Whistling Ridge
Public Comment
#350

Talburt, Tammy (UTC)

From:	Paul Smith <[redacted]@pacifier.com>
Sent:	Saturday, January 15, 2011 5:58 PM
To:	EFSEC (UTC)
Cc:	Talburt, Tammy (UTC)
Subject:	Whistling Ridge comments
Attachments:	Whist.RidgeComments01-15-10doc.doc; ATT11084595.txt; page 1.jpg; page 2.jpg; page 3.jpg; ATT11084596.txt

Thank you for the opportunity to comment on such an important and potentially devasting proposal if allowed to be placed as the proposal is currently written. Also atttached are three pages from the National Renewable Energy Laboratory showing "windy lands" throughout the U.S. and Washington State where there are better suited areas for wind turbine sitings.

Thank you,

Whistling Ridge Comments, 01-15-2011

Energy Facility Site Evaluation Council
P.O. Box 43172
Olympia, Wa 98504-3172
Whistling Ridge Energy Project Appl. # 2009-01

Thank you for the opportunity to share some of my concerns:

--First, I am concerned about EFSEC ability to be fully impartial/objective. Nothing personal to you all. EFSEC is in charge of conducting the project analysis and will make a recommendation to Washingtion's Governor. In my mind, this is analogous to the BIA in charge of doing an EIS for proposed tribal casinos, giving their recommendation to the DOI, such as the horrendous 600,000+ sq.ft. off-reservation casino proposal for Cascade Locks which would also destroy the majesty of the CRG. I feel that both of these agencies are enablers for the parties they represent. I find it hard to believe that these agencies can be fully transparent and impartial. How many wind turbine proposals have EFSEC rejected? The Council's duty first and foremost is to "evaluate" potential energy facility sites. This should not be confused with evaluation to seek approval for proposed sites.

--The interests of the majority should outweigh the financial benefits for the few.

--First Wind Turbine project in a wooded area in the Northwest therefore impacts to wildlife are unknown. It is improper to arbitrarily use data from any other wind turbine site and try to model or extrapolate that data to fit the Whistling Ridge site. This site has many unknown impacts which have not been fully, in some cases if at all, studied.

--The wind turbines for this project are larger than the diameter of a Boeing 747 Jumbo Jet—these placed on top of a 2000ft. forested ridgeline would cause major negative visual impacts not to mention the unknown impacts to bird/bat mortality. These wind turbines could be seen from Mt. Adams, Mt. Hood, Hood River Valley, the Historic Columbia River Highway and well as several popular hiking trails and other key viewing areas throughout the Columbia River Gorge. This kind of an eyesore from so many areas is simply unacceptable.

--This proposal is within a designated "Special Emphasis Area" for protection of the Northern Spotted Owl, an endangered species in Washington State. This designation warrants more evaluation to fully address impacts over time to N. S. Owl populations.

--These wind turbines can have deleterious effects to numerous bird and bat populations. Stated in the EIS by the applicant under Unavoidable Adverse Impacts, "...the project would result in some ongoing mortality to birds and bats..." and that "...this level is not expected to be high enough to impact species viability..." The proponent is only speculating on this. There is no hard science to back this claim. The Columbia River

Gorge is part of the Pacific flyway for numerous migratory birds. There is no model to predict the mortality in such a heavily used flyway.

--These wind turbines will be 420ft. tall. The space needle is 605ft. tall. The Columbia River Gorge is no place for any manmade structure on top of the beautiful ridgelines. The EIS states that, "…the level of visual impact would not be higher than low to moderate at any of the viewpoints examined." Over half of the proposed wind turbines would be highly visible from several designated key-viewing areas, which is more than a "moderate" negative impact. Every wind turbine will have to have a blinking red light on top of it as required by the Federal Aviation Association, Although in the EIS the lighting impact has been downplayed. The FAA requirements trump all county or state regulations therefore having red blinking lights along the ridgeline will be an unacceptable negative visual impact which is unavoidable, there is no way to mitigate for that. People come to the CRG to enjoy many recreational opportunities. If they want to see the Space Needle, they can drive to Seattle.

