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**Four Turbines on East Mountain:
An Examination of Wind Farm
Aesthetics in the Vermont Landscape**

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Contents

Introduction	3
Evaluating Aesthetics: The Quechee Test	4
Limits of Quechee: The Questions of Context and Fit	5
Quechee Reconsidered: Four Principles Concerning Wind	7
Vermont's Landscape: Cultural, Dynamic and Value-based	7
1. Compatibility with Environmental Values	9
2. An Integrated, Working, Resource-Based Landscape	10
3. A Symbiosis of Wind Power and Windy Places	12
4. Reports from the Field: People Like What They See	13
▪ Searsburg, Vermont	14
▪ Northern Europe	15
Conclusions	16
References	19

Introduction

At first glance, the visual implications of wind turbines in Vermont are pretty self-evident. Locations suitable to wind generation are generally found at the state's highest elevations – running along the north-south trending mountain ridges that frame the state's distinctive landscape. We are the Green Mountain State. It's not easy to hide a 329 foot high structure on a mountaintop. A large wind project is likely to be visible from somewhere in Vermont.

A large scale wind project in Vermont must first secure a "certificate of public good" from the Vermont Public Service Board. Under Section 248(b)(5) of the applicable state law, the board must find that the project "will not have an undue adverse effect on aesthetics, historic sites, air and water purity, the natural environment and the public health and safety." [1] The statute goes on to require this be done with "due consideration" given to specific criteria of Vermont's well-known land use review law, Act 250.

Wind turbines offer many environmental benefits, but they are not invisible. The towers on East Mountain will be tall. However, several important factors will significantly reduce their perceived size and visibility. The tapered towers are very slender (14 feet at base) relative to their height (220 feet). Their distant location (about 6 to 12 miles) within affected viewsheds will dramatically reduce their apparent size or render them effectively invisible. The towers' neutral sky-gray color will further reduce their visibility under many light conditions. Even taking these factors into account, however, the towers will still be visible on many days from a few locations.

Perhaps a more important consideration is their location on a mountain ridgeline. The ridgeline is where the land meets the sky in most Vermont vistas. Along with steeped villages, rolling farmlands, and wooded hillsides; ridgelines are a key compositional element in Vermont scenery. And they are, by and large, an element that has not been significantly violated by human interventions— with the notable exception of ski areas and occasional communication towers. They are visual resources that merit careful consideration and protection.

The ridgeline of East Mountain is notable in several respects. First, it is not visible from many places and it is not part of any major public vistas. Secondly, where it is visible, it is typically part of a middle or rear layer of overlapping ridges that comprise the broader sweep of the East Haven Range. It does not stand alone in the landscape like Mt Ascutney or Camel's Hump. And lastly, as the site of a prominent mountaintop radar facility from the 1950's and 1960's (now long abandoned), it is already one of the most impacted ridgelines in Vermont. The main 64 foot high, 63 foot wide radar building and several slightly smaller buildings are visible from as far away as Lancaster and Groveton, NH, some 15 miles to the east. All visible buildings would be removed as part of the project. However, even with these mitigating factors, any mountaintop proposal of this scale must be carefully evaluated.

It is the purpose of this report to evaluate the effect of the four proposed wind turbines on the landscape aesthetics of the East Mountain area and the surrounding Northeast Kingdom landscape.

Evaluating the "Effect on Aesthetics": The Quechee Test

Aesthetics is not a science. Aesthetics is a branch of philosophy that "deals with the nature of beauty, art, taste, and with the creation and appreciation of beauty." [2] Everyone knows the old adage "beauty is in the eye of the beholder." Aesthetic standards are by their nature more subjective, more elusive, more complex, and more open to debate than most other environmental standards. And yet by including this criterion in state statute, our legislative leaders acknowledge that there is something about aesthetics, something about the "nature of beauty," that lies at the very heart of Vermont as a place. The aesthetic qualities of Vermont and its landscape affect its image, its economy and its way of life. And the task of sorting out reasonable protections of such values in the face of continued growth and change is left to be puzzled out by its citizens in public planning and review proceedings.

Nearly 20 years ago, in an effort to give deliberations over aesthetics some structure and predictability, the Environmental Board developed a conceptual framework for evaluating aesthetic impacts under Act 250's criterion 8. [3] That framework, known as the "Quechee Lakes analysis" established a two-step test to guide determination of whether or not a project would result in an undue adverse impact on "scenic and natural beauty, aesthetics, natural areas, and historic sites." Although only required to give "due consideration" to Act 250 criteria in its deliberations, the Public Service Board has routinely accepted the Quechee methodology for evaluating Section 248's aesthetics criterion in its Certificate of Public Good proceedings. [4]

The Quechee test is based on two essential questions: [5]

- Will the project have any "adverse" aesthetic impacts on the scenic quality of the area? And if so,
- Will those impacts be considered "undue" when taking into consideration the type of development proposed and its surroundings?

