5 = very unsupportive.

Table 22 shows how support from the Searsburg residents and the other respondents has changed during the construction and completion of this project. Support has increased for both groups. This change is very significant for the non-Searsburg respondents. The modest support among the Searsburg group has not significantly changed concerning the project as constructed, or the possibility that it might be moved to someone else's backyard. However, they are significantly more supportive of keeping the project where it is in Searsburg if it is the best suited place, and even in enlarging the existing project to twice its present size.

Table 22. Change in support for the Searsburg Wind Power Project by Searsburg and other residents: 1996 and 1997.

	Searsburg			Other		
Statement	1996	1997	Paired *t* (*p*)	1996	1997	Paired *t* (*p*)
From what you know about this wind power project, how supportive of it are you?	2.18	2.00	1.2 (.226)	2.01	1.46	8.5 (≤.0001)
If this project were located in or near a community other than your own, how supportive would you be of it?	1.97	1.78	1.1 (.264)	2.01	1.49	7.4 (≤.0001)
Assuming that there are no other places in Vermont better suited for a project of this type, how supportive would you be of this project in your community?	2.06	1.74	1.9 (.070)	2.00	1.65	4.6 (≤.0001)
If the project is technically successful, how supportive would you be of doubling it's output from 11 to 22 turbines?	2.55	2.06	3.5 (.002)	2.12	1.71	4.9 (≤.0001)

Notes : Mean are based on ratings with 1 = very supportive and 5 = very unsupportive.

Construction-related Effects of the Searsburg Wind Power Project
The experience of the effects associated with the construction of the Searsburg project by the Searsburg residents is compared in Table 23 to the experience by the other respondents. All effects were considered to have a modestly insignificant impact by both groups. However, the non-Searsburg residents found them to be less a problem than the Searsburg residents. The difference is statistically significant for traffic congestion, noise, dust and dirt.

Table 23. Significance of Searsburg Wind Power Project construction impacts for Searsburg and other residents.

	Mean		
Statement	Searsburg	Other	*t* -test (*p*)
Removal or damage of vegetation during construction.	4.44	4.78	1.1 (.276)
Disturbance to wildlife during construction.	4.47	4.53	0.2 (.841)
Erosion resulting from construction activity.	4.94	4.85	0.3 (.765)
Visual effects from construction activity.	5.13	5.75	1.9 (.055)
Increased traffic congestion or delays.	5.16	5.96	2.9 (.004)
Noise from construction activity.	5.19	6.06	3.1 (.003)
Dust and dirt from construction activity.	5.19	5.99	2.8 (.006)

Notes: Mean are based on ratings with 1 = very significant and 7 = very insignificant.

Visual Quality of the Searsburg Wind Power Project

Visibility. Table 24 shows that Searsburg residents see the project much more frequently than do the other respondents ($X^2 = 10.3$, $df = 5$, $p = 0.0667$). Fifty-seven percent of the Searsburg residents see the project at least once a week, while only 34 percent of the non-Searsburg residents see it that frequently.

Table 24. How often Searsburg and other residents normally notice the Searsburg Wind Power Project.

	Percent	
Frequency	Searsburg	Other
Many times a day	12.9	5.2
Once or twice a day	22.6	10.4
Couple times a week	22.6	18.4
Couple times a month	16.1	25.9
Once a month	0.0	9.0
Not even once a month	25.8	31.1

Notes: $X^2 = 10.3$, $df = 5$, $p = 0.0667$

Table 25 gives some indication from where they see the project. In general, the Searsburg wind power project is clearly visible from about 10 percent of the houses surveyed. In the winter, 14 percent of Searsburg residents can see the project a little, compared to 3 percent of the other respondents. This difference is statistically significant. Searsburg residents are much more likely to see the project during either the summer or winter from the homes of friends or neighbors. Relatively few of the respondents see the project from their place of work. However, over half of the respondents see it clearly while driving around the area.

Table 25. Where Searsburg and other residents can see the Searsburg Wind Power Project.

		Percent						
		Searsburg			Other			
Season:	Location	Not	A little	Clearly	Not	A little	Clearly	X^2 (p)
Summer:	Your home	86.7	3.3	10.0	86.3	3.3	10.4	0.005 (.997)
	Friend or relative	56.7	16.7	26.7	77.3	11.4	11.4	6.7 (.035)
	Your place of work	93.3	3.3	3.3	91.9	2.8	5.2	0.2 (.899)
	While driving in the area	16.7	30.0	53.3	16.1	37.4	46.4	0.7 (.717)
Winter:	Your home	75.0	14.3	10.7	84.9	3.0	12.1	7.4 (.025)
	Friend or relative	53.6	21.4	25.0	74.4	11.6	14.1	5.3 (.072)
	Your place of work	85.7	7.1	7.1	91.5	3.0	5.5	1.4 (.500)
	While driving in the area	17.9	28.6	53.6	15.1	30.2	54.8	0.2 (.928)

Scenic value. Both the Searsburg and other residents see the project as having a significant visual impact on the site. Further, Table 26 shows that there are no significant differences in the ratings given the individual scenes or the project impacts.

Table 26. Comparison of the 1997 scenic ratings of Searsburg Wind Power Project visual simulations by Searsburg and other residents.

View	Searsburg	Other	Paired *t* (*p*)
View A: 1.25 miles away, no turbines	1.81	1.84	0.1 (.890)
View B: 4 miles away, no turbines	1.62	1.60	0.1 (.902)
View C: 1.25 miles away, with turbines	3.26	2.98	0.8 (.426)
View D: 4 miles away, with turbines	2.81	2.39	1.4 (.157)
Near visual impact (View A – View C)	-1.45	-1.12	0.9 (.353)
Far visual impact (View B – View D)	-1.28	-0.77	1.6 (.107)
Average visual impact	-1.41	-0.95	1.4 (.164)

Notes: Means are based on ratings with 1 = very attractive and 5 = very unattractive.

The change in rating by the Searsburg and other respondents between the 1996 and 1997 surveys is given in Table 27. It is important that the ratings of the pre-construction scenes did not change significantly over the intervening year and a half. This stability demonstrates that the ratings are reliable measurements. Over this same time period, the ratings by both groups of the post-construction scenes became significantly more favorable. This demonstrates that the public developed a greater sense of visual acceptability for the project as it was being built.

Table 27. Change in the scenic ratings of the Searsburg Wind Power Project visual simulations by Searsburg and other residents: 1996 and 1997.

	Searsburg			Other		
View	1996	1997	Paired *t* (*p*)	1996	1997	Paired *t* (*p*)
View A: 1.25 miles away, no turbines	1.52	1.81	– 1.1 (.294)	1.79	1.84	–0.0 (.963)
View B: 4 miles away, no turbines	1.43	1.62	– 1.0 (.327)	1.54	1.60	– 0.1 (.907)
View C: 1.25 miles away, with turbines	4.14	3.26	3.6 (.002)	3.54	2.98	4.6 (≤.0001)
View D: 4 miles away, with turbines	3.68	2.81	2.5 (.019)	2.95	2.39	5.6 (≤.0001)
Near visual impact (View A – View C)	-2.61	-1.45	-3.0 (.007)	-1.75	-1.11	-4.2 (≤.0001)
Far visual impact (View B – View D)	-2.25	-1.28	-2.2 (.036)	-1.41	-0.77	-4.8 (≤.0001)
Average visual impact	-2.43	-1.41	-2.6 (.016)	-1.58	-0.95	-4.6 (≤.0001)

Simulation quality. Both the Searsburg residents and other respondents found the simulations to be accurate representations of the wind power project, as indicated in Table 28. There is no statistical difference between their accuracy judgments ($X^2 = 2.95$, $df = 4$, $p = 0.566$).

Table 28. Accuracy of simulations compared to the actual project as judged by Searsburg and other residents.

	Percent	
Frequency	Searsburg	Other
Very accurate	51.7	45.9
Somewhat accurate	34.5	41.1
Uncertain	10.3	8.2
Somewhat inaccurate	0.0	3.9
Very inaccurate	3.6	1.0

Notes: $X^2 = 2.95$, $df = 4$, $p = 0.566$.

It is apparent from the survey questions in Table 19 and Table 20 that both the Searsburg residents and other respondents think that the turning turbine blades are visually interesting. While most respondents think that it is unimportant to represent the blades' movement in the simulations, a sizable minority does think it would be important. Table 29 shows that there are no statistical differences between the groups in this regard ($X^2 = 6.33$, $df = 4$, $p = 0.176$).

Table 29. Importance of simulations showing the wind turbines moving as judged by Searsburg and other residents.

	Percent	
Frequency	Searsburg	Other
Very important	13.3	10.6
Somewhat important	23.3	28.8
Uncertain	20.0	12.0
Somewhat unimportant	10.0	26.9
Very unimportant	33.3	21.6

Notes: $X^2 = 6.33$, $df = 4$, $p = 0.176$.

PRE-CONSTRUCTION SUPPORT FOR WIND POWER AND CHANGE IN ACCEPTANCE

How does the public's predisposition towards a project type influence its acceptance of a specific project? This is an important question for those wishing to understand the possible dynamics of public acceptance over time. For instance, how much does this general attitude change? Is the pattern of change in attitude over time the same or different for initial supporters and non-supporters? Does initial support lead the public to be more accepting of information about a project, such as the visual simulations, or not?

This section looks at comparisons based on the respondents' initial evaluation of the advantages and disadvantages of wind power. It begins by describing how the respondents are divided into three levels of initial support. It then compares how these levels of initial support relate to the various other factors investigated in this study.

Attitudes towards Wind Power Plants

The advantage or disadvantage of ten characteristics commonly attributed to wind power projects are evaluated in the pre- and post-construction surveys. Each characteristic is rated on a 7-point rating scale with 1 being for a big advantage, 4 for unsure, and 7 for a big disadvantage. The average of these ten ratings is used in this section as an index of overall support for wind power.

The 250 respondents to both surveys are divided into three approximately equal-sized groups based on their overall support for wind power in the first survey, prior to construction. A respondent is considered a big supporter if her average rating is less than 3.0 for all ten characteristics. A respondent is a moderate supporter if his mean rating is less than 3.6. Respondents with mean ratings of 3.6 or greater are uncertain or non-supporters of wind power.

Prior to construction, 30 percent of the respondents investigated here were big supporters of wind power, 36 percent were moderate supporters, and 35 percent were not supporters. The results in Table 30 show how respondents' support changed during the period of the Searsburg project's construction. The 1997 post-construction survey found only 17 percent of the respondents who were non-supporters of wind power. The number of moderate supporters was slightly lower at 31 percent, while big supporters of wind power had soared to 52 percent.

Table 30. Change in overall level of support for wind power from pre-construction to post-construction.

	Percent (1996 Level of Support)			
1997 Level of Support	Non-supporter	Moderate Supporter	Big Supporter	1997 % Total Sample
Non-	35.6	9.0	4.1	16.8
Moderate	35.6	37.1	17.6	30.8
Big	28.7	53.9	78.4	52.4
1996 % Total	34.8	35.6	29.6	100.0

Notes: n = 250. $X^2 = 53.6$, $df = 4$, $p \leq 0.0001$

In 1996, and again in 1997, there were significant differences in how the three levels of supporters rated the advantages of wind power. The differences in their initial predisposition towards wind power seems to still influence their judgments after the construction of the Searsburg project. The change in ratings for each of the 10 characteristics that contribute to the index of support for wind power are shown in Table 31.

Non-supporters' ratings all became more positive; most improved substantially. Initially, non-supporters had fearful expectations about the impacts of the turbines on wildlife, the noise they might produce, their conspicuous visibility, and likely unreliability. All of these concerns have moved to more neutral ratings indicating that they are unsure whether they are real disadvantages, or possible advantages. Money issues are the only area where initial non-supporters' scores did not improve. There was positive, but statistically insignificant, improvement in their ratings of the relative cost and contribution to the local tax base.

Moderate supporters generally improved their ratings also, and most of their change in attitude is also statistically significant. Their primary concerns were also impacts to wildlife, sound, and reliability. Their assessment of sound and wildlife problems significantly improved.

Big supporters were already closer to the most positive ratings, so there was less opportunity for significant improvement in their ratings. However, four of their scores actually became less positive. In particular, they had come to think that possibilities of multiple use of the land under the turbines, and the relative cost of wind power were not as advantageous as they once thought.