--Numerous individuals as evidenced by the public testimony you have heard at the public meetings, as well as several major groups including hikers, bikers, photographers and toursist have valid concerns and are opposed to this project including: Friends of the Columbia Gorge, Save Our Scenic Area, Skamania County Agri-Tourism Assoc., Seattle Aububon Society, Gifford Pinchot Task Force, Columbia Gorge Audubon Society, Friends of the Historic Columbia River Highway.

--Multiple agencies such as the USFS and the NPS have recommended substantial modifications to the project as it is currently proposed. This should be of concern to the EFSEC Council.

--This project would harm sacred cultural resources, as confirmed by two separate professional archeologist's reports by the Yakama Nation. This is unacceptable. There is no way to mitigate for the destruction and/or desecration of thise sacred resources.

--This project would produce less than 20 Megawatts of energy a year yet Oregon and Washington have over 40,000 MW of wind energy development potential that can easily meet any growing demand in either of those states without sacrificing such an iconic National treasure. Whistling Ridge is simply not worth the cost to devastate the scenic splendor that is the Columbia River Gorge one of only two designated National Scenic Areas in all of the United States of America.

--The wind turbines are made by a foreign company, with the majority of energy forecast to go to California. The tax credits the proponent will receive will be coming from my tax dollars to fund a supposed "green energy" project that will purchase foreign made materials for energy slated to mostly go to California. There is no guarantee that the construction jobs will go to locals and the miniscule 8-9 on-site positions stated in the EIS may also go to outsiders. Sure there has been a mandate put in place for each state to reach a certain amount of renewable energy but just because the wind blows doesn't mean you erect several dozen Space Needles in that area, especially an area so unique in all of America as the Columbia River Gorge.

Do we have to ruin all of our scenic places in the name of manmade progress?

Attached are three pages from the National Renewable Energy Laboratory to show that there are many other potential "windy" areas in Washington State and throughout the U.S. which are more suitable than this poorly placed proposal.

Thank you,

Paul Smith
Skamania County resident
[redacted] Mabee Mines Road
Washougal, WA 98671

National Renewable Energy Laboratory
Innovation for Our Energy Future

Estimates of Windy[1] Land Area and Wind Energy Potential by State for Areas >= 30% Capacity Factor at 80m

February 4, 2010

AWS Truewind

These estimates show, for each of the 48 contiguous states and the entire United States, the windy land area with a gross capacity factor (without losses) of 30% and greater at 80-m height above ground and the wind energy potential from development of the "available" windy land area after exclusions. The "Installed Capacity" shows the potential megawatts (MW) of rated capacity that could be installed on the available windy land area, and the "Annual Generation" shows annual wind energy generation in gigawatt-hours (GWh) that could be produced from the installed capacity. AWS Truewind, LLC developed the wind resource data for windNavigator® (http://navigator.awstruewind.com) with a spatial resolution of 200 m. NREL produced the estimates of windy land area and windy energy potential, including filtering the estimates to exclude areas unlikely to be developed such as wilderness areas, parks, urban areas, and water features (see Wind Resource Exclusion Table for more detail).

	Windy Land Area >= 30% Gross Capacity Factor at 80m					Wind Energy Potential	
State	Total (km^2)	Excluded[2] (km^2)	Available (km^2)	Available % of State	% of Total Windy Land Excluded	Installed Capacity[3] (MW)	Annual Generation (GWh)
Massachusetts	1,709.0	1,503.4	205.6	0.99%	88.0%	1,028.0	3,323
Michigan	19,761.3	7,952.9	11,808.5	7.85%	40.2%	59,042.3	169,221
Minnesota	121,884.7	24,030.6	97,854.1	44.83%	19.7%	489,270.6	1,679,480
Mississippi	0.0	0.0	0.0	0.00%	N/A	0.0	0
Missouri	69,676.8	14,805.8	54,871.0	30.39%	21.2%	274,355.1	810,619
Montana	232,768.6	43,967.7	188,800.9	49.60%	18.9%	944,004.4	3,228,620
Nebraska	199,627.8	16,028.0	183,599.7	91.64%	8.0%	917,998.7	3,540,370
Nevada	5,873.6	4,424.2	1,449.4	0.51%	75.3%	7,247.1	20,823
New Hampshire	1,663.8	1,236.8	427.1	1.78%	74.3%	2,135.4	6,706
New Jersey	280.8	254.5	26.4	0.14%	90.6%	131.8	373
New Mexico	111,445.8	13,029.1	98,416.7	31.25%	11.7%	492,083.3	1,644,970
New York	17,705.8	12,549.6	5,156.3	4.10%	70.9%	25,781.3	74,695
North Carolina	1,155.6	994.1	161.5	0.13%	86.0%	807.7	2,395
North Dakota	182,374.6	28,335.4	154,039.2	84.25%	15.5%	770,195.8	2,983,750
Ohio	17,189.9	6,205.9	10,983.9	10.28%	36.1%	54,919.7	151,881
Oklahoma	123,243.6	19,879.2	103,364.4	57.10%	16.1%	516,822.1	1,788,910
Oregon	17,109.8	11,689.7	5,420.1	2.16%	68.3%	27,100.3	80,855
Pennsylvania	2,123.5	1,462.1	661.4	0.56%	68.9%	3,307.2	9,673