The determination of "**adversity**" depends on "whether it is in harmony with its surroundings" or "whether it fits its context". Case history has shown this depends on a number of factors: "the nature of the surroundings, the compatibility of the design, the context of colors and materials chosen, where the project can be seen from, and the impact of the project on the open space in the area." [6]

If a positive finding is reached on the first question, the next step is to determine if that adverse impact is "**undue.**" This determination depends on whether a positive conclusion can be reached on any one of three questions:

1. whether the project violates a clear, written community standard
2. whether the project offends the sensibility of an average person
3. whether the applicant has failed to take generally available mitigative steps which a reasonable person would take to improve the harmony of the proposed project to its surroundings. [7]

The testimony of the Terry Boyle will take the Board through the standard Quechee analysis as it applies to this project. My testimony, however, will take a slightly different approach. For reasons I will outline below, I will challenge some of the underlying assumptions that have guided Quechee as it pertains to the aesthetics of the Vermont landscape in general and as it may pertain to the aesthetic impacts of wind turbines in particular.

The Limits of Quechee – The Cornerstone Questions of “Harmony” and “Fit”

Central to the logic of Quechee is the question of “harmony” or “fit” with its surroundings. In their November 4th, 1985 “Conclusions of Law,” the Environmental Board identified this question as the “cornerstone” issue of aesthetics. [8] They proceeded to instruct that this determination depends on several factors including the site’s context, the project’s design, and where can it be seen from.

In this case, the context of East Mountain may be generally described as the sparsely populated landscape of forest and mountains. Within a six-mile radius there are almost no public roads and virtually no views of the site due to the pervasive forest and intervening ridges. As one moves out another four miles, the landscape changes little to the north, east and south – views of the site are extremely limited and very distant. The site is more visible from the west. Occasional cleared fields along several gravel roads in parts of Burke and Newark offer views of the East Haven Range that include East Mountain. The summit can also be seen from the Burke Mountain toll road some 8 miles to the southwest. While Terry Boyle’s testimony will characterize the site’s context and visibility in more detail, it is generally a pretty rugged forested landscape where the occasional long range view reveals little evidence of human impact with the exception of the Burke Mountain Ski resort and the abandoned radar tower on East Mountain.

Now let’s consider the conventional Quechee test for a wind farm project in this type of landscape. (For the moment, I would like to set aside the important considerations that 1) a radar installation that has crowned East Mountain for 50 years and 2) the views of the site are few and distant – these will be addressed in Terry Boyle’s testimony.) At first pass, it may seem very unlikely that four 220 foot high steel towers with three 110 foot blades spinning around their apex could be seen in “harmony” or “fitting the context” of a Northeast Kingdom mountaintop. The surrounding context is primarily trees and mountains. There is little in the way of man-made elements – especially any that could be seen as “in context” with industrial -scale steel towers. The project contrasts with its context in terms of design scale, materials, color, etc. Furthermore, Act 250 decisions give added weight to “special features” in the landscape such as ridgelines. Following conventional logic (again without consideration of the pre-existing towers and limited views), it appears likely, upon initial consideration, that the aesthetic impacts would be considered “adverse.”

However, such a conclusion would be based on a narrow interpretation of the concepts of “harmony” and “fit” – one that shortchanges the full understanding

of the potential relationship of this project to the “aesthetics and scenic beauty” of the Vermont landscape. It does so by reducing the question of “fit” to a simple equation of “visual sameness.” In Act 250 cases, projects that exhibit qualities that are similar to the scale, color, materials, massing of its surroundings are generally determined to be in harmony; projects that don’t are dissonant and judged to be adverse. [9] And in cases where projects are unavoidably different from their surroundings (e.g. houses in open farmland, gravel pits on a forested hillside, etc.) the typical mitigation strives to lessen these differences; to make them more “the same”. Permits are often conditioned by requirements for vegetative buffers and careful siting that mask these differences from the public view points. [10]

While the simplicity of this analysis has served the state reasonably well in protecting the basic integrity of the Vermont landscape over the past 20 years, its strict application in the case of wind turbines in this location is inappropriate and misleading. Clearly the turbines are “different” from their surroundings. Clearly the idea of mitigating them with vegetative screens or moving them off the ridgeline would be absurd – the very nature of a wind turbine is to capture the wind. They need to be above wind blocking topography and vegetation to capture the free flow of wind across their blades. They are, by their very nature, ridgeline-specific in a mountainous state like Vermont.

Quechee Reconsidered: Four Principles Supporting Wind Power as an Integral Element in the Vermont Landscape

An alternative line of analysis could reasonably be applied to the question of the aesthetic effects of this project. It is one that goes beyond the pragmatic case for an “acceptable” level of adversity. It is one that supports the proposition that **a well-sited, well-designed wind farm can be a visually integral part of the Vermont landscape and have a positive effect on aesthetics.**

Four principles support this line of analysis:

1. the compatibility of wind generated electricity with the established Vermont values of environmental conservation, stewardship and self-sufficiency;
2. the potential of wind farms to be an integrated element of a working, resource-based landscape;
3. the basic environmental “fit” and “harmony” of seeing wind farms located where the natural resource it depends on, wind, is most abundant;
4. the experience of other scenic places that suggests the more people know about and experience wind power, the more attractive they find it.

Connecting the above principles to the issue of aesthetics requires a deeper probing into the essential nature of the Vermont landscape, and why we find it aesthetically pleasing, than the typical Quechee test allows. A more informed understanding of the Vermont landscape, in turn, supports a broader and more appropriate analytical framework for evaluating the aesthetic effects of wind farms without abandoning the underlying rationale of the two step Quechee test. This line of reasoning will hopefully lead the Board to a positive conclusion with respect to the “harmony” and “fit” of the project with its surroundings and therefore one with no adverse impact on aesthetics and scenic and natural beauty.