In general, initially non-supporters of wind power are tending to become moderate supporters, and initially moderate supporters are tending to become big supporters.

Table 31. Change in attitudes towards wind power plants by respondents' initial level of support for wind power: 1996 and 1997.

	Non-supporter			Moderate Supporter			Big Supporter		
Statement	1996	1997	Paired *t* (*p*)	1996	1997	Paired *t* (*p*)	1996	1997	Paired *t* (*p*)
It does not pollute either the air or water.	1.66	1.40	2.24 (0.028)	1.33	1.12	3.48 (0.0008)	1.09	1.09	0.0 (1.000)
It's an energy source that can be produced and used locally.	2.60	1.66	5.13 (≤0.0001)	1.70	1.34	2.97 (0.005)	1.19	1.16	0.39 (0.698)
Wind turbines must be on hill-tops to intercept strong winds resulting in man-made structures on the Vermont landscape.	5.22	3.93	4.60 (≤0.0001)	3.86	3.06	4.10 (≤ 0.0001)	2.63	2.17	1.97 (0.052)
The wind power facility will increase the local tax base and lower property taxes.	3.49	3.08	1.97 (0.053)	3.02	2.67	1.97 (0.053)	2.03	2.30	–1.46 (0.148)
Land under wind turbines can be used for some other purposes.	3.53	3.11	2.08 (0.040)	3.19	2.85	1.66 (0.102)	1.88	2.38	–2.60 (0.011)
Its cost relative to other sources.	3.64	3.33	1.47 (0.146)	2.65	2.51	0.89 (0.377)	1.75	2.54	–4.50 (≤ 0.0001)
Wind turbines' impact on birds and wildlife (which is not well understood, and may be negative).	5.46	4.63	5.24 (≤0.0001)	4.52	4.12	2.40 (0.018)	3.78	3.55	1.10 (0.274)
Wind turbines may make sounds heard by neighboring residences.	6.26	4.86	8.78 (≤0.0001)	5.01	4.58	3.03 (0.003)	4.46	4.05	2.08 (0.041)
Wind power is not reliable because the wind does not blow all the time.	5.38	4.58	5.14 (≤0.0001)	4.82	4.57	1.92 (0.058)	4.19	4.09	0.79 (0.430)
I like seeing wind turbine blades turning, knowing they are producing electricity our community is using.	4.15	3.26	3.67 (0.0004)	2.44	2.11	2.08 (0.040)	1.64	1.84	–0.70 (0.487)

Notes : Means are based on ratings with 1 = a big advantage and 7 = a big disadvantage.

Attitudes towards the Searsburg Wind Power Project

Table 32 shows how support for the Searsburg project and specific alternatives changed between 1996 and 1997 among the three levels of wind power supporters. In 1996 the non-supporters of wind power were generally uncertain about their support of the Searsburg project, whether it was the only possible location or could be located elsewhere. After the project's construction, their overall ratings changed significantly to be somewhat supportive. Respondents who were moderate supporters of wind power were somewhat supportive of the Searsburg project in 1996, and became significantly more supportive by 1997. The big supporters of wind power were already very supportive of the Searsburg project, and there are no significant changes in their assessment.

Table 32. Change in support for the Searsburg Wind Power Project by respondents' initial level of support for wind power: 1996 and 1997

	Non-supporter			Moderate Supporter			Big Supporter		
Statement	1996	1997	Paired *t* (*p*)	1996	1997	Paired *t* (*p*)	1996	1997	Paired *t* (*p*)
From what you know about this wind power project, how supportive of it are you?	2.86	1.98	7.40 (≤ 0.0001)	1.81	1.29	5.66 (≤ 0.0001)	1.35	1.28	0.97 (0.334)
If this project were located in or near a community other than your own, how supportive would you be of it?	2.64	1.90	5.48 (≤ 0.0001)	1.83	1.28	6.80 (≤ 0.0001)	1.47	1.38	0.88 (0.382)
Assuming that there are no other places in Vermont better suited for a project of this type, how supportive would you be of this project in your community?	2.75	2.09	4.70 (≤ 0.0001)	1.82	1.37	5.32 (≤ 0.0001)	1.36	1.50	–1.17 (0.248)
If the project is technically successful, how supportive would you be of doubling it's output from 11 to 22 turbines?	2.94	2.18	5.37 (≤ 0.0001)	1.93	1.51	3.56 (0.0006)	1.58	1.55	0.34 (0.738)

Notes : Mean are based on ratings with 1 = very supportive and 5 = very unsupportive.

Construction-related Effects of the Searsburg Wind Power Project
The ratings of how each of the three levels of supporters of wind power were affected by the construction activity associated with the Searsburg project are shown in Table 33. In general, the ratings indicate that there were no important impacts from the construction activity. There are no significant differences in ratings that can be attributed to their initial support of wind power.

Table 33. Significance of Searsburg project construction impacts by initial level of support for wind power.

	Mean			
Statement	Non-supporter	Moderate Supporter	Big Supporter	*F* -test
Disturbance to wildlife during construction.	4.30	4.61	4.68	1.2 (0.305)
Removal or damage of vegetation during construction.	4.58	4.83	4.81	0.6 (0.564)
Erosion resulting from construction activity.	4.64	4.93	5.03	1.3 (0.280)
Visual effects from construction activity.	5.58	5.78	5.63	0.3 (0.711)
Increased traffic congestion or delays.	5.79	5.98	5.78	0.5 (0.619)
Dust and dirt from construction activity.	5.80	6.05	5.79	0.7 (0.487)
Noise from construction activity.	5.94	6.07	5.81	0.6 (0.560)

Notes: Mean are based on ratings with 1 = very significant and 7 = very insignificant.

Visual Quality of the Searsburg Wind Power Project

Visibility. Initial level of support for wind power is not associated with how frequently the respondents see the Searsburg wind power project, as seen in Table 34. This relationship is looked at in more detail in Table 35. Again there are no significant associations between the different level of support and where or when they see the Searsburg project.

Table 34. How often respondents with different initial levels of support for wind power normally notice the Searsburg Wind Power Project.

	Percent		
Frequency	Non-supporter	Moderate Supporter	Big Supporter
Many times a day	8.1	4.7	5.6
Once or twice a day	12.8	9.3	14.1
Couple times a week	15.1	23.3	18.3
Couple times a month	26.7	23.3	23.9
Once a month	7.0	8.1	8.5
Not even once a month	30.2	31.4	29.6

Notes: $X^2 = 3.65$, $df = 10$, $p = 0.962$

Table 35. Where respondents with different initial levels of support for wind power can see the Searsburg Wind Power Project.

		Non-supporter			Moderate Supporter			Big Supporter			
Season:	Location	Not	A little	Clearly	Not	A little	Clearly	Not	A little	Clearly	X^2 (p)
Summer:	Your home	85.9	3.5	10.6	84.9	4.5	10.5	88.6	1.4	10.0	1.3 (0.861)
	Friend or relative	65.9	16.5	17.6	80.2	9.3	10.5	78.6	10.0	11.4	5.5 (0.244)
	Your place of work	88.2	4.7	7.1	93.0	2.3	4.7	95.7	1.4	2.9	3.2 (0.524)
	While driving in the area	17.6	34.1	48.2	11.6	40.7	47.7	20.0	34.3	45.7	2.5 (0.637)
Winter:	Your home	83.3	3.9	12.9	81.7	7.3	11.0	86.6	1.5	11.9	3.1 (0.534)
	Friend or relative	64.1	16.7	19.2	76.8	8.5	14.6	74.6	13.4	11.9	4.4 (0.354)
	Your place of work	87.2	5.1	7.7	90.2	3.7	6.1	95.5	1.5	3.0	3.1 (0.547)
	While driving in the area	14.1	24.4	61.5	13.4	32.9	53.7	19.4	32.8	47.8	3.5 (0.477)

Notes: $df = 4$

Scenic value. The scenic ratings of the visual simulations by each of the three levels of support for wind power are given in Table 36. There is a consistent pattern of the same view receiving more scenic ratings with increasing support for wind power. However, further investigation using Tukey's HSD test shows that the differences between moderate and big supporters is not significant for any of the ratings in Table 36, while they are both significantly different from the ratings made by non-supporters of wind power.

Table 36. Comparison of the 1997 scenic ratings of Searsburg Wind Power Project simulations by respondents' initial level of support for wind power.

	Non-supporter	Moderate Supporter	Big Supporter	*F* -test (*p*)
View A: 1.25 miles away, no turbines	2.12	1.71	1.65	3.2 (0.042)
View B: 4 miles away, no turbines	1.89	1.48	1.41	4.8 (0.009)
View C: 1.25 miles away, with turbines	3.98	2.59	2.40	20.5 (≤0.0001)
View D: 4 miles away, with turbines	3.27	2.03	1.97	21.1 (≤0.0001)
Near visual impact (View A – View C)	-1.82	-0.87	-0.73	8.4 (0.0003)
Far visual impact (View B – View D)	-1.39	-0.55	-0.55	8.0 (0.0005)
Average visual impact	-1.64	-0.71	-0.64	9.1 (0.0001)

The change between 1996 and 1997 in scenic ratings of the four views by the three levels of supporters is presented in Table 37. There are no significant differences between the ratings in 1996 and 1997 of the views without turbines. This indicates all three levels of supporters have relatively stable landscape ratings. However, the evaluations by non-supporters and modest supporters of the simulations with turbines and their visual impact are significantly more attractive in 1997 than in 1996. There are no significant differences in how big supporters rated the views in 1996 and 1997.

Table 37. Change in scenic ratings of Searsburg Wind Power Project simulations by respondents' initial level of support for wind power: 1996 and 1997

	Non-supporter			Moderate Supporter			Big Supporter		
	1996	1997	Paired *t* (*p*)	1996	1997	Paired *t* (*p*)	1996	1997	Paired *t* (*p*)
View A: 1.25 miles away, no turbines	1.82	2.12	-1.3 (0.199)	1.77	1.71	1.0 (0.327)	1.68	1.65	–0.2 (0.865)
View B: 4 miles away, no turbines	1.61	1.89	–1.5 (0.128)	1.49	1.48	0.9 (0.386)	1.48	1.41	0.2 (0.842)
View C: 1.25 miles away, with turbines	4.76	3.98	3.9 (0.0002)	3.26	2.59	4.2 (0.0001)	2.67	2.40	1.0 (0.306)
View D: 4 miles away, with turbines	4.10	3.27	4.0 (0.0001)	2.62	2.03	5.0 (≤0.0001)	2.27	1.97	1.3 (0.187)
Near visual impact (View A – View C)	-2.94	-1.82	-4.1 (0.0001)	-1.49	-0.87	-3.0 (0.003)	-0.99	-0.73	-1.2 (0.226)
Far visual impact (View B – View D)	-2.49	-1.39	-4.6 (≤0.0001)	-1.13	-0.55	-3.5 (0.0008)	-0.79	-0.55	-0.6 (0.536)
Average visual impact	-2.71	-1.64	-4.5 (≤0.0001)	-1.31	-0.71	-3.5 (0.0007)	-0.89	-0.64	-0.7 (0.498)

Simulation quality. Table 38 describes how accurate each of the three levels of supporters for wind power believed the simulations to be. Those who are big supporters are particularly more likely to find the simulations to be very accurate.

Table 38. Accuracy of the simulations when compared to the actual project as judged by respondents with different initial levels of support for wind power

	Percent		
Frequency	Non-supporter	Moderate Supporter	Big Supporter
Very accurate	42.0	43.5	55.7
Somewhat accurate	38.3	42.4	40.0
Uncertain	8.6	11.8	4.3
Somewhat inaccurate	8.6	1.2	0.0
Very inaccurate	2.5	1.2	0.0

Notes: $X^2 = 16.5$, $df = 8$, $p = 0.036$.

The level of support for wind power does not appear to be related to how important the respondents thought it was for the simulations to show the motion of the wind turbine blades. Table 39 shows the pattern of responses.

Table 39. Importance that the simulations show the wind turbines moving for respondents with different initial levels of support for wind power.

	Percent		
Frequency	Non-supporter	Moderate Supporter	Big Supporter
Very important	6.1	11.6	15.7
Somewhat important	24.4	29.1	31.4
Uncertain	11.0	17.4	10.0
Somewhat unimportant	31.7	24.4	17.1
Very unimportant	26.8	17.4	25.7

Notes: $X^2 = 11.1$, $df = 8$, $p = 0.194$.