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February 4, 2010

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	Windy Land Area >= 30% Gross Capacity Factor at 80m					Wind Energy Potential	
State	Total (km^2)	Excluded[2] (km^2)	Available (km^2)	Available % of State	% of Total Windy Land Excluded	Installed Capacity[3] (MW)	Annual Generation (GWh)
Rhode Island	74.0	64.7	9.3	0.35%	87.4%	46.6	153
South Carolina	102.8	65.8	37.0	0.05%	64.0%	185.0	504
South Dakota	193,828.3	17,345.8	176,482.5	88.36%	8.9%	882,412.4	3,411,690
Tennessee	359.9	298.1	61.9	0.06%	82.8%	309.3	900
Texas	435,638.6	55,332.7	380,305.9	55.54%	12.7%	1,901,529.7	6,527,850
Utah	5,273.6	2,652.8	2,620.7	1.19%	50.3%	13,103.7	37,104
Vermont	2,569.6	1,979.8	589.7	2.39%	77.0%	2,948.7	9,163
Virginia	1,567.2	1,208.5	358.7	0.35%	77.1%	1,793.3	5,395
Washington	11,932.6	8,236.9	3,695.7	2.12%	69.0%	18,478.5	55,550
West Virginia	1,495.2	1,118.6	376.6	0.60%	74.8%	1,883.2	5,820
Wisconsin	30,228.8	9,477.3	20,751.4	14.29%	31.4%	103,757.1	300,136
Wyoming	146,166.2	35,751.7	110,414.5	43.58%	24.5%	552,072.6	1,944,340
US 48 Total	2,571,180	479,391	2,091,789	26.89%	18.6%	10,458,945	36,919,551

[1] NREL's wind potential estimates were based on maps produced by AWS Truewind using the MesoMap® system.

[2] Excluded lands include protected lands (national parks, wilderness, etc.), incompatible land use (urban, airports, wetland, and water features), and other considerations. See Table 1 for full listing.