Preface: Vermont as a Cultural, Dynamic, and Value-Based Landscape

The Vermont landscape is a complex affair – historically, compositionally and perceptually. While there is a tendency for us to see the Vermont landscape scenery landscape as “unspoiled” and “natural,” it is, in fact, a man-made or “cultural landscape.” The landscape that greeted the first European settlers has been radically altered by the hand of man over several hundred years. In a little less than 100 years, almost 70% of the native forest was cleared for agricultural purposes. A subsequent abandonment of marginal hill farms led to a dramatic regeneration of the forest over the next 100 years. Today open land accounts for less than 30% of the landscape.

A cultural landscape is almost certainly a dynamic one. Fields, farms, villages, roads, stone walls, barns and covered bridges are all man-made elements that have evolved in dialog with their natural setting into the pleasing aesthetic we call “Vermont”. Thus it is impossible to argue that simply because something is “man made” or “in contrast with its surroundings” it is inherently at odds with the aesthetics of Vermont scenery. [11]

Qualities of “contrast” and “change” are integral to the natural as well as the man-made elements of scenery. Building thunderheads on a summer afternoon, the lifting of a morning valley fog, or the stunning change of seasons all characterize a landscape endowed with strong attributes of contrast and change. **Conceptualizing the Vermont landscape as a static composition that can only tolerate the addition of elements exhibiting “sameness” is a misleading construct.** One only has to imagine the hypothetical example of a District Commission rejecting an application to re-clear an overgrown pasture on the basis that the open meadowland would contrast with color, scale, and design of the surrounding forest. It is the contrast of meadow and woodland, not the similarity, that is key to the aesthetic fit with the landscape. Clearly the Vermont

aesthetic is based on elements of contrast and change as well as those of consistency or sameness.

Expanding the notion of context to include contrast as well as similarity is also justified by examining the compositional values of the Vermont landscape. A careful analysis reveals a number of basic juxtapositions in a typical “scenic” landscape. Probably the most basic contrast is the visual play between patchworks of open farmland and surrounding woodlands. In the more intensive agricultural landscapes (e.g., the Champlain Valley) the relationship can reverse – well-defined hedgerows and woodlands are set off by the surrounding farmland. Another prominent example is the familiar geometric contrast of clustered village rooftops or a white steeple set against the backdrop of wooded hillside. Others might include the resolute line of a stone wall bending in response to topography or the flat stillness of mill pond in contrast to a cascading stream beyond.

Finally, it is important to understand that landscape aesthetics are not value neutral. The relative attractiveness of a scenery is inextricably bound up in the cultural values we collectively associate with the scenery. [12] The crashing surf of the California coast may convey the openness and environmental awareness that permeate life on the west coast. Elegant oaks overhanging a Savannah street may convey the gentility and grace of southern life. Here in New England, and particularly in Vermont, the pervasive pattern of clustered white villages and farmsteads set against a patchwork of fields, forests and mountains are strongly associated with values of self-reliance, local governance, and an intimate and respectful relationship with the natural environment.

The authenticity of these associations matter. We would not feel the same about those black and white Holsteins if they were carefully constructed paper mache models or if our rolling farmlands were cultivated by Disney-employed actors. These authentic associations of community and environmental stewardship help give Vermont products and businesses a value-added cache of excellence and quality. And these associations cannot be separated from the landscape itself. It thus comes as no surprise that Vermont’s first and only National Park, the Marsh-Billings-Rockefeller National Historic Park in Woodstock, is “the only national park to tell the story of conservation and land stewardship in America.” [13]

It is against this background that I will outline four principles supporting wind farms as landscape elements that could contribute to Vermont’s scenic beauty.

1. Wind farms are compatible with well-established Vermont values of environmental conservation, stewardship and self-sufficiency.

Vermont's commitment to environmental conservation is well known. Act 250, the bottle bill, the billboard ban, historic preservation efforts, aggressive land and energy conservation programs, anti-sprawl policies, scenic resource planning, etc., all point to a well-established public value on resource conservation. Vermont's "green" reputation is an asset to business and an attraction for residents and tourists alike.

The area where this commitment is perhaps weakest is the production of energy. While there have been strong public policy goals promoting renewable energy planning since the 1980's, changing long established directions in energy use and production is not easy. [14] As of the late 1990's, more than 1/2 of Vermont's electricity was imported from out-of-state. Of the electricity produced in-state, about 60% of it was nuclear (Vermont Yankee). Only 17% of Vermont's electrical needs were met by in-state renewable sources (12% hydro, 5% other – mostly wood). [15]

Historically, of course, this wasn't true. Vermont's early power needs were almost entirely derived from local, renewable resources that were part of the visual landscape. Mills were powered by local streams, homes were heated with wood from local forests, transportation was powered by horses fed on local grass and grain. While today's landscape retains much of its historic land use patterns, the visibility of local energy production has dramatically declined.

Wind power is an opportunity to reintroduce local energy production into the landscape as a symbol of Vermont's environmental commitment. Technological advances have made wind economically feasible at a scale that could make a real difference in the environment. While estimates of the full potential of wind production in Vermont vary, the Department of Public Service's 1998 Comprehensive Twenty Year Energy Plan concludes Vermont could "meet a significant portion of its electricity needs with wind power." [16] Looked at another way, that could represent a reduction of millions of tons of harmful emissions into the air we breathe every year. Four turbines on East Mountain alone could mean reducing the emissions regionally by thousands of tons (see Testimony of Mathew Rubin).