REFERENCES

Palmer, J.F. 1996. **Public Acceptance Study of the Searsburg Wind Power Project: Pre-construction Baseline**. Fayetteville, NY: Clinton Solutions

Vellman, P.F. 1995. **Data Desk Handbook and Statistics Guide**. [version 5.0] Ithaca, NY: Data Descriptions Inc.

APPENDIX

- Survey cover letter
- Questionnaire
- Project images
- Follow-up postcard

Submitted on Tuesday, February 5, 2013 - 17:37 Submitted by anonymous user: [50.133.135.196] Submitted values are:

Name: Bob Farnham
Town: Thetford
Organization: Bob the Green Guy

2) Energy Sources and/or Facilities: Please check the type of energy generation you wish to comment upon: Other Energy Sources, Facilities or General Comment
3) Comment : While at the Burlington Siting Commission meeting, I recorded each of the people who spoke and I've loaded those videos onto my YouTube Channel. The videos are free to be viewed and shared. I hope people will tag themselves by leaving a comment in the comment section after the video. I will take that information and give them proper attribution.
http://bit.ly/bvt-siting-hearing

The results of this submission may be viewed at:
http://sitingcommission.vermont.gov/node/7/submission/791

From:
Sent: Tuesday, February 05, 2013 4:02 PM
To:
Subject: Re: FW: Wall Street Journal - Bird-Brained by Stephen Moore

Rob,
I added a sentence to may article.
Willem

-----Original Message-----

Sent: Tue, Feb 5, 2013 2:56 pm
Subject: FW: Wall Street Journal - Bird-Brained by Stephen Moore

There is nothing exaggerated about them. A 1993 study in Sweden and Germany had found even higher numbers: “In a summary of avian impacts at wind turbines by Benner et al. (1993) bird deaths per turbine per year were as high as 309 in Germany and 895 in Sweden.” (2)

http://savetheeaglesinternational.org/releases/spanish-wind-farms-kill-6-to-18-million-birds-bats-a-year.html
This was before the wind industry took control of mortality monitoring studies.

What was exaggerated was the minimization of mortality by all kinds of tricks, as Big Wind progressively seduced the ornithology profession with its big pockets. These frugal people had never seen such riches before.

Think of it that way: if average mortality is of one bird per turbine per day (nothing unreasonable in this hypothesis), for 39,000 turbines in the US (official figure) this comes to 365 days x 39,000 turbines = 14,235,000 dead birds per year for the US.
And if wind turbines kill twice as many bats as they do birds, which is likely because 1) scientists have found that bats are attracted to wind turbines, and 2) just watch this video where bats are struck, or "barotraumized" to death in front of your eyes:

http://www.epaw.org/multimedia.php?lang=es&article=b6
... then, average bat mortality will be: 365 x 2 x 39,000 = 28,470,000 dead bats per year.

For birds and bats taken together: 14,235,000 + 28,470,000 = 42,705,000 killed yearly in the US.

Wall Street Journal - Bird-Brained by Stephen Moore
Date: Tuesday, February 5, 2013, 6:24
http://online.wsj.com/article/SB10001424127887324445904578283760530083732.html

The Wall Street Journal Political Diary 2013-02-04Bird-BrainedSTEPHEN MOORESen. David Vitter of Louisiana wants to know why the Obama administration is bringing criminal prosecutions against oil and gas companies for violating the Migratory Bird Treaty Act but not prosecuting wind farms that kill an estimated 400,000 birds each year. Moreover, many of the birds killed by wind turbines are endangered.
"It appears the Justice Department is hand-picking which migratory bird mortality cases to pursue with an obvious preference of going after oil and gas producers," said Mr. Vitter, the ranking Republican on the Senate Environment and Public Works Committee.

We first reported these prosecutions in late 2011. DOJ brought cases against seven oil and gas companies operating in North Dakota.

Continental Resources was prosecuted for accidentally killing fourMallard ducks—which are not even protected or rare. On the other hand, wind turbines have chopped to death tens of thousands of birds. Harold Hamm, the CEO of Continental, called the prosecution "unfair and absurd" and an example of the Obama administration's "harassment" of oil companies. "We are environmentally safe with a great record of protecting wildlife," Mr. Hamm added. A federal judge threw out the complaint.

Meanwhile, the wind industry has been working with the Obama administration to exempt many wind farms from the migratory bird act. Some environmental groups have questioned this favoritism, though others, like the Sierra Club, have stayed quiet. "We find it absurd that the Department of Justice, in conjunction with the Fish and Wildlife Service, could reasonably conclude that three oil and gas operators should face prosecution for the incidental killing of seven birds at the same time it considers permits to kill between eight and fifteen bald eagles," Mr. Vitter wrote.

According to Energy and Environment News, the Senate Republicans on the committee "are asking DOJ how many criminal prosecutions it has pursued under the statute against oil and gas companies versus wind energy producers." What seems clear from the prosecution history is the wildlife-protection statute is being selectively enforced to slowdown oil and gas production while wind farms receive a free pass. For wildlife enthusiasts, the danger is that wind farms are responsible for killing rare and endangered birds—including cranes and bald eagles. "This does not pass the common-sense test," complains Mr Vitter.

From: Rob Pforzheimer
Sent: Monday, February 04, 2013 10:58 AM
To:
Subject: Wind turbine Noise - 3 articles

3 articles on windaction.org

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Industrial wind turbines exceed environmental guidelines for noise
New scientific measurements reveal that industrial wind turbines (IWTs) in Ontario routinely exceed acceptable noise limits set by Ministry of Environment (MOE) guidelines.
February 3, 2013 in Wind Victims Ontario http://www.windaction.org/news/37251

New scientific measurements reveal that industrial wind turbines (IWTs) in Ontario routinely exceed acceptable noise limits set by Ministry of Environment (MOE) guidelines.

Five typical sites in central Ontario were independently monitored using precision sound recording instruments. Two sites provided background sound levels with no exposure to wind turbines. Three other sites were adjacent to turbines with distances ranging from .6 to 1.4 kilometres between the IWTs and the measuring instruments. These are distances beyond the 550m distance set by MOE.

The data shows that when wind turbines are present, the associated sound pressure levels are repeatedly higher than government guidelines permit during the day, evenings and late at night.

The study results suggest that the model used by the MOE to predict sound pressure levels substantially under-estimates levels of industrial wind turbine noise. This implies the problem is generalized and not merely confined to each test site under study.

The analysis reaffirms hundreds of subjective reports from residents living near wind turbine installations about daily disturbances.

Two policy aspects are key for investigation; the location of turbines relative to dwellings (i.e. their relative setback), and the validity of current MOE noise guidelines. Both policies influence citizen well-being and require review.

The full report can be accessed here .
Web link: http://www.windvictimsontario.com/industrial-wind-...

****

Wind Rush
We have a new 90th Parallel Productions documentary airing on CBC Doc Zone, February 7 at 9:00 pm in Canada. We spent two years making this film about wind turbines and how they can make people sick. A lot of people are skeptical–so was I.

The adherence to the dream of green energy can be very much like a religion. People feel if they believe deeply enough the perfect clean future for electricity will come true. They didn't want to believe it was as bad as all that in Ontario.
http://www.andrewgregg.ca/2013/01/27/wind-rush/

****

Officials continue to urge additional testing at Shirley Wind Farm amid health concerns

The PSC decision does not mean further testing is off the table at Shirley. The Wisconsin Towns Association adopted a resolution asking the Public Service Commission to enact a moratorium to prevent wind turbines from being permitted and installed until further studies are done that investigate the link between turbines and health concerns.

February 3, 2013 by Maria Amante in Appleton Post-Crescent
State regulators won't need to see additional health testing at the large Shirley Wind Farm in southern Brown County before deciding whether to approve another wind power development in western Wisconsin.
The Public Service Commission based its recent decision on testing conducted in December aimed at determining whether low-frequency noise generated by wind turbines at the site in Glenmore was responsible for the residents' health complaints.

Scientists did not find a correlation but recommended further testing at the site. The PSC used the Shirley study and also examined a wind farm study from Massachusetts while conducting an environmental assessment for the Highland...*[continue via Web link]*

Web link: http://www.postcrescent.com/article/20130203/APC01...

From:
Sent: Monday, February 04, 2013 10:23 AM
To:
Subject: Falmouth Taking Down Noisy, Sickening IWTs

After three years of suffering and foot dragging.

The public was invited to provide comments at Wednesday night's meeting in Town Hall related to various options that will be presented to voters at town meeting this spring.

Prior to the meeting, dozens of residents held a candle light vigil and prayed that the selectmen would not only hear their voices, but also take immediate action to stop what they described as a nuisance and danger to their health.

Nearly 50 residents voiced their opinion during the public comment session, with almost every comment opposing the future operation of the turbines.

Eric Sockol's home at 819 Falmouth Highway is just 1,000 feet from Wind 2, a town-owned industrial wind turbine.

Sockol passionately urged selectmen to remove the turbines immediately.

He said Falmouth has an obligation to protect the health of its citizens, despite any economic consequences that may come from tearing down the turbines. "Understand there are some issues that are more important than simply economics," Sockol said.

Richard Bowen's home also neighbors one of the town-owned turbines.

Bowen said that the town had somehow made a great error by installing the turbines and feels town officials are not willing to own up to the mistake.

Bowen also urged selectmen to take the turbines down."Do the right thing, please, for our sake," Bowen said.

John Ford, a resident living on Blacksmith Shop Rd., said neighbors of Wind 1 and Wind 2 have lost peace and quiet and good health.

Ford suggested using solar panels as an alternative to wind power. "I request that you join your fellow residents and neighbors and decide to remove the wind turbines and replace them with people friendly photovoltaic arrays," Ford said.

Judy Fenwick does not live near the turbines, but she was a member of the working group that was organized by the town to develop options for dealing with the wind turbines.

Fenwick told selectmen that after much deliberation she believes that the health of Falmouth residents should be placed above any financial repercussions of removing the turbines."I ask that you don't be counter dependent and that you ask the state for help before you ask the Falmouth taxpayers," Fenwick urged.

Residents who were unable to make Wednesday night's meeting can still submit a statement to the Selectmen's Office by 4:30 p.m. Monday January 28th.

Statements can also be emailed to townmanager@falmouthma.org by the deadline.

From: Peter H. Roth
Sent: Monday, February 04, 2013 7:49 PM
To:
Subject: RE: Falmouth Taking Down Noisy, Sickening IWTs

As a trained engineer and energy expert, I am delighted people are coming to their senses and seeing the risk and non-value of wind turbines. If intermittent solar power is to be an adjunct to the towns energy portfolio, it is much preferrede to wind. The real long term energy source that people are slowly coming around to accepting and seeing as safe, clean, reliable and economical, it is advanced, modern nuclear. It is happening around the world and the US may fall behind because of a reluctance hyped by nothing more then emotional phobia, not reason or science; but that day is coming because it is necessary for our energy hungry society to progress, and the eventual shortage and cost of petroleum based fuels.

Peter H. Roth, Applied Tech. Consultants and member of "Coalition form Energy Solutions"

From:
Sent: Monday, February 04, 2013 11:02 AM
To:
Subject: Re: Falmouth Residents: Take the Turbines Down [Video]

Falmouth selectmen support tearing down turbines
By sean teehan

February 02, 2013 2:00 AM

FALMOUTH — Standing in the shadow of Falmouth's two town-owned wind turbines on Wednesday, Brent Putnam said he felt a squeeze in the air pressure and heard the loud mechanical noise akin to a jet engine. "You can feel it," said Putnam, vice chairman of the board of selectmen.
That sealed his decision about Falmouth's two 1.65-megawatt turbines at the town's wastewater treatment facility.

He then drove about five miles to a special selectmen's meeting where, for the first time, he and all four other selectmen voted in support of removing the town-owned Wind 1 and Wind 2 turbines, the cause of a bitter three-year controversy in Falmouth that began when neighbors complained of adverse health effects they say were from the turbines.

Wednesday night, selectmen voted in favor of sending delegations from the board to state legislators and the Massachusetts Clean Energy Center — a public agency funded with ratepayer dollars — to find out how much financial assistance and debt forgiveness the town could receive if it takes down the turbines.

The board also plans to vote Monday on three separate warrant articles for a special town meeting in April that would collectively recommend the decommissioning of the turbines, fund the dismantling process and pay the cost of operating them for the rest of the fiscal year.