[3] Assumes 5 MW/km^2 of installed nameplate capacity

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	Windy Land Area >= 30% Gross Capacity Factor at 80m					Wind Energy Potential	
State	Total (km^2)	Excluded[2] (km^2)	Available (km^2)	Available % of State	% of Total Windy Land Excluded	Installed Capacity[3] (MW)	Annual Generation (GWh)
Alabama	80.4	56.7	23.6	0.02%	70.6%	118.2	333
Arizona	4,545.0	2,364.1	2,180.8	0.74%	52.0%	10,904.1	30,616
Arkansas	4,663.2	2,823.2	1,840.1	1.34%	60.5%	9,200.3	26,906
California	26,901.3	20,079.2	6,822.0	1.67%	74.6%	34,110.2	105,646
Colorado	95,830.4	18,386.5	77,443.9	28.73%	19.2%	387,219.5	1,288,490
Connecticut	31.4	26.1	5.3	0.04%	83.1%	26.5	73
Delaware	36.6	34.7	1.9	0.04%	94.8%	9.5	26
Florida	9.6	9.5	0.1	0.00%	99.2%	0.4	1
Georgia	281.3	255.3	26.0	0.02%	90.7%	130.1	380
Idaho	13,420.4	9,805.3	3,615.1	1.67%	73.1%	18,075.6	52,118
Illinois	70,763.6	20,787.1	49,976.4	34.25%	29.4%	249,882.1	763,529
Indiana	46,255.2	16,609.7	29,645.5	31.63%	35.9%	148,227.5	443,912
Iowa	134,900.1	20,757.3	114,142.8	78.32%	15.4%	570,714.2	2,026,340
Kansas	211,861.3	21,387.1	190,474.2	89.38%	10.1%	952,370.9	3,646,590
Kentucky	48.7	36.6	12.1	0.01%	75.1%	60.6	173
Louisiana	125.5	43.6	82.0	0.07%	34.7%	409.8	1,100
Maine	6,026.5	3,776.2	2,250.2	2.69%	62.7%	11,251.2	33,779
Maryland	567.7	271.1	296.6	1.18%	47.8%	1,482.9	4,269

Whistling Ridge
Public Comment
#351

Talburt, Tammy (UTC)

From:	Katie Pearmine <[redacted]@gmail.com>
Sent:	Saturday, January 15, 2011 8:26 PM
To:	EFSEC (UTC); Talburt, Tammy (UTC)
Subject:	Whistling Ridge and the National Academy of the Science
Attachments:	Environmental Impacts of Wind-Energy Projects (NRC 2007).pdf

Dear EFSEC,

Dear Energy Facility Site Evaluation Council, I am opposed to the Whistling Ridge Energy project and am writing to recommend that you deny the project going forward to Governor Gregoire. Whistling Ridge, if completed, would harm important aspects of our national heritage, including natural, historic and cultural resources of the Columbia River Gorge National Scenic Area, the Lewis and Clark National Historic Trail, the Historic Columbia River Highway, the Oregon Pioneer National Historic Trail, the Ice Age Floods National Geologic Trail and the SR14 scenic byway.

The National Academy of the Sciences published guidance for decision makers for evaluating scenic impacts of wind energy development. I attached an excerpt for your reference. The NAS identified impacts to regionally and nationally significant landscapes as a reason for denying a project. The Whistling Ridge Project harms these landscapes and should be denied.
Sincerely,

Katie Pearmine

APPENDIX D

A Visual Impact Assessment Process for Evaluating Wind-Energy Projects

Evaluating aesthetic impacts requires a process of information-gathering, analysis, and evaluation. This appendix provides a more detailed outline than is in Chapter 4 of the steps involved and some of the underlying visual principles that form the basis of aesthetic impact assessment.

The steps are as follows:

- Project Description.
- Project Visibility, Appearance, and Landscape Context.
- Scenic-Resource Values and Sensitivity Levels.
- Assessment of Aesthetic Impacts.
- Mitigation Techniques.
- Determination of Acceptability or Undue Aesthetic Impacts.

PROJECT DESCRIPTION

A detailed description of all elements of a proposed project is an essential first step. All site alternatives that will have potential visual impacts should be identified by the developer in detail. These should include the characteristics of the turbines (e.g., height, rotor diameter, color, rated noise levels), the number planned, their locations; information about meteorological towers; roads; collector, distribution, and transmission lines; temporary or permanent storage ("laydown") areas; substations; and any structures associated with the project. In addition all site clearing should be identified, including clearing for turbines, roads, power lines, substations, and laydown areas. Information also is needed on all site regrading that will be engineered, including the amount of cut and fill, locations, and clearing required. This information forms the basis for all aesthetic review.

PROJECT VISIBILITY AND LANDSCAPE CONTEXT

A number of tools and techniques are available for determining visibility and for describing relevant landscape and project characteristics. The key techniques outlined below often are required as part of a permit application.

Computer Viewshed Analysis

Computer-generated maps based on digital-elevation models (DEMs) illustrate where any hypothetical point (such as the tip of a turbine blade) could potentially be visible within a given area, such as a 10-mile radius around the proposed project (Figure D-1). They also can indicate approximately how many turbines are likely to be visible from a given point. They are based on digital-terrain modeling and may not account for surface elements like vegetation or buildings that might block views. Field analysis is essential to verify actual visibility. It also is possible to do a "partial viewshed analysis," which examines the visibility of particular turbines, or to look at a particularly sensitive viewing point on the ground to examine an area of potential visibility.