Just as local energy production from Vermont's streams and forests has been a significant element of the state's historic landscape, Vermont's wind resources offer the potential for local energy production to be part of our future landscape. Wind energy will reinvest values of local, non-polluting energy production into

the Vermont aesthetic. Furthermore, by lessening negative environmental impacts (and associated vulnerabilities) of imported gas, oil and nuclear power, wind's potential for aesthetic acceptance is greatly increased. Wind power offers the chance for Vermont to showcase a commitment to environmentally sound energy choices in its public landscape.

Does that mean we want windmills spinning all over the state? Not at all. The point is simply that well-sited wind energy projects could provide a visible symbol of the values to which we aspire, as an integral part of the landscape in which we live.

2. Wind farms are an integrated component of Vermont's working, resource-based landscape.

Vermont's scenic beauty cannot be separated from its long tradition of rural and resource-based land uses. Agriculture fields were not cleared to open beautiful vistas but to grow food and graze livestock. Barns were not built to adorn coffee table picture books but to store farm animals, feed and equipment. Orchards were not planted for their spring blossoms but to bear edible fruit. Woodlands were not managed for their autumn color but as a source of fuel, maple sugar and saw logs. But it is these resource-based enterprises that have produced the landscape scenery that we know and value as Vermont.

And today's landscape is not simply a 19th century agrarian scene frozen in time. It is a landscape that continues to develop and evolve as a result of an ongoing relationship between its citizens and their natural environment. For example, the familiar blue steel "harvestor" silos that rhythmically punctuate Vermont's most productive dairy landscapes are a relatively recent addition to the landscape. These vertical "industrial" structures have become an integral part of the aesthetic of a viable working, agricultural landscape. These are not hobby farms. They contribute to economic prosperity of the Vermont's resource-based economy.

The relatively recent cutting of ski trails down Vermont mountainsides represents another kind of resource-based economy made visible in the landscape. Only here we are not cultivating cows and corn but skiers and snow. While some may consider this a despoiling of the state's natural beauty, many others recognize the development of the ski industry as a positive form of economic development that can be compatible with the overall Vermont aesthetic of a clean, outdoors-oriented landscape. Ski areas have become part of the Vermont landscape, and some are even expanding at this time.

The Northeast Kingdom Landscape. In the Northeast Kingdom, the working landscape is more about pulpwood and timber than corn and cows. Its relative lack of good agricultural land and abundant woodlands has made forestry its primary resource-based economic activity. Its abundant wildlife habitat and sparse population has also made it a mecca of outdoor recreation such as hunting, fishing and snow-machine touring. In recent years, new partnership opportunities between forestry, recreation and conservation interests have arisen. The recent sale of the former Champion lands resulted in 84,000 acres of private woodlands being dedicated to sustainable forestry practices that balance timber yield with conservation goals and recreational access.

Wind farms represent a resource-based land use that is fully compatible with the working landscape of the Northeast Kingdom. East Mountain itself lies in the midst of the 84,000 acre holding of the Essex Timber Company – the portion of the former Champion lands set aside as working forest. As with wind, the visibility of logging, as an industry, can vary widely depending on the type and location of harvesting practices. Visual impacts generally decrease with selective-cutting and increase with clear-cutting. Other primary impacts include large logging trucks on area roads as well as landing sites and occasional mills.

Within the Northeast Kingdom forest, modern technology is abundant. Timbering is characterized by the use of industrial equipment such as skidders, bulldozers, trucks and chainsaws. The same is true for outdoor recreation as old logging roads provide access to fisherman and hunters in 4x4 trucks and to snow machine tourists in the winter. Because wind turbines are located on ridgetops, they easily co-exist with these activities – they are well above the trees and, at least with respect to the East Mountain project, have biologically insignificant impacts on wildlife (see Testimony of Jeffrey Parsons and Paul Kerlinger). And the spinning wind turbines will be virtually impossible to detect from within the forest cover.

Finally, the road to the East Mountain summit can provide year-round public access to outstanding views of the kingdom for visiting tourists and local residents alike. In fact, experience elsewhere suggests that the wind turbines themselves have potential to become a tourist draw. It is very possible to imagine genuine public interest in “scenic overlooks” with views of wind turbines spinning in the landscape.

Does this mean that any resource-based economic activity will be compatible with the Vermont landscape? Of course not. West Virginia-style strip mining operations, or reckless clear-cutting of entire mountainsides, would create long-term scars in the landscape and contribute to degradation of both the visual and

natural environment. It is a question of the scale and degree of landscape alteration, and the extent to which that alteration can be restored or mitigated.

One of the most attractive aspects of wind turbines from an environmental point of view is their tiny impact on the landscape's physiographic character. Each turbine occupies less than 1/4 of an acre. And aside from the road and the buried electrical cable, there is virtually no site infrastructure required to support it. That means no soil erosion, no surface runoff, no truck traffic, no smokestack emissions, no offensive odors, no industrial waste. Well designed wind projects live lightly on the land. And perhaps most importantly, unlike almost every other type of industrial or commercial site, once their useful life is exhausted, they can be removed with not much more residual impact than the cellar hole of an abandoned hill farm.