"This is something that has polarized the community," board Chairman Kevin Murphy said. "It was a situation in which Murphy's Law played out."

In a presentation Wednesday night, Assistant Town Manager Heather Harper — who served as the turbine project's manager — told selectmen that taking down the turbines would cost up to $11.9 million.

It would cost up to $1.5 million in the first year when accounting for dismantling costs, annual energy costs and other considerations, Harper said. Residents would pay an average of $53 to $66 in additional taxes that year. Tearing down Wind 1 and Wind 2 may quash arguments among residents and town officials that began when the first turbine was erected in 2010 at a cost of $4.3 million, but the cost of decommissioning them could ignite new quarrels between local and state officials.

In the years leading up to Wind 1's ribbon-cutting, the Massachusetts Technology Collaborative, the Clean Energy Center's predecessor, paid for a feasibility study and provided expert advice for design and siting, Catherine Williams, a spokeswoman for the center, said.

In 2007, the Technology Collaborative prepaid Falmouth for $1.9 million in renewable energy credits they expected the turbine to produce. The center, which was established as part of Gov. Deval Patrick's 2008 Green Jobs Act, sold the Wind 1 turbine to Falmouth in 2009. The turbine had been in storage after Orleans' water commissioners rejected a plan to install it and another one in a public drinking-water watershed in their town. "I would certainly hope that they would see it within their financial ability to waive the money for the renewable energy credits," said Selectman Douglas Jones, one of two selectmen chosen by the board to speak to officials from the center about taking down Falmouth's turbines.

Noting that data provided by the center guided many of the town's decisions related to siting and installation of the turbines, Putnam also sees the agency as partially responsible for the fallout. "A lot of the information we received about the process was from them," Putnam said. "We had originally started with a 660-kilowatt turbine and moved up to the 1.65-megawatt turbine; you've got to wonder if we would have had all this trouble."

The center paid for a $388,000 report by a town panel charged with finding options to mitigate turbine complaints from abutters and plans to continue working with the town, Williams said. But it was the town, not the center, that approved Wind 1's site.

"Our role is to help communities gather the information they need," Williams said. "At the end of the day, the decision is with the local communities."

Senate President Therese Murray, D-Plymouth, praised the idea of removing the turbines. Murray, whom selectmen named as a legislator they would likely approach seeking financial assistance, said in a statement she looks forward to hearing more about Falmouth's decommissioning plans.

"This is an issue that has divided the community, and I want to thank the town for their commitment to continuing to find a solution that works best for all residents," she said.

About 10 days ago, Rep. David Vieira, R-Falmouth, filed a Wind Energy Relief Act at the Statehouse that would create two funds totaling $22.5 million.

The money would go toward compensating people and businesses for detrimental effects on health or property resulting from turbines in locations chosen in cooperation with the Clean Energy Center. Funds would also help towns to relocate or decommission the turbines.

The board's support of dismantling the turbines on Wednesday was a step in the right direction, said Malcolm Donald, an abutter and outspoken opponent of the turbines.

"I'm guardedly happy," Donald said. "My fear is that they're going to drag this out as long as possible to generate as much revenue as possible."

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In a message dated 2/4/2013 9:51:32 A.M. Eastern Standard Time [redacted] writes:
http://falmouth.patch.com/articles/falmouth-residents-take-the-turbines-down-video
Falmouth Residents: Take the Turbines Down [Video]

Nearly one hundred Falmouth residents attended a Board of Selectmen meeting last night to peacefully protest and speak out against the ongoing operation of three identical industrial wind turbines in the Falmouth Industrial Park, pleading with selectmen

By Sara Mannal
Email the author
January 24, 2013
Email
Print
39 Comments

Upload Photos and Videos

The public was invited to provide comments at Wednesday night's meeting in Town Hall related to various options that will be presented to voters at town meeting this spring.

Prior to the meeting, dozens of residents held a candle light vigil and prayed that the selectmen would not only hear their voices, but also take immediate action to stop what they described as a nuisance and danger to their health.

Nearly 50 residents voiced their opinion during the public comment session, with almost every comment opposing the future operation of the turbines.

Eric Sockol's home at 819 Falmouth Highway is just 1,000 feet from Wind 2, a town-owned industrial wind turbine. Sockol passionately urged selectmen to remove the turbines immediately. He said Falmouth has an obligation to protect the health of its citizens, despite any economic consequences that may come from tearing down the turbines.

"Understand there are some issues that are more important than simply economics," Sockol said.
Richard Bowen's home also neighbors one of the town-owned turbines. Bowen said that the town had somehow made a great error by installing the turbines and feels town officials are not willing to own up to the mistake. Bowen also urged selectmen to take the turbines down.

"Do the right thing, please, for our sake," Bowen said.

John Ford, a resident living on Blacksmith Shop Rd., said neighbors of Wind 1 and Wind 2 have lost peace and quiet and good health. Ford suggested using solar panels as an alternative to wind power.

"I request that you join your fellow residents and neighbors and decide to remove the wind turbines and replace them with people friendly photovoltaic arrays," Ford said.

Judy Fenwick does not live near the turbines, but she was a member of the working group that was organized by the town to develop options for dealing with the wind turbines. Fenwick told selectmen that after much deliberation she believes that the health of Falmouth residents should be placed above any financial repercussions of removing the turbines.

"I ask that you don't be counter dependent and that you ask the state for help before you ask the Falmouth taxpayers," Fenwick urged.

Residents who were unable to make Wednesday night's meeting can still submit a statement to the Selectmen's Office by 4:30 p.m. Monday January 28th.

Statements can also be emailed totownmanager@falmouthma.org by the deadline.
Related Topics: Selectmen, Wind Turbine, falmouth, and public comment

From: Rob Pforzheimer
Sent: Monday, February 04, 2013 9:52 AM
To:
Subject: Falmouth Residents: Take the Turbines Down [Video]

http://falmouth.patch.com/articles/falmouth-residents-take-the-turbines-down-video
Falmouth Residents: Take the Turbines Down [Video]

Nearly one hundred Falmouth residents attended a Board of Selectmen meeting last night to peacefully protest and speak out against the ongoing operation of three identical industrial wind turbines in the Falmouth Industrial Park, pleading with selectmen

- By Sara Mannal
- Email the author
- January 24, 2013

From: Rob Pforzheimer
Sent: Saturday, February 02, 2013 8:17 PM
To:
Subject: wind turbines to kill bald eagles for 30 years.

The wind industry getting away with murder, literally, again.

http://online.wsj.com/article/SB10001424127887324039504578259824223563736.html?KEYWORDS=Fish+and+Wildlife

The Fish and Wildlife Service Is Not for the Birds

The federal government plans to allow wind turbines to kill bald eagles for 30 years.
By ROBERT BRYCE

On June 20, 1782, the Continental Congress, after nearly six years of haggling and numerous design changes, finally approved the Great Seal of the United States. In doing so, it made the bald eagle our national symbol. This year, in the name of clean energy, the Fish and Wildlife Service is considering changing federal rules so that a wind-energy developer can be granted an "incidental-take" permit allowing wind projects to kill bald eagles and golden eagles for up to 30 years.

On Jan. 15, the Fish and Wildlife Service determined that the New Era Wind Farm—a proposed project near Red Wing, Minn.—might kill as many as 14 bald eagles per year. Despite that toll, the agency said the developer of the 48-turbine wind farm could go ahead and apply for an eagle-kill permit. If granted, it could be the first project to get one. At least one other wind-energy concern, Oregon's West Butte Wind Project, also has applied for an incidental-take permit, and others are sure to follow.

The Fish and Wildlife Service said that its estimate for bald eagle kills at the New Era facility was a "worst-case scenario" that "would not damage" the local population of bald eagles. That might be true. Nevertheless, the possibility that federal authorities are willing to issue such a permit once again exposes the **double standard at work when it comes to renewable energy**.

For years, the wind industry has had de facto permission to violate both the Migratory Bird Treaty Act (which protects 1,000 species) and the Bald and Golden Eagle Protection Act. Federal authorities have never brought a case under either law—despite the Fish and Wildlife Service's estimate that domestic turbines kill some 440,000 birds per year.

While the wind industry enjoys its exemption from prosecution under these federal wildlife laws, the Interior Department has aggressively brought cases against the oil-and-gas industry. In 2011, the Fish and Wildlife Service filed criminal indictments against three drillers who were operating in North Dakota's Bakken field. One of those companies, Continental Resources, was indicted for killing a single bird (a Say's Phoebe) that is protected by the Migratory Bird Treaty Act. This law was adopted in 1918, at a time when several bird species were being decimated by hunters.

Compare the action taken against Continental Resources with the Pine Tree wind project, a three-year-old facility owned by the Los Angeles Department of Water and Power. Since 2009, nine golden eagle carcasses have been recovered at the project and reported to the Fish and Wildlife Service. Los Angeles Times reporter Louis Sahagun reported on Feb. 16, 2012, that at least six of the birds had been struck by turbine blades. Yet there have been no indictments. Jill Birchell, special agent in charge of law enforcement for the Fish and Wildlife Service in California and Nevada refused to comment on the Pine Tree case, other than to tell me that "it is an ongoing criminal investigation."

Federal law has protected the bald eagle since 1940, the golden eagle since 1962. Violating the Eagle Protection Act can result in a fine of $250,000 and imprisonment for two years. From 1976 to 2007, the bald eagle also was protected under the Endangered Species Act. It got off the federal endangered-species list—among only a handful of animals ever to do so—thanks to decades of conservation efforts, including captive-breeding projects, some of which were sponsored by the Fish and Wildlife Service. Today, there are about 10,000 breeding pairs of bald eagles in the lower 48 states. But they are still protected by both the Eagle and Migratory Bird acts.

Getting a permit to kill eagles has always been difficult. Indian tribes are allowed to obtain eagle feathers for religious purposes. In addition, some scientific and educational entities can be permitted to possess eagle parts. The wind-energy lobby has sought such permission for years, insisting that eagle-kill permits ought to last longer than the current limit of five years. Last April the Fish and Wildlife Service agreed, and it published a Federal Register notice saying it planned to extend incidental-take permits to 30 years so as to "facilitate the *responsible development* of renewable energy."

Although the agency hasn't made a final ruling on the 30-year permit, the proposal has riled environmental groups and several Native American tribes. The Natural Resources Defense Council, the Defenders of Wildlife, the National Audubon Society, the Sierra Club and the Wilderness Society submitted a joint statement to the Fish and Wildlife Service saying that the 30-year term was too long and that there was a "lack of sufficient baseline population data" on the two eagle species.

An eagle-kill permit "infuriates me," says Daniel Stussy, who owns a 20-acre farm on the border of the proposed New Era Wind Farm in Minnesota. "As a hunter, if I mistook the bald eagle for a Canada goose, a big fine would be the least of my worries. I couldn't even go to town for coffee because I'd be so ashamed."

Kelly Fuller of the American Bird Conservancy has a stronger warning: "If you want to turn the public against the wind industry, building a project that kills a lot of bald eagles will do it."

Mr. Bryce is a senior fellow at the Manhattan Institute and the author of "Power Hungry: The Myths of 'Green' Energy and the Real Fuels of the Future" (PublicAffairs, 2010).

From: Willem Post [mailto
Sent: Saturday, February 02, 2013 3:45 PM

Subject: Across the NEK, ISO-NE Puts Limits On Wind Energy Generation

All,

A classic case of a haste-makes-waste, build-out of IWTs in the Northeast Kingdom, which has a limited capacity grid not capable of dealing with multiple Lowell Mountain type IWT facilities. Will it cost $50 million, $100 million or more to bring the NEK grid up to its envisioned task? How long will it take before fully implemented? 1, 2 or 3 years? Is it worth it?

Why not try increased energy efficiency? It is less costly, reduces CO2 emissions much more effectively and at a lower cost/ton, is invisible, makes no noise, and UNBURDENS THE GRID, etc. An outlay of $100 million on EE would upgrade 10,000 energy hog houses AND would reduce more CO2 emissions at a lower cost than the IWTs on ridge lines.
http://theenergycollective.com/willem-post/46652/reducing-energy-use-houses
http://theenergycollective.com/willem-post/71771/energy-efficiency-first-renewables-later

Below is an article from the Orleans Record which nicely sums up the situation.