3. There is an environmental symbiosis or "fit" between wind farms and places where wind is abundant.

There is a very strong corollary in the Vermont landscape that connects types of land use activities with certain types of locations. For instance, farms are almost always located in areas of good farmland for obvious reasons. More often than not this typically results in a concentration of farms in fertile valleys and some relatively level upland plateaus. Likewise, towns and villages tend to be located where there is good access to transportation and power. Thus as Vermont made the transition from turnpikes to rail, population centers tended to move downhill and become more concentrated in valley locations where rail lines and water power were located. Forestry and recreation tend to be naturally drawn to more rugged terrain locations where access, topography and good soils are less critical.

Applying the same corollary to a proposed wind energy project points to the self-evident conclusion that wind turbines belong where the wind blows. This connection between use and context is important to the aesthetic quality of a landscape. It's not simply a question of whether the proposal is similar to or different from its surroundings – it's about whether or not it belongs there. Part of a beautiful scene is the sense that everything is in its proper place. When things appear "out of place" they give the landscape a fragmented, dissonant quality. Take for example a house plopped down in the middle of a cornfield. It just doesn't look right. Or consider a covered bridge without its stream or a mill building up high on a hillside. They would look stranded and out of place – like "fish out of water."

Thus a viewshed that includes wind turbines on a ridgetop would convey a sense of natural positioning, of "fit," in a landscape composition., If you want to

harvest corn you go a valley; if you want to harvest wind you go to a ridgetop. In Vermont, wind turbines belong up on a hill silhouetted against the sky. There is an older wind generator visible from I-91 in the Connecticut River Valley near Norwich. It has always looked out of place sitting on a small rise in a sheltered river valley. The marginal siting of the generator is further evidenced by the fact it hasn't worked for years and some of its blades are missing. It looks out of place. In contrast, four turbines spinning atop East Mountain may be seen to have a natural "fit" with their context; to be in "harmony" with their surroundings. They would enable us to "see the wind" atop a distant ridge without actually being there to feel or hear it.

Does this mean that wind generators should be lined up along every mountain ridge? No. I am merely suggesting there is a natural congruence between windmills and windy places in the landscape. But many other factors must be considered. Windmills are not appropriate in wilderness areas where no other human activities are found. Windmills should not be located on the most dramatic and important ridgelines. Windmills should not interfere with views or historic sites of statewide significance. In other words, wind projects, just like any other development project, should be carefully sited in accordance with principles of sound planning.

4. Experience elsewhere suggests the more people know about and experience wind farms, the more attractive they find them.

One of the biggest challenges in assessing the impacts of wind turbines on the Vermont landscape is our relative lack of experience with them. They are a new element in the state's landscape. On one hand, they are big visible machines. On the other hand, given careful siting and controls, there is much about them that could make a positive contribution to the environmental quality and character of Vermont. Thus a critical part of our assessment must look at public reaction to wind turbines in other places. Or, more generally, to the addition of new, large, engineering structures into the public landscape.

Here, it is instructive to remember that evaluating landscape scenery can never be fully objective. Our view of the landscape is always colored by the cultural values or "lens" through which we view it. Take, for example, the steam train. When it was introduced into the New England landscape in the mid-19th century, it was denounced by some as an alien intrusion into the bucolic life of New England. It interrupted Henry David Thoreau's tranquility at Walden reminding him of things he did not wish to think about. "The whistle of the locomotive penetrates my woods summer and winter, sounding like the scream of a hawk sailing over some farmer's yard." [18] But it did not take long for

trains to become widely accepted, even by Thoreau. Many of Currier & Ives 19th century scenes of rural life would seem incomplete without a steam train puffing its way through a pastoral landscape. [19]

Other well-known examples of changing public perceptions of engineering structures include the Eiffel Tower and the Golden Gate Bridge. The tower that Parisians initially despised for despoiling their city has become inseparable from the self-image of one of the world's most beautiful cities. Likewise the Golden Gate Bridge was initially decried by some as despoiling the dramatic natural setting of the headlands framing San Francisco Bay. The outcry did result in a much more elegant design solution. And while the view was certainly altered, almost no one would argue the graceful bridge spanning the Golden Gate is not one of the world's great landscape scenes.

However, the introduction of technology into a scenic landscape is not always acceptable. Rather, these examples are merely intended to illustrate that 1) our concepts of landscape beauty are not absolute – they can vary over time with changing cultural values and perceptions, and 2) engineering elements should not be categorically assumed to have an adverse impact on landscape aesthetics.

The Vermont Experience: Searsburg. There is some evidence that sensibly sited wind turbines have been accepted as a contributing element of landscape scenery. Vermont's first and only wind farm was completed in the southern Vermont town of Searsburg in 1997. It consists of eleven .55 MW turbines mounted on 132 foot towers running along a ridgetop about 2.2 miles south of the center of Searsburg. It is far more visible than the East Mountain project with public views from as close as 1/2 mile (see testimony of Terry Boyle).

An unusual "before and after" survey of 345 randomly selected area residents provides some useful insights into attitudes about the wind power. The project generated considerable local interest. The initial 63% response rate to a mail-in survey was unusually strong. The initial survey showed a mixed though generally positive support for "wind power in general" before construction. About 30% of the sample were big supporters, 36% were moderate supporters, and 35% were not supporters. After the project had been up and running for a year, a second survey found, that support for the project had grown significantly. It found big supporters had grown to 50% of respondents, 30% were moderate supporters and the group of non-supporters shrunk by almost 1/2 to less than 20%. [20]

Another question asked respondents to rate the attractiveness of the views of the site from 1.25 miles and 4 miles away. Respondents rated each view with and without the wind turbines. While both views were rated more attractive without

the turbines, both were still rated on the attractive end of the spectrum when the turbines were included. In the post-construction survey the negative influence of the turbines was significantly reduced – assessments of the view with and without the turbine were both strongly attractive though respondents still preferred the one with no turbine. This suggests that visual acceptance of wind turbines will increase once people have first hand experience. Actually seeing them makes a difference. As one respondent wrote: “I think once the turbines were up that people’s initial doubts or fears were lessened. There is nothing like ‘seeing them in the flesh’. Anyone I’ve talked to thinks they’re great.”

Finally, in analyzing responses from the approximately 140 respondents (40% of “after” sample) who had actually been to the site, the surveyor reported the most common reaction was a sense of “awe” or an expression of “amazement.” [21] This reaction suggests that the turbines themselves tend to evoke a strong aesthetic reaction in viewers – especially when viewed up close. The idea that wind turbines may possess a “kinetic” aesthetic – one that is only revealed through motion -- is supported by the everyday experience many people find with things animated by the invisible force of the wind (think of flags, or sails, or kites, or autumn leaves). Although to my knowledge this effect has not been the specific subject of any academic research, it is a phenomenon that I have seen reported anecdotally in numerous accounts.

Public Reaction in Europe. There are also a number of surveys and accounts from other places that suggest Vermont’s experience is not unique. Most of these are from Europe where much stronger public policies have advanced wind power development well ahead of the United States. Europe accounts for about 75% of the world’s wind generation capacity – now estimated at over 31,000 MW. Most of that is concentrated in Germany, Spain and Denmark. In the United States almost all the built capacity is west of the Mississippi where there are vast open spaces and fewer people. The lion’s share of US capacity is concentrated in California and Texas but many other states are starting to see large projects.

Aesthetics have been a huge part of the discussion in Europe. Like Vermont, most European countries have a keen sense that landscape aesthetics are a public value deserving protection and stewardship [22]. This concern has resulted in the careful incorporation of landscape values into project siting and design and gathering public input on aesthetics through computer simulations. These efforts have contributed to substantial public support for wind projects in Europe [23]. In early installations in California, less sensitivity to aesthetics and site design issues resulted in a much more negative public reaction towards wind projects [24].

There have been a number of surveys, especially in Europe, assessing public response to wind power. The most useful surveys are ones like Searsburg that survey opinions both before the project is built (as imagined) and after (as experienced). An often-cited 1994 survey in Wales gathered before and after responses in the UK. Significantly, it was not undertaken by either a "pro" or "anti" wind organization. It was commissioned by the BBC Wales and carried out by a researcher of City and Regional Planning at Cardiff University. It examined public opinion in three Welsh communities where wind farms were proposed and built. It found support for the project growing from 32% to 74% in Taff Ely, from 36% to 61% in Rhyd-y-Groes, and from 65% to 76% in Llandianam. The survey revealed "an overwhelming degree of support for wind power in Wales and the three local wind farms upon which the research was centered. Respondents had become more positive towards wind power following the construction of their local wind farm." [25] These findings mirror the Searsburg survey findings that initial public acceptance grows even more favorable after the turbines are installed and operating.

More recently a public acceptance process not dissimilar from that of the Golden Gate Bridge was played out in Copenhagen. Denmark has long been one of the leaders in wind energy. However, when a large wind farm was proposed just outside Copenhagen harbor in 1996, a great public debate ensued about the aesthetics of the project. Located a little of over a mile from its historic city center, the project would be highly visible to many people. Two years of public debate and visual simulations led to design revisions that rearranged the 20 turbine, 40 MW project into a single graceful arc of turbines along a shallow offshore shoal instead of the gridded configuration originally proposed. The project, completed in 2000, will provide electricity for about 40,000 households in the city. It has quickly become a symbol of pride for the city and a tourist attraction. [26]

One might reasonably argue that these and other studies showing increased public acceptance of wind farms after construction may not necessarily equate with "no aesthetic impact". Perhaps, the argument continues, it is more a case of people resigning themselves to a diminished visual environment than actually liking them. **The heart of the problem, however, is that it's impossible to fully separate aesthetic judgement from human values. If you see a wind turbine as an "industrial factory" you are going to find it less attractive than if you see it as an "environmental solution" that contributes to the long-term health of the planet. The aesthetic judgement is informed by broader social and environmental sensibilities.** And there is a growing body of evidence that suggests the more aware people become of the compelling environmental benefits of wind power (especially when compared with the traditional energy sources), the more positively they will view them in the landscape.

Conclusion

In the final analysis, the very nature of the aesthetic experience makes it impossible to conclude with absolute certainty how wind turbines will affect Vermont's aesthetic and scenic beauty. Of course in most cases, we can and should make every effort to select sites that minimize their visibility in the landscape. But as I have pointed out, their very nature makes the idea of screening them an oxymoron. They need wide open exposed locations to operate—locations that are certain to be visible for miles around.