2/2/2013

Across NEK, North Country Grid Operators Put Limit On Wind Power Use Robin Smith, Staff Writer; Orleans Record Staff Writer Amy Ash Nixon contributed to this story.

Wind power projects are facing limits that even the staunchest supporters can't control. The operators of the New England grid are restricting the amount of electricity being accepted from the three operating wind projects in the Northeast Kingdom and the North Country of New Hampshire. And there's no indication that the restrictions, called curtailments, will end anytime soon.

Curtailments to balance electricity production with demand are common, according to ISO-New England, the grid operator. But it's the extent of the curtailments that caught some by surprise and has Vermont Electric Cooperative questioning whether any intermittent wind or solar project will be allowed to produce as much electricity as it could.

That's why the VEC board of directors wants a moratorium on new wind and solar projects in Vermont. VEC is asking the Legislature to back off demands that utilities buy even more renewable and intermittent power until curtailments and other problems are studied.

"These curtailment issues are a surprise to us," said Dave Hallquist, CEO of VEC. He testified before the Vermont Senate Natural Resources and Energy Committee this week, which is considering a wind project moratorium. He said the different wind projects are reacting to the curtailments.

Granite Reliable Power?

ISO-New England only accepted about half of the electricity that could be produced last year by Granite Reliable Power wind project in Coos County, N.H., Hallquist said. As a result, the majority owner doesn't want to pay its full amount for 2012 to the county. Granite Reliable Power operators say that the curtailments limited the electricity it was allowed to produce and the money the owners made. The county and the companies are now fighting over that.

Sheffield Limits

The First Wind Project at Sheffield did not sell as much electricity as expected in 2012, said spokesman John Lamontagne. Hallquist said that the production was 23 percent of capacity, down from the expected 32 percent for its 16 wind turbines. Wind project capacity factors are estimated to be the 32-35 percent range. Lamontagne said the lower than expected generation was due to a number of factors, "including higher than expected utility curtailment, higher bat curtailment and below average wind speeds throughout the year."

First Wind has to reduce operations to protect bats. "Wind generation in 2012 was below predicted wind averages based on multiple years of on-site wind measurements and testing. These reductions were partially offset by higher than expected turbine availability. "First Wind expects that the generation projections will be on target over the life of the project," Lamontagne said. Hallquist said VEC has estimated that curtailments caused half of the reduction in the electricity production at First Wind.

Low For Lowell

Curtailments also affect the 21 wind turbines at Kingdom Community Wind in Lowell, which has a maximum capacity of 63 megawatts. Green Mountain Power officials said ISO-New England limited the Lowell project to 15 megawatts earlier this week. Then the amount was increased to 30 megawatts, GMP spokesman Robert Dostis told Vermont Public Radio.
Dostis said that Lowell could have produced 45 megawatts because of the winds.

At the same time, GMP has reduced turbine operation to study noise.
Dorothy Schnure with GMP said the turbines have to be shut down every four to eight hours for 20 minutes each time to take noise measurements. And, as a new plant, there is start-up maintenance issues that require the turbines to go off line.

Before the end of the year, GMP will install what's called a synchronous condenser which will smooth the flow of electricity into the grid, at a cost of $10.5 million. That, Hallquist and Schnure said, will prompt the grid operators to allow more electricity from Lowell.
"We think that can resolve most of this," Schnure said, calling the limits on generation a temporary issue. The condenser will help, Hallquist said. "But we're not sure if it's going to entirely fix the problem."

Grid Limits

ISO-New England operators rely on curtailment of all types of power plants to balance production versus demand, spokesman Marcia Blomberg said this week. "Our job one is dispatching power into the system on a minute-by-minute basis," Blomberg said. "It has to be kept in balance,"
with the supply being generated to meet the demand. The problem with electricity is that there isn't a way to store it for future demand, she said. So energy plants are directed to cut back on the amount put into the grid when the demand is less.

The ISO-New England grid, said Hallquist, like others, was built on what's called spinning resources -- power plants that produce on demand consistently - including nuclear and fossil fuel plants, especially natural gas. ISO-New England has operating protocols that determine whether wind projects can get on the grid or not and by how much. The same would be true for a large solar farm, he said. Utility specialists knew that intermittent energy sources should expect to be curtailed, because big wind projects elsewhere in the country, like Texas and the Pacific Northwest have been curtailed by grid operators to smooth out power flow, Hallquist said. They just didn't expect so much curtailment last year, he said.

ISO-New England may curtail resources when the energy production in one area exceeds the transmission

system capability, Blomberg said.
"Sometimes these generation adjustments are preventative measures required to avoid overloading the transmission system following the loss of a resource or transmission line. "Also, in some instances, newer resources may have interconnected to areas of the system that have limited transmission capability -- if the transmission lines are full, for instance, the resource will not be able to get all their power out," Blomberg said. That's what Hallquist wants studied before more big renewable projects are planned or go online.

As for Lowell, the utility-owned wind project is still the lowest priced renewable energy available for both GMP and VEC, even with the expensive condenser, Hallquist and Schnure said. VEC has enough renewable energy contracts to meet legislative requirements, Hallquist said. But he said VEC wants the Legislature to stop requiring more until grid limits, health concerns and other problems with wind and solar are considered.

From: Rob Pforzheimer
Sent: Monday, February 11, 2013 10:12 AM
Subject: NH vdo A Little Time To Plan

Siting commission members,
Please watch this video from NH.

A Little Time To Plan **http://www.windaction.org/videos/37335**
Produced February 10, 2013 (Posted February 10, 2013) by evpnh2000

Description:

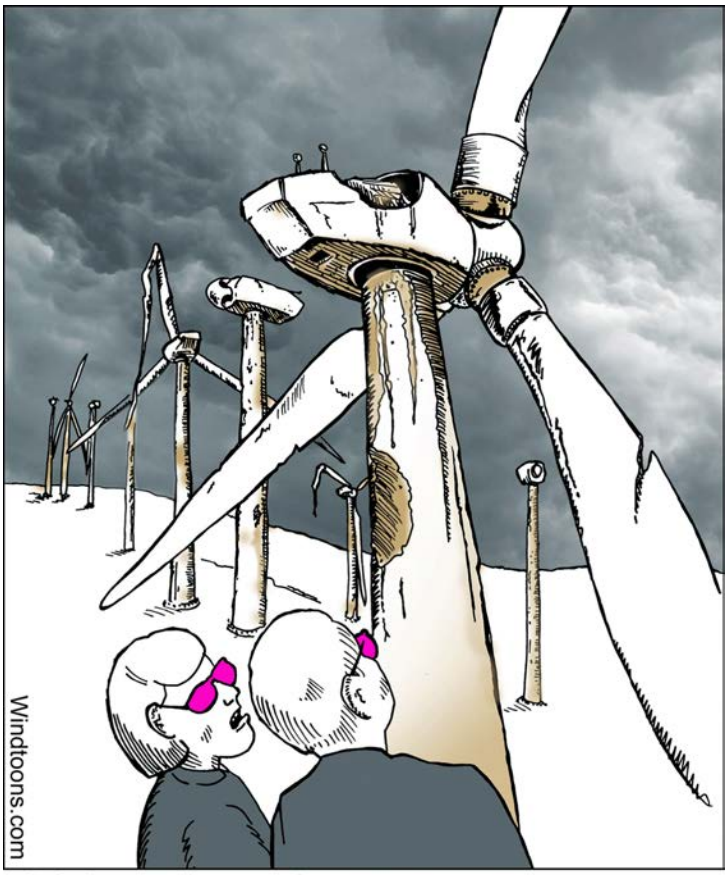
Meeting New England's Renewable mandates means thousands of industrial wind turbines erected all along NH's most scenic ridgelines. And Northern Pass proposes 1200 steel towers over 200 miles of NH landscape. How do we know if these destructive projects are worth the cost to thousands of people's livelihoods, property value and the state's tourism if we don't have a comprehensive energy plan for the state? Watch this video to find out what is at stake for the state. A bill is before the New Hampshire legislature seeking a moratorium on wind farm development in the State.
Duration: 8 minutes 21 seconds

From: Rob Pforzheimer
Sent: Sunday, February 10, 2013 9:12 PM
Subject: Rose Colored Glasses

Siting commission members,

Here's something to keep in mind on your upcoming site visits to Sheffield & Lowell.

There are lots of other good windtoons you'd enjoy at: http://windtoons.com/gallery.htm



It's hard to see the brown in green energy when you're wearing Rose Colored Glasses.

From: Rob Pforzheimer [mailto
Sent: Sunday, February 10, 2013 7:55 PM

Subject: a resident caught in the middle of a wind development

From: Rob Pforzheimer
Sent: Sunday, February 10, 2013 7:13 PM

Subject: Property near wind project denied bank line of credit

Property near wind project denied bank line of credit
August 18, 2011 by Belinda S. Reid
Summary:
This residential property located near the Melancthon I and II wind energy facilities (2 hours NW of Toronto) was denied a bank line of credit due to the health risks caused by proximity to the transformer substations.

Paul Thompson's front porch is located just 388.82 meters from the two Trans Alta transformer substations that service the Melancthon I and II wind energy facilities (133 industrial turbines). The constant hum emanating from the substations are audible from both outside and inside his dwelling even with the windows closed. The noise has required he move out of his house at night and rent other accommodations.

In 2011, Mr. Thompson contacted his bank about using his home as collateral for a line of credit to support the lawsuit against the siting of the Trans Alta substation. The bank denied his request based on the appraisal which found that his property was a high risk and its future marketability potentially jeopardized.

The letter accompanying the bank's appraisal report is provided below. Both the letter and the appraisal report can be accessed by clicking on the links at the bottom of this page.

Dear Paul:
It is with regret that I must advise that we are unable to put a second credit line on your property. The property was appraised and based on the report and the health concerns mentioned therein, the report is hypothetical in nature and the health risks caused by the hydro station located close to your home, we find your property a high risk and its future marketability may be jeopardized.
Please rest assured that you are a high value client with RBC and your credit with us has never been an issue, however, the property at this time has caused some concerns.
Please feel free to contact me at 519-943-0012 if you require further clarification.
Regards,

Ms. Belinda S. Reid
RBC Mortgage Specialist
Windaction.org wishes to thank Mr. Thompson for granting us permission to share these documents with our readers.

Download File(s):
Royal credit line declined letter.pdf (15.88 kB)
Paul D Thompson royal bank appraisal.pdf (1.42 MB)
August 18, 2011 by Belinda S. Reid

From: Annette Smith
Sent: Sunday, February 10, 2013 1:01 PM
Subject: Era of Fast Growth Ends for Wind Energy in Europe - SPIEGEL ONLINE

http://www.spiegel.de/international/business/era-of-fast-growth-ends-for-wind-energy-in-europe-a-882357.html

In Europe, the failure of the Continent-wide carbon emissions trading system, which is intended to penalize CO2-heavy companies by requiring them to purchase certificates for their emissions and is thus intended to spur investment in green energies, is contributing to the growth problem. The floor has fallen out on the market for emissions certificates. Meanwhile, the US hasn't even established its own carbon trading system yet. Add to this the fact that fracking has given the country access to cheap and cleaner natural gas. Instead of burning coal, the US is now exporting it abroad and driving global market prices down.

Annette Smith
Executive Director
Vermonters for a Clean Environment, Inc.

From: Annette Smith
Sent: Sunday, February 10, 2013 12:58 PM

Subject: CHRISTOPHER BOOKER: Wind farms will be a monument to an age when our leaders collectively went off their heads | Mail Online

http://www.dailymail.co.uk/debate/article-1199535/CHRISTOPHER-BOOKER-Wind-farms-monument-age-leaders-collectively-went-heads.html

Left with a land blighted with useless towers of metal, we shall look on those windmills as a monument to the age when the politicians of Britain and Europe collectively went completely off their heads.

Annette Smith
Executive Director
Vermonters for a Clean Environment, Inc.