And because they are a relatively new element in Vermont's visual vocabulary, there are no ready-made rules of context to guide us. They will certainly contrast with their surroundings. But experience has shown us that we live in a humanized landscape whose aesthetic is rich with human interventions. Fields, farms, villages, roads & bridges are all man-made elements that have become an integral part of the visual landscape. Then again, other human interventions such as strip malls, big box retail stores, sprawling subdivisions and other types of scattered development remain alien to our concept of scenery. We strive to minimize their aesthetic impacts by working to better integrate them within the traditional patterns of landscape development.

But there is no traditional pattern for wind farms. So how are we to proceed on the question of aesthetics? The answer is carefully. I have tried to show there is potential for a well planned project to achieve a positive visual "fit" in the Vermont landscape. The four principles outline the rational basis for this conclusion including: 1) compatible values, 2) a working landscape, 3) functional siting, and 4) increased knowledge / increased support. The East Mountain proposal is clearly consistent with these basic principles.

Does this mean a wind project would "fit" on any ridgeline in the State? I do not believe so. The four principles only suggest the **potential** for a positive fit. Realizing this potential depends on whether or not a specific project meets basic standards of sound environmental planning. This requires establishing review criteria that reach well beyond the four principles. Such criteria might be structured around three sets of questions.

The first set of questions should ensure wind farms don't end up in places where they just don't belong. For instance, is the project site a mountain ridgeline or scenic viewshed of state or national significance? Will it adversely impact any natural or cultural resources of statewide or national significance? Is the project

sited within a designated wilderness area where no human activities are permitted?

The second set of questions should evaluate the quality of a project's site selection and general planning. [27] For example, does the site possess a wind resource that promises an efficient and effective operation? Is the site located so as to take maximum advantage of existing roads and transmission line infrastructure? Is the site located in an area where visual exposure will be reasonably minimized, or in an area where turbines will be a distant element of most public views? Is the site proximate with other resource based economic activities that are visible in the landscape such as farming, forestry, or skiing?

The third set of questions should evaluate how well the design of a specific project aesthetically "fits" with its surrounding landscape [28]. Have the windmills been sited in harmony with surrounding landforms? Does the project exhibit a strong degree of internal visual order (i.e. poles heights, turbine shapes, blade patterns, etc)? Do individual turbine components (i.e. tower, nacelle, rotor) work together as a pleasing visual whole? Does the turbine color harmonize with landscape and sky? If there are more than a small group of turbines, are they clustered together into identifiable "visual units?" Has care been taken to hide or bury all associated infrastructure (i.e. power lines, roads, transformers, site lighting) from public view? [29]

Once a few wind farms are actually up and running, it will become easier to assess how we can best fit future wind energy projects into the visual context of Vermont. Time and experience will help us to decide as a culture how we view them and to what extent they will evolve as an accepted part of the Vermont aesthetic. As we have seen, aesthetic judgements are intertwined with cultural values and both change over time.

The East Mountain site is arguably among the best sites in Vermont. It is sited on a previously industrialized ridgeline. It has limited visibility from its immediate surroundings, good access to existing roads and infrastructure, and is compatible with the surrounding land uses of forestry, conservation, and recreation. Its design consists of four identical turbines clustered neatly along a ridgeline. All access roads and power infrastructure either underground or well-removed from public view. It does not impact mountain views of statewide significance, rare natural, historic or cultural resources, and is not located in any designated wilderness areas. I am confident that it will "fit" and that it will not adversely impact the landscape aesthetics of the region.

Renewable and Removable. As a parting thought, I offer the Board one more observation. Wind power offers one more significant aesthetic advantage over

almost every other type of energy plant—the visual impacts of wind power are completely reversible. Let's imagine, for a moment, that my analysis proves completely wrong. What if over time wind power is seen as a persistently despised and degrading element in the landscape? Or what if we eventually discover a new, even more benign energy source?

Consider this: the same mobile crane that put up the turbines can take them down. The wind turbines' tiny footprint would leave almost no trace. Now contrast this with Vermont Yankee. A nuclear energy plant produces dangerous radioactive waste that must be stored for many generations, requires expensive decommissioning, and leaves a contaminated site with massive structure and infrastructure that may never again be useable. Which aesthetic impact should we leave to future generations? It doesn't seem like a difficult choice.

References

[1] *Vermont State Statutes, Title 30, Section 248, page 458* (Chapter 5, Public Service, Regulation of Corporations).

[2] Webster's Ninth Collegiate Dictionary, (Merriam-Webster, 1987).

[3] *Act 250 ENOTES, Section I.762 "Elements of Quechee Test"* (Vermont Environmental Board, Montpelier, June, 2003).

[4] For example see Certificate of Public Good Order (CPG NM-11) RE: Petition of David and Jan Blittersdorf, Vermont Public Service Board, May 26, 2000.

[5] *Act 250: A Guide to Vermont's Land Use Law* (Vermont Environmental Board, Montpelier, November 2000).

[6] *Act 250 ENOTES, Section I.762 "Elements of Quechee Test" & Section I.762 .1 "Adverse Effect"* (Vermont Environmental Board, Montpelier, June, 2003).

[7] *Act 250 ENOTES, Section I.762 "Elements of Quechee Test" & Section I.762 .2 "Undue Adverse Effect"* (Vermont Environmental Board, Montpelier, June, 2003).

[8] *Finding of Fact, Conclusions of Law & Order*, page 18, RE: Quechee Lakes Corp., Permit Applications #3W0411-EB & #3W0439-EB, November 4, 1985.

[9] For example see numbers cases cited under *Act 250 ENOTES, Section I.762.1 "Adverse Effect"* (Vermont Environmental Board, Montpelier, June, 2003).

[10] Ibid.

[11] A comprehensive and beautifully illustrated discussion of the dynamic interaction between Vermonter's and their landscape can be found in: Jan Albers Hands on the Land: A History of the Vermont Landscape (MIT Press, Cambridge, MA, 2000).

[12] The fields of environmental psychology and cultural geography both address the complex relationship between values, perception and their impact on human transformation of the landscape. Two good overviews include: Erwin Zube, Environmental Evaluation: Perception and Public Policy (Cambridge

University Press, Cambridge, UK, 1984) and J. B. Jackson Reading the Verancular Landscape (Yale University Press, New Haven, CT, 1984).

[13] *Marsh-Billings-Rockefeller: A Guide to the Park* (National Park Service, 2000)

[14] Governor Kunin's 1989 Executive Order called for new efforts in comprehensive energy planning to achieve a sustainable energy future. This resulted in Vermont's first 20 year energy plan—*Fueling Vermont's Future: Comprehensive Energy Plan and Greenhouse Gas Action Plan* (Vermont Department of Public Service, Montpelier, July, 1998). See section 3.I.B.4 : "The State's Role in Energy Planning."

[15] *Fueling Vermont's Future: Comprehensive Energy Plan and Greenhouse Gas Action Plan* (Vermont Department of Public Service, Montpelier, July, 1998). See section 3.II: "Current Energy Use" for discussion of individual energy fuel sources.

[16] Ibid. See section 3.II.G: "Potential Energy Sources and Technologies for the Future" for discussion of wind potential in Vermont.

[17] Estimate from Green Mountain Power webpage describing their 6 MW wind facility in Searsburg (<http://gmpvt.com/whoweare/wind.shtml>)

[18] Thoreau, Henry David Walden (1854), from Chapter 4 "Sounds."

[19] For an excellent discussion of 19th century cultural tension between the "progressive" and "pastoral" ideals see Leo Marx The Machine the Garden: Techology and the Pastoral Ideal in America (Oxford University Press, 1964).

[20] *Public Acceptance Study of the Searsburg Wind Power Project: Year One Post Construction*, Dr. James Palmer, College of SUNY(Clinton Solutions, Fayetteville, NY, 1997)

[21] Personal Conversation (October 22, 2003) with Dr. James Palmer, author of *Public Acceptance Study of the Searsburg Wind Power Project: Year One Post Construction*. Conversation confirmed that description of "common response" with respect to reactions was the result of a "content analysis" of written responses from an open-ended survey question asking for reactions of those who had visited the survey site. He estimated that represented 1/3 to 1/2 of all responses. He also suggested the kinetic quality of the turbines was likely a significant explanatory factor in these responses.

[22] Paul Gipe *Aesthetic Guidelines for a Wind Power Future* in Martin Pasqualetti, Paul Gipe and Robert Righter, Editors, Wind Power in View: Energy Landscapes in a Crowded World (Academic Press, London, 2002).

[23] The best discussion of aesthetic issues in Europe I found was *A Formula for Success in Denmark* by Frode Birk Neilson in the recently published collection of essays on visual issues cited above: Wind Power in View: Energy Landscapes in a Crowded World (Academic Press, London, 2002). Nielson, a Danish landscape architect, also published a beautifully illustrated folio on wind aesthetics call Wind Turbines & the Landscape: Architecture & Aesthetics (Birk Neilson Tegnestue, Aarhus, Denmark, 1996). Other articles in the collection discuss of landscape aesthetics and wind power in Sweden, Germany and England.

[24] Martin Pasqualetti *Living with Wind Power in a Hostile Landscape* in Pasqualetti, et al, Eds, Wind Power in View (Academic Press, London, 2002).

[25] *Love Them or Loathe Them? Public Attitudes Towards Wind Farms in Wales*, Dr. Kevin Bishop & Alison Proctor, Dept. of City and Regional Planning, Cardiff University (BBC Wales, 1994)

[26] *The Middelgruden Offshore Wind Farm*, AnnVikkelso, Editor, (Copenhagen Environment and Energy Office, Copenhagen, 2003)

[27] See *Siting a Wind Turbine on Your Property: Small Wind Technology and Vermont's Scenic Landscape*, Jean Vissering (Vermont Public Service Board, Montpelier, 2003). Although it primarily addresses siting small wind turbines in Vermont, this recently published small booklet provides a useful introduction to basic wind siting criteria such as compatible land use and visual assessment.

[28] Excellent summary of wind and landscape aesthetics in Frode Birk Neilson *A Formula for Success in Denmark* by in Pasqualetti, et al, Eds, Wind Power in View (Academic Press, London, 2002).

[29] The best summary of aesthetic guidelines for wind installations I found was by Paul Gipe *Aesthetic Guidelines for a Wind Power Future* in Pasqualetti, et al, Eds, Wind Power in View (Academic Press, London, 2002). He summarizes why aesthetics are important in building public acceptance, illustrates examples where they have been treated poorly and offers easy to read and well illustrated discussion of important aesthetic guidelines.