From: Annette Smith
Sent: Sunday, February 10, 2013 12:50 PM
Subject: Lessons from England

http://blogs.telegraph.co.uk/news/jamesdelingpole/100200909/wind-turbines-not-just-hateful-but-ruddy-dangerous-too/

Here is what one man wrote in a letter to Torridge district council objecting to plans to erect an 84 metre turbine at Witherdon Wood in one of the loveliest parts of North Devon.
I am James Lovelock, scientist and author, known as the originator of Gaia theory, a view of the Earth that sees it as a self-regulating entity that keeps the surface environment always fit for life… I am an environmentalist and founder member of the Greens but I bow my head in shame at the thought that our original good intentions should have been so misunderstood and misapplied. We never intended a fundamentalist Green movement that rejected all energy sources other than renewable, nor did we expect the Greens to cast aside our priceless ecological heritage because of their failure to understand that the needs of the Earth are not separable from human needs. We need take care that the spinning windmills do not become like the statues on Easter Island, monuments of a failed civilisation.

Annette Smith
Executive Director
Vermonters for a Clean Environment, Inc.

From: Rob Pforzheimer
Sent: Sunday, February 10, 2013 11:12 AM
Subject: 2 Letters re VT & NH moratoriums on wind

"We do not need these projects, for there already is more than enough electrical energy in New England. They needlessly will contribute to the degradation of our environment. They will benefit the bottom line of corporations, while leaving us poorer - economically and aesthetically."

NH moratorium in order for energy projects

Sustainability is not, or should not be, a political issue. Real conservatives recognize the need to husband resources and live within their means. Real progressives understand the cannibalizing of nature can only lead to "death by a thousand cuts." These truths are relevant to the current gold rush by energy corporations to cover New Hampshire's landscape with long-distance, high-voltage power lines and wind farms.

February 10, 2013 by Peter Martin in Nashua Telegraph

The Oxford dictionary defines "finite" as "having bounds, ends or limit." The word "infinite," of course, means the opposite.

This isn't news to anyone older than a grade-school child, yet we are bombarded with propaganda from the corporate world and government that there is no limit to "growth" on our finite planet.

Obviously, there is a limited amount of oil, clean water, metals, soil in which to grow our food, fish and, well, every other resource you can think of in our finite world.

So, if we opt for infinite growth, we eventually will run out of our ability to sustain human existence. Once we destroy the Earth's ability to renew itself, no number of clever solutions or magical scientific breakthroughs will help us.

Exhausting the environment that sustains human life is not a new phenomenon. Numerous societies have exhausted their resources by demanding too much. Collapse and abandonment of all that they had built was the inevitable result.

We are digging up vast areas by mining for minerals and fuel; cutting the great tropical and boreal forests that store carbon dioxide and replenish the oxygen that we and other animal life need to live; flooding vast areas to produce hydropower; pouring industrial wastes into our water and atmosphere, and overfishing and polluting the oceans.

Sustainability is not, or should not be, a political issue. Real conservatives recognize the need to husband resources and live within their means. Real progressives understand the cannibalizing of nature can only lead to "death by a thousand cuts."

These truths are relevant to the current gold rush by energy corporations to cover New Hampshire's landscape with long-distance, high-voltage power lines and wind farms.

We do not need these projects, for there already is more than enough electrical energy in New England. They needlessly will contribute to the degradation of our environment. They will benefit the bottom line of corporations, while leaving us poorer - economically and aesthetically.

By ourselves, we cannot change the world, although we can set a good example by changing the way things are done in New Hampshire. In the process, we can create community-based sustainable energy facilities, together with the companies and jobs to support a healthier, renewable environment for ourselves and our children.

To get this done, we must encourage our legislators to insist on a moratorium on any new industrial energy projects until such time as the Legislature formulates and passes a comprehensive energy policy for our state.

There are a number of bills to get the ball rolling, but we must do our part by contacting our representatives to let them know we support efforts to build a sane, renewable future.

Don't wait, for these issues will be considered soon. Our voices can make a difference. Let's make sure they are heard.

Peter Martin, of Plymouth, is a member of the No Northern Pass Coalition.

Web link: http://www.nashuatelegraph.com/opinion/commentary/...

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Vermont's flawed renewable energy policy

February 10,2013

Recently Sen. Bernie Sanders dove headfirst into the controversy surrounding ridgeline wind development in Vermont by vehemently opposing the three-year ridgeline wind moratorium proposed by state Sens. Joe Benning and Bob Hartwell. While some have attacked Sen. Sanders for taking sides on a controversial state policy issue as a U.S. senator, that criticism seems unfair since Bernie is a Vermont citizen like the rest of us and has the right to weigh in on issues being debated in the Statehouse.

The development of ridgeline wind has divided Vermont environmentalists like no issue before and while Sen. Sanders must have known his position would create controversy, it is certainly an issue on which people can disagree.

Unfortunately, both Sen. Sanders and climate activist Bill McKibben have greatly exaggerated the national policy and global environmental harm that a three-year Vermont ridgeline wind moratorium could have. Additionally, in attacking the moratorium they have unwittingly embraced a decade of failed Vermont renewable energy policy.

Both Sanders' and McKibben's attacks on the moratorium, if accepted at face value, would leave Vermonters with the impression that, if the Legislature rejects the moratorium, all will be well in regards to Vermont renewable energy policy. Nothing could be further from the truth.

Moratorium opponents, including Sanders and McKibben, have offered two largely hollow arguments. First, they have argued that the moratorium will send the wrong signal regarding Vermont's commitment to renewable energy. Additionally, they argue that it will be a step backward on climate change action, which we cannot afford.

Unfortunately, they are overlooking the effect of current state policy.

First, Vermont's Sustainably Priced Energy Enterprise Development (SPEED) program, in which all of the instate wind resources participate, is the most fundamentally flawed renewable energy policy in the nation today. As a result of this policy, Vermont's utilities are largely selling the renewable energy credits from these projects into out-of-state programs rather than retiring them for Vermont customers.

While this program raises Vermonters' electric rates, it does not result in a net increase in renewable energy in the region. How can a moratorium that would slow rate increases, but not change the regional procurement of renewable energy, send a worse message nationally than the fundamentally flawed policy in place today?

Second, because Vermont's utilities are largely selling the renewable energy credits from the Vermont wind projects into out-of state-programs, Vermont's utilities are actually exporting the low-carbon energy and in its place importing energy that is largely sourced from fossil fuels and nuclear power.

Any credible analysis, including that from the Vermont Department of Public Service, demonstrates that the more Vermont increases the SPEED resources, the greater Vermont's greenhouse gas emissions.

Contrary to Sen. Sanders' and Bill McKibben's claims, a moratorium on the primary SPEED resources should actually slow the growth of Vermont's greenhouse gas emissions, given the shell game that is being played with the renewable energy credits, and it would also temporarily halt development on our sensitive mountain ecosystems.

Sen. Benning's and Hartwell's proposed ridgeline wind moratorium may not be the optimal fix for Vermont renewable energy policy, but compared to the flawed Vermont policy in place today, it at least sends an appropriate message that Vermonters should not sacrifice their mountains for sham renewable policies that offer no benefit to the climate.

Maybe then our Democratic legislative majority will actually implement a Renewable Portfolio Standard based on the successful state policies of all of our Northeastern neighbors and that would be state policy worthy of the support of Sen. Sanders and Bill McKibben.

Kevin B. Jones is a resident of Chittenden.

From: KI [redacted]
Sent: Saturday, February 09, 2013 2:09 PM
[redacted]
Subject: Fw: Wind farms / MUST READ Article.....

This is a must read article about how IW is ***REALLY*** doing in the UK. ~ K

Wind farms will be a monument to an age when our leaders collectively went off their heads
http://www.dailymail.co.uk/debate/article-1199535/CHRISTOPHER-BOOKER-Wind-farms-monument-age-leaders-collectively-went-heads.html

From: regina wdowiak
Sent: Saturday, February 09, 2013 12:23 PM
Subject: Wait before approving any more wid power projects

Dear Commissioners

Before approving any more wind energy proposals, let us scrutinize the effectiveness of the present wind farms

regina wdowiak

From: Rob Pforzheimer
Sent: Friday, February 08, 2013 8:31 PM

Subject: New Hampshire is at a crossroads: Towers or tourism?

New Hampshire is at a crossroads: Towers or tourism?

We are presently at a critical point in New Hampshire. Foreign wind farm companies are rushing to construct huge wind turbine projects along NH's ridgelines, in ways that will forever change the landscape of our state, unless we act now. We need to institute an immediate state-wide moratorium on such projects, before we reach the point of no return.

February 7, 2013 by Jae-ann Rock in Laconia Citizen http://www.windaction.org/opinions/37319

We are presently at a critical point in New Hampshire. Foreign wind farm companies are rushing to construct huge wind turbine projects along NH's ridgelines, in ways that will forever change the landscape of our state, unless we act now. We need to institute an immediate state-wide moratorium on such projects, before we reach the point of no return.

Significant wind turbine development projects are currently planned for construction on pristine ridgelines in NH's Lakes Region. Large foreign companies, such as Spanish Iberdrola and Portuguese EDP, are working behind the scenes, preying on NH's small, rural towns with NO zoning laws and WEAK land use regulations, to erect 500' wind turbines across NH's mountain ridges. The process has already begun in some towns around Newfound Lake. Small towns such as Alexandria, Hebron, Groton, Grafton and Danbury are unprepared to deal with such behemoth international corporations which are intentionally seeking these "easy targets" to establish their next wind farm projects in NH's Lakes Region!

Dr. Benjamin Luce, physicist and professor at Lyndon State College in Vt., is an expert on sustainable energy and ridgeline wind power. He recently spoke at Newfound High School, to report his findings that ridgeline wind power is not an effective means of energy production in NH. For this reason, NH would require thousands of large ridgeline projects throughout the state to produce energy of any significance. (Can you picture that?) This should give us all cause to stop, think and ACT to stop these projects before it's too late.

I support green energy, but not at the expense of New Hampshire's ridgelines or our economic base of tourism. Will tourists come to NH to see an industrial skyline of 500' wind turbines on previously pristine, forested ridgelines? Probably not. Realize that if NH tourism suffers, our entire tax base suffers, affecting NH as a whole.

Once our ridgelines have been bulldozed, clear cut, filled with cement bases, and dwarfed by huge steel wind turbines, it will be too late. And what will become of these towering, defunct turbines once more efficient energy production methods become available? Will they be retired to sit and rust like so many others around the country? This issue warrants our immediate attention.

Please support the following legislative bills which are being heard in the coming weeks:

· House Bill 508 (HB508), calling for a state moratorium on wind turbines projects, until more complete impact studies can be conducted;

· HB484, requiring the Site Evaluation Committee (SEC) to more closely review local impact issues before approving wind farm projects;

· HB306, calling for an updated proactive statewide energy plan, required to stop this constant "reactive" state we are now in.

Together, we can preserve the beautiful, forested ridgelines of our Lakes Region for generations to come, while developing a truly sustainable energy plan for NH. Let's not roll over and play dead. We must act now.

For further information, view the upcoming bills
at: http://gencourt.state.nh.us/house/committees/HouseBillsInCommittee.

Join "NH Wind Watch" on Facebook or go to **Error! Hyperlink reference not valid.** where you can view a video of Dr. Luce's presentation.

Write your State reps and town officials now. Make your voice heard. Please take action to stop these projects before it is too late. Thank you for your time attention to this matter.

Web link: http://www.citizen.com/

Filed under : New Hampshire : Impact on Landscape : Impact on Economy : Tourism

From:
Sent: Friday, February 08, 2013 2:23 PM

Subject: Vermont's Choice: Almost CO2-free Energy or Politically-Correct, Sustainable/Renewable Energy that is Not So CO2-free.

Time to get real on Vermont's carbon policy.

It might surprise many environmentally-minded Vermonters to learn that if the State of Vermont's energy leaders must choose between "sustainable" energy and "low-carbon," they'll take "sustainable."

If there's one thing most Vermonters know, it's that low-carbon energy generation is regarded as crucial to fighting climate change, a fearsome threat to global life as we know it. Our governor says so frequently. Climate change authority Bill McKibben recently spoke to the State Legislature by special invitation from Speaker of the House Shap Smith.

Here in Vermont, we want everyone to know we're serious about climate change.

Except when we're not.

And we are especially not serious about climate change when the subject is Vermont Yankee, a virtually carbon-free producer of three-quarters of the electricity made in Vermont. The carbon "life cycle" of nuclear energy – emissions from mining, refining, generation and all related processes – is virtually equal to that of wind, solar and hydro power, according to the U.S. Energy Information Administration.

The State of Vermont's Public Service Department stated, in an October
2012 filing to the Vermont Public Service Board in opposition to Vermont Yankee receiving permission to operate for another 20 years, that for power producers, being "sustainable" and "renewable" is more important than actually emitting less carbon:

"Because renewable sources are more sustainable than non-renewable sources, and state goals emphasize the importance of renewable resources to the state's economy, meeting the state's energy needs and greenhouse gas targets through renewable sources is more compatible with state policy than meeting those needs with other, non-renewable, resources, even those with low or zero greenhouse gas emissions.
Relevant to Entergy's petition, although nuclear sources may offer energy with low greenhouse gas emissions, renewable sources, even those with greater greenhouse gas emissions than nuclear sources, are more compatible with state policy because nuclear energy is not renewable and is less sustainable than energy from renewable sources (italic added)."

Well, there you have it. Calling something "renewable" and "sustainable" matters more than actually doing all we can to reduce Vermont's carbon footprint. State policy says so. What the earth's atmosphere actually needs – well, that seems less important. It's like someone driving a trendy brand of car just to project a personal image of being "green," When a less-popular car would actually emit less pollution.

Is industrial wind – currently unpopular among many for disfiguring Vermont mountaintops with huge, permanent concrete pads – more "renewable" than nuclear power plants fueled in part by recycled Soviet nuclear warheads? It is so easy for green buzzwords to distract from the only real question that matters about climate change, which is

simply: how can we produce less carbon?

For that matter, why can't nuclear energy and state-approved "renewable" and "sustainable" power simply co-exist? Vermont Yankee doesn't sell directly to Vermont utilities, so it is a stretch to claim the plant's 24/7 reliability and relatively low cost undercuts the development of much higher-priced renewable power sources, like wind and solar. The Public Service Department has an answer for that, too.
Vermont Yankee's low-carbon power production apparently reduces economic demand for other forms of renewable power:

"In fact, it [operating Vermont Yankee] would marginally reduce the ability of renewable energy generation to compete in the New England market by lowering the price of Regional Greenhouse Gas Initiative ("RGGI") allowances, and thereby the effective cost with which clean energy resources must compete."

See how that works? Carbon credits trade higher when demand for carbon-free power is high. If Vermont Yankee closes, demand increases, along with New England's carbon dioxide emissions.

There is an old saying, "the enemy of my enemy is my friend." If climate change is the enemy our leaders say it is, then they have no better friend in the struggle than the much-maligned but carbon-free plant on the banks of the Connecticut River. It's time they start treating it that way.

From: Rob Pforzheimer
Sent: Friday, February 08, 2013 11:30 AM

Subject: the wind turbine would present a significant distraction to the play of golf

Judge limits turbine

"I am satisfied by a fair preponderance of the evidence that the operation of the wind turbine would present a significant distraction to the play of golf." Judge Doerfer ordered a specific schedule protecting golf-play hours and limiting turbine operation to hours of darkness from April 1 through Nov. 15. His order allows turbine operation 24-hours a day from Nov. 16 through March 31.

February 7, 2013 by Laura Griffin in Milton Times

Milton's wind turbine plans hit a major snag this past week when Judge Gordon Doerfer officially ordered that the proposed turbine be shut down during golfing hours for the seven and a half months from April 1 through Nov. 15.

Judge Doerfer referred to the town's legal obligations to its lease-holder, Quarry Hills Associates, and the operation of Granite Links Golf Course, a "professional golf course," throughout his 27-page binding arbitration decision issued Jan. 31.

"I am satisfied by a fair preponderance of the evidence that the operation of the wind turbine would present a significant distraction to the play of golf on the holes most proximate to it, namely 4, 5, 6 and 7," declared Judge Doerfer in his decision.

As a result, Judge Doerfer ordered a specific schedule protecting golf-play hours and limiting turbine operation to hours of darkness from April 1 through Nov. 15. His order allows turbine operation 24-hours a day from Nov. 16 through March 31. Neither Selectmen Chairman Thomas Hurley nor Town Counsel John Flynn issued a statement on the judge's decision by the Times deadline this week.

However, when the judge's draft decision was first issued in October, Hurley said that town officials would review the decision and assess the financial impact of limited operation.

Flynn represented the town in the arbitration procedure; Jeffrey Tocchio of Hingham's Drohan Tocchio & Morgan, PC, represented QHA.

In an emailed statement, Tocchio said, "The arbitration process was very positive and professional, and we are pleased that both positions were fully presented and considered by the arbitrator."

Town officials originally planned the construction of a wind turbine on town land at the former landfill near the border of the Quarry Hills Golf Course and in 2010 authorized a $6 million borrowing for the project.

However, QHA challenged that plan in Norfolk Superior Court, charging the turbine would violate terms of their 50-year lease with Milton for the adjacent property, which now sports eight holes of the 27-hole golf course.

Since the dispute involved terms of the lease, the court ordered the case be decided by binding arbitration. Both sides agreed to the choice of Judge Doerfer who determined that QHA had no claim regarding aesthetics, but the noise of the turbine was an impediment to a "professional golf course."

"That's going to make it economically tough to operate," said Shaun Pandit when asked to comment on the decision. Pandit is a member of the town's Wind Energy Committee and a consultant in green energy. His firm, Early Bird Power, recently negotiated a major solar energy project for Cape Cod Hospital.

Pandit described the decision as unfortunate and said the committee has not met since word of the judge's draft decision was publicized in November. The committee's chairman Richard Kleiman resigned in October for personal reasons.

Daryl Warner, Matthew Cammack, and Kevin Chase also serve on the committee, which worked on the project for more than four years.

The arbitration process involved seven days of testimony by 15 witnesses and a review of 70 exhibits.

"Here the threat posed from the noise and motion of the turbine is a threat to the character or value of the leased premises," concluded Judge Doerfer.

In his decision, Judge Doerfer also described several unusual steps by which the town approved the turbine project. He cited the town's creation of a wind turbine overlay district.

Judge Doerfer noted that the creation of the overlay district eliminated the requirement for a review process and prevented abutters from voicing objections.

In September, 2010, Town Meeting approved the proposed "Industrial Turbine on Town-owned land ‘as of right,'" noted Judge Doerfer who added, "This circumvented all of the controls that a developer normally has to fulfill."

The judge also addressed the eminent domain landtaking for an access road that was authorized last year by Town Meeting vote. He stated, "It is clear that no taking is authorized or created under terms of the Lease."

However, Judge Doerfer declined to rule on the land-taking issue, stating the question was not a part of the claims before him. Neither party was awarded damages, costs or attorney fees.

Judge Doerfer discounted the town's contention that the turbine noise would be no more of a distraction than the airplane noise currently coursing over the golf course and wrote the following: "I am satisfied from the testimony that the distraction presented by such aircraft is not comparable to the distraction that would be presented by the sound and motion of the wind turbine blades when in operation at the location above."

Judge Doerfer described the proposed wind turbine as 410 feet tall with blades that, at the tip, would travel at up to 100 mph.

Milton's not alone in hitting detours on wind turbine projects. As the Boston Globe's Emily Rooney recently reported, five of the 16 communities in Eastern Massachusetts with working turbines have "residents that say the turbines near their homes have caused health problems."

Web link: http://www.miltontimes.com/

From: Teresa Bobel
Sent: Friday, February 08, 2013 11:24 AM
Subject: Support the development of renewable energy

Dear Commissioners

1. Use the State's Comprehensive Energy Plan and existing legislation as a roadmap for reviewing proposed projects—In order to reach the state's goal of meeting 90% of our energy needs with renewable power by 2050, it will be necessary to substantially increase the development of local, clean energy projects such as wind, solar and small hydro facilities. Local clean energy projects are a necessary public good and should be given a preference over non-renewable energy sources.

2. Use Climate Change as a framework for determining which projects should be sited— The potential climate impact of an energy project should be considered when determining whether the project qualifies for a Certificate of Public Good.

3. Provide additional support for public participation without silencing the majority— The State should encourage and facilitate meaningful public participation in the energy siting process. Technical or financial support for qualifying interveners is one way to facilitate that participation. While encouraging more local input, the State must also consider the best interests of all state residents. Host communities alone must not have the exclusive power to approve or deny projects. Local voices need to be considered and balanced with the interests of all residents of the state.

Teresa Bobel

From: steve paxton
Sent: Friday, February 08, 2013 12:59 PM

Subject: Support the development of renewable energy

Dear Commissioners,

I live in the NE Kingdom and often see the wind projects in Sheffield and Lowell. I live here for the natural environment which poverty and remoteness has blessed the area with. Route 91 was a big intrusion. But even a huge ribbon of tar is less intrusive than the industrial scale wind generators.

I am for wind and solar in theory. As these are developing technologies, I had hoped that the design faults which spoil giant hydro, coal, and nuclear generation, which all boil down to environmental degradation, could be avoided.

As I drive over the hill above Lake Willoughby, facing west, I am assaulted by multiple wind turbines. This was one of the great Vermont expanses of forest, farm and fabulous lake which soothed my soul for the past 40 years. Here was a landscape one could get lost in, surrounded by the one thing I still trust; nature doing its thing. The turbines' scale, their very hugeness is a blight; not just on the view, but on the atmosphere of a place in which plants and animals were living as they have from the end of the Ice Age. I crest the hill, my heart sinks, and I think, "there goes the neighborhood."

I am aware of other designs for wind turbines. There is a very small sort which could perch on roof ridges, lightweight, sensitive frisky little machines which might power the immediate buildings and provide something for the grid. I don't object to the few small scale windmills some enterprising farmers have erected.

But in my opinion industrial-scale wind turbines are a travesty, a failure of imagination and a blight. Another way to tap the wind must be found. No more Sheffields and Lowells should be allowed. A three year moratorium to assess the situation is certainly called for; and in fact, I would call for removal of the generators which have so far been raised.

Being pro-wind is not either/or. If the fit of the design to the site is not a factor, if what is being lost is not understood, then this remarkable and valued area will be changed into a wind park, the value of which will be mainly the profits which will accrue to out-of-state corporations eager to take advantage of our political and economic weakness.

I say, this must stop now. Let Vermont be a leader, finding a way to develop wind in a way which does not destroy what Vermont is.

Steve Paxton
Mad Brook Farm

From: Nilah Cote
Sent: Friday, February 08, 2013 1:02 PM
Subject: Support the development of renewable energy

Dear Commissioners

There is a state comprehensive Energy Plan and existing legislation that I feel needs to be followed when reviewing proposed projects. My grandchildren and their children's future depends on our ability to stay focused on the state's goal of meeting 90% of our energy needs with renewable power. As commissioners, you must take the lead for approving renewable proposals. I encourage you to consider the best interests of all state residents by facilitating public participation in this process.

Thank you.

Nilah Cote

From: Hope Saunders
Sent: Friday, February 08, 2013 9:28 PM

Subject: Support the development of renewable energy

Dear Commissioners

[1. Use the State's Comprehensive Energy Plan and existing legislation as a roadmap for reviewing proposed projects—In order to reach the state's goal of meeting 90% of our energy needs with renewable power by 2050, it will be necessary to substantially increase the development of local, clean energy projects such as wind, solar and small hydro facilities. Local clean energy projects are a necessary public good and should be given a preference over non-renewable energy sources.

2. Use Climate Change as a framework for determining which projects should be sited— The potential climate impact of an energy project should be considered when determining whether the project qualifies for a Certificate of Public Good.

3. Provide additional support for public participation without silencing the majority— The State should encourage and facilitate meaningful public participation in the energy siting process. Technical or financial support for qualifying interveners is one way to facilitate that participation. While encouraging more local input, the State must also consider the best interests of all state residents. Host communities alone must not have the exclusive power to approve or deny projects. Local voices need to be considered and balanced with the interests of all residents of the state.Copy and paste suggestions from above, or craft your own comments here. Just be sure to delete this message before you submit your comment to the commissioners!]

Hope Saunders

From: Julieann Barney
Sent: Friday, February 08, 2013 10:50 PM
Subject: Support the development of renewable energy

Dear Commissioners

Dear Commissioners;

Please consider the following regarding VT renewable energy:

1. Use the State's Comprehensive Energy Plan and existing legislation as a roadmap for reviewing proposed projects—In order to reach the state's goal of meeting 90% of our energy needs with renewable power by 2050, it will be necessary to substantially increase the development of local, clean energy projects such as wind, solar and small hydro facilities. Local clean energy projects are a necessary public good and should be given a preference over non-renewable energy sources.

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Julieann Barney

From: Rob Meader
Sent: Saturday, February 09, 2013 6:20 PM
Subject: Support the development of renewable energy

Dear Commissioners

I live in Georgia, VT and we just saw the completion of a 4 turbine project in town. I believe that after conservation or efficiencies, clean energy is the next step. I am worried about our aging nuclear sources, and coal based sources while maybe not in my state are concerning as well. Please consider carefully between the interests of "big wind" and the realities of this necessary energy source. We don't want to give away our ridges to people looking to make a buck, but we do seem to increasingly need more power.

Rob Meader

From: Annette Smith
Sent: Friday, February 08, 2013 10:42 AM

Subject: Europe consuming more coal

I've received about 6 copies of this Washington Post article today from various people, and you may too. This is an example of unintended consequences of pushing renewables without thinking through the whole system. In New England, we have natural gas pushing out coal and oil, and even after seeing $2 billion invested in big wind development in four states, there is no evidence that there is any reduction in GHG emissions or fossil fuel consumption because of the wind development.

Before you go forcing regions to plan for 90% renewables in Vermont and requiring each region to identify places where they want big wind, you need to look at what those unintended consequences might be. I noted a couple times at the meeting the other day the comment that people don't want to live near big wind turbines. To a person, every second homeowner I've met in a Vermont area threatened by big wind turbines has said if they build them they will leave. So you can kiss good-bye our second home economy. (contrast that with the happy, positive interactions around solar -- take big wind off the table and we could really get cooking building out solar)

If you think these things are tourist attractions, go to Cohocton NY, Lempster NH, Mahanoy City, PA, Bear Creek PA, or Coos County NH and see for yourself how inviting they are. In Bear Creek, all I could find was a dented mailbox next to the entrance which was plastered with posted signs. In Cohocton NY there is absolutely no evidence it has done a thing for the community (which is desolate and run down) and you have to hunt to find the First Wind headquarters, there is one small sign on a fenced in area surrounding their operations building, and nothing with any information. Mahanoy City is in the coal region (I've been back 3 times to talk to people to find out why people who live in the coal region are opposing wind) and Iberdrola's Locust Ridge project is heavily posted and gated. As with Iberdrola's Lempster NH wind project, the only thing public is one sign at the entrance with a few items. In Coos County NH it is heavily posted and gated and the only way I got within 1/2 a mile of the turbines was by being taken in by a local, and we got 8 miles into the site before the wind company caught up with us and called the Sheriff -- not exactly inviting. What these sites do attract is gawkers, and I can tell you having done it numerous times, that driving around to try and get close to the turbines is incredibly dangerous, it creates a safety hazard on the roads, and does nothing for the local economy, if there is one. In most places, there is not, because these projects are built in such low income areas. The only place I have seen where there is any local benefit is that there is a store in Lempster NH that sells sandwiches to the gawkers. I have not seen any businesses benefiting at any of the other sites I have been to. In Lowell, the Nelsons who live at the end of a dirt road sometimes now have 40 or 50 cars turning around in their driveway. Their lives have been ruined by the Lowell wind turbines and it is now evident that this administration cares nothing for the people who live around these wind projects. And it appears you don't either, since you are scheduling a site visit to Lowell and Sheffield that does include meeting with any of the people who live nearby to see what is happening to them.

Annette Smith
Executive Director
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Europe consuming more coal

By Michael Birnbaum, Published: February 7

JAENSCHWALDE, Germany — Green-friendly Europe has a dirty secret: It is burning a lot more coal.

Europe's use of the fossil fuel spiked last year after a long decline, powered by a surge of cheap U.S. coal on global markets and by the unintended consequences of ambitious climate policies that capped emissions and reduced reliance on nuclear energy.

The new dependence on one of the dirtiest fuels shows just how challenging it is to maintain the momentum needed to go green, analysts and officials say, and demonstrates the far-reaching effects of America's natural gas boom.

In the United States, natural gas is now frequently less expensive than coal for power, so demand for the hard, black fuel has plummeted. Ships are steaming the coal around the world instead. U.S. coal exports to Europe were up 26 percent in the first nine months of 2012 over the same period in 2011. Exports to China have increased, too.

"It's been very welcome that U.S. greenhouse gas emissions have been going down because of the switch to gas," said David Baldock, executive director of the Institute for European Environmental Policy in London. "But if we're simply diverting the coal somewhere else, particularly to Europe, a lot of those benefits are draining away."

In Germany, which by some measures is pursuing the most wide-ranging green goals of any major industrialized country, a 2011 decision to shutter nuclear power plants means thatdomestically produced lignite, also known as brown coal, is filling the gap . Power plants that burn the sticky, sulfurous, high-emissions fuel are running at full throttle, with many tallying 2012 as their highest-demand year since the early 1990s. Several new coal power plants have been unveiled in recent months — even though solar panel installations more than doubled last year.

Here in Jaenschwalde, a stone's throw from the Polish border, the forested countryside quickly drops away into a 300-foot-deep pit stretching for miles. Enormous machines slowly eat away at the earth and shower soft lignite onto a conveyor belt that feeds directly into a nearby power plant. From the precipice of the mine, the 20-foot-tall trucks at the bottom look like Tonka toys.

Last year, the power plant consumed 88,000 tons of lignite a day and generated more electricity than it had since 1981, according to Vattenfall, the Swedish company that runs it. That record is even more impressive given that in 1981, Communist East German officials didn't have to contend with labor laws or environmental regulations and could run the mines almost every day of the year.

The expansion of lignite mining has stunned some people who live in its path. One community under threat is the tiny hamlet of Atterwasch, a cluster of 250 people on the edge of a proposed expansion of the Jaenschwalde mine. They might have to leave their homes, as well as their church, whose chapel was built in 1294.

"This church survived the Thirty Years' War [in the 1600s], two world wars and socialism," said Mathias Berndt, the senior pastor at the church, which is festooned with anti-coal-mining protest banners. "Now a free country is coming and saying, 'Good for you, but now you have to move.'"

Demand for coal in Germany has been rising since a May 2011 move to phase out nuclear power by 2022. The shutdown was spurred by the nuclear meltdown at the Fukushima Daiichi plantin Japan as well as long-standing German concerns about safety. But nuclear energy, which is low in greenhouse gas emissions, has been partially replaced by brown coal. Lignite supplied 25.6 percent of Germany's electricity in 2012, up from 22.7 percent in 2010. Hard black coal supplied an additional 19.1 percent last year, and it was also on the rise.

Germany phases out nuclear

“The faster phaseout [of nuclear energy] has led to an increased fallback on lignite,” said Thomas Bareiss, a member of Germany’s parliament and the energy policy coordinator for the ruling Christian Democratic Union party. “Lignite will surely play an important role for our energy mix over the next two or three decades.”

But the rise of coal has posed a challenge to Germany’s tough environmental goals. By 2050, the country aims to generate 80 percent of its electricity from renewable sources, allowing steep reductions in greenhouse gas emissions. Green advocates worry that if Germany’s extensive — and pricey — support for renewable energy such as wind and solar power diminishes, coal might further fill in the gap.

Energy companies say that the two forms of power generation can live together for now. Lignite plants, they say, are an economical way to meet demand at times when the wind isn’t turning windmills and the sun isn’t warming solar panels. But officials acknowledge that with the ambitious energy goals, coal’s future might be limited.

Germany “has to change completely,” said Hartmut Zeiss, head of mining for Vattenfall Europe. “The question now is how long it will take and what we can afford.”

In other European countries, the quick rise of coal has surprised people who thought it was a waning industry. In Britain, domestic coal production nearly died in 1984 during a bitter, year-long miners’ strike that pitted Prime Minister Margaret Thatcher against the once-powerful unions. Domestic production is still moribund, but in the first nine months of 2012, imports of U.S. coal were up 73 percent from the same period in 2011.

The few remaining domestic coal mines say they can’t compete, and newspaper headlines have harped on the irony.

“The future looks a bit gloomy,” said David Brewer, director general of the Confederation of U.K. Coal Producers.

Consumption of coal also has leapt in Spain and Italy, with much of it supplied by the United States. That comes despite extensive efforts to harness Spain’s sun and Italy’s wind in the name of power production. Consumers, slammed by sky-high unemployment, have been particularly sensitive to energy prices.

U.S. shift to natural gas

The abundance of American coal on international markets has been an unintentional side effect of the rapid rise of new drilling techniques for natural gas in the United States. Hydraulic fracturing, or “fracking,” has opened up new reserves so vast that the United States will soon become a net natural gas exporter, slashing the country’s reliance on costly oil imports. U.S. manufacturers are looking with glee at cheaper natural gas prices. And because natural gas is cleaner than coal, U.S. greenhouse gas emissions from electricity generation have dropped to their lowest levels since 1992.

Now, U.S. coal is spreading around the world instead, pushing down global prices. In Europe, that has raised fears among environmentalists that the cheap natural gas in the United States has simply led to higher overall fossil fuel consumption.

One big part of the problem, experts and officials say, is Europe’s cap-and-trade system, which aims to reduce European Union-wide industrial greenhouse gas emissions by 20 percent by 2020. The system is the centerpiece of Europe’s green policies. But the program, which charges industries for permits to emit greenhouse gases, no longer serves as a major disincentive to pollute. Industrial production fell dramatically during the economic crisis, so overall greenhouse gas emissions remain well underneath the cap, and they are still falling. The price per ton of carbon emissions is barely more than a tenth of its 2008 peak. Energy companies, who must plan decades in advance, have shied away from investing in gas-fired power plants because they are not profitable in comparison to coal.

Europe's coal use might soon taper off, some experts say. And European lawmakers are trying to prop up the cap-and-trade system by setting more ambitious targets for 2025 and 2030. That would quickly send the price of permits up and make coal less competitive with greener forms of energy.

"The higher the price is for carbon, the worse the business case is for coal, and the better it is for gas," said Hubertus Bardt, an energy expert at the Cologne Institute for Economic Research.

In addition, American mines might cut back on their production because of the lower prices, thus tightening the global supply and making coal less competitive in comparison to other energy sources, according to analysts.

For now, confronted with a glut of newly available fossil fuel, environmentalists are trying to decide whether it's best to try to keep it underground.

"What we want to achieve is a reduction in the total quantities of the emissions of greenhouse gases," said John Broderick, a research fellow at the Tyndall Center for Climate Change Research in Manchester, England. "If we're serious about this, we would be looking to disincentivize the extraction of fossil fuels."

Petra Krischok in Jaenschwalde, Germany, and Eliza Mackintosh in London contributed to this report.

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From: Rob Pforzheimer [mailto:
Sent: Friday, February 08, 2013 9:02 AM

Subject: FW: From today Washington Post--so much for wind displacing the burning of fossil fuel!

http://www.washingtonpost.com/world/europe-consuming-more-coal/2013/02/07/ec21026a-6bfe-11e2-bd36-c0fe61a205f6_story_2.html

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"It's been very welcome that U.S. greenhouse gas emissions have been going down because of the switch to gas," - *NOT WIND*

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From: Rob Pforzheimer [mailto:
Sent: Thursday, February 07, 2013 3:22 PM

Subject: Do you believe living near wind turbines causes health problems? 73% YES

Results of online poll in Green Bay, Wis http://www.greenbaypressgazette.com/poll/2013-02-05/6880214/results

From: Luann Therrien
Sent: Thursday, February 07, 2013 1:20 PM
Subject: Senator Introduces Bill To End Huge Corporate Tax Giveaway | ThinkProgress

But it's ok to spend billions of United States tax payers money out of country to buy what it takes to build wind turbines.

http://thinkprogress.org/economy/2013/02/07/1554221/sanders-corporate-tax-bill/?mobile=nc

From: Pam Arborio [mailto:
Sent: Thursday, February 07, 2013 12:51 PM

Subject: Updates | Seneca Mountain Wind

http://seneca-wind.com/category/updates/

Please note two items in particular on this page; SMW keeps saying they have no plans farther than Met Towers but it's quite apparent what the intent is. The picture also shows less than half of the projected amount of towers and, please keep in mind, there will be no transmission to the grid per VEC. What purpose other than subsidies would SMW have or this project.

The "vote" held in UTG was a straw poll in the parking lot purposely held outside so it would not be construed as a binding vote. Yet, as you will read, the information is not only misleading but is indicative of the misinformation being fed to the townspeople involved.
Pam Arborio

Sent from my iPad