Line-of-Sight Visual Analysis

When complex topography makes it difficult to determine whether a particular turbine or other object will be visible from a particular point, a line-of-sight analysis can provide a useful check (Figure D-2).

Simulations (Visualizations)

Several types of simulations can be used to help predict how the project will appear. Photographic simulations or photomontages based on still photographs taken from selected viewpoints are the most common (Figures D-3 and D-4). Some professionals prefer 3D visualization models, which create a digital image from selected viewpoints. These images eliminate the variability and lack of clarity in some photographs and can depict conditions ranging from clear blue skies to nighttime lighting conditions, but they are not as realistic in appearance and details as a photographic simulation. Animated simulations illustrate the rotation of the blades on the turbines at accurate speeds. Photographic simulations generally show only a narrow window of a particular view (wide-angle lenses result in inaccurate perspec-

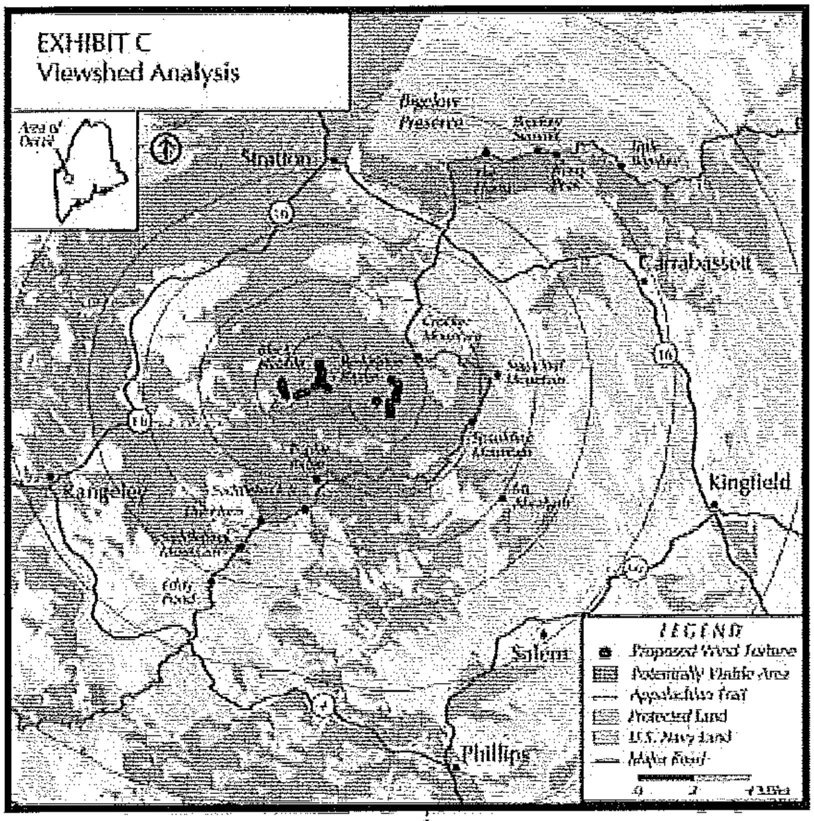

FIGURE D-1 Example of a simple viewshed analysis map showing areas from which a proposed wind-energy project would potentially be visible (shaded areas). Field assessment is necessary to determine actual visibility and the characteristics of the views. Source: Appalachian Trail Conservancy 2007. Reprinted with permission; copyright 2007, Appalachian Trail Conservancy.

tives). In understanding visual impacts it is useful to understand the broader context of the view. Whether the broader panorama will contain turbines as well, or whether it will remain undeveloped, will be an equally important part of the analysis. Several 3D visualization programs allow "fly-through" simulations, and are based on a virtual landscape.

Creating technically accurate simulations is critically important. Simulations can be manipulated to produce images that either exaggerate or minimize the visual impacts of a proposed project. Accuracy should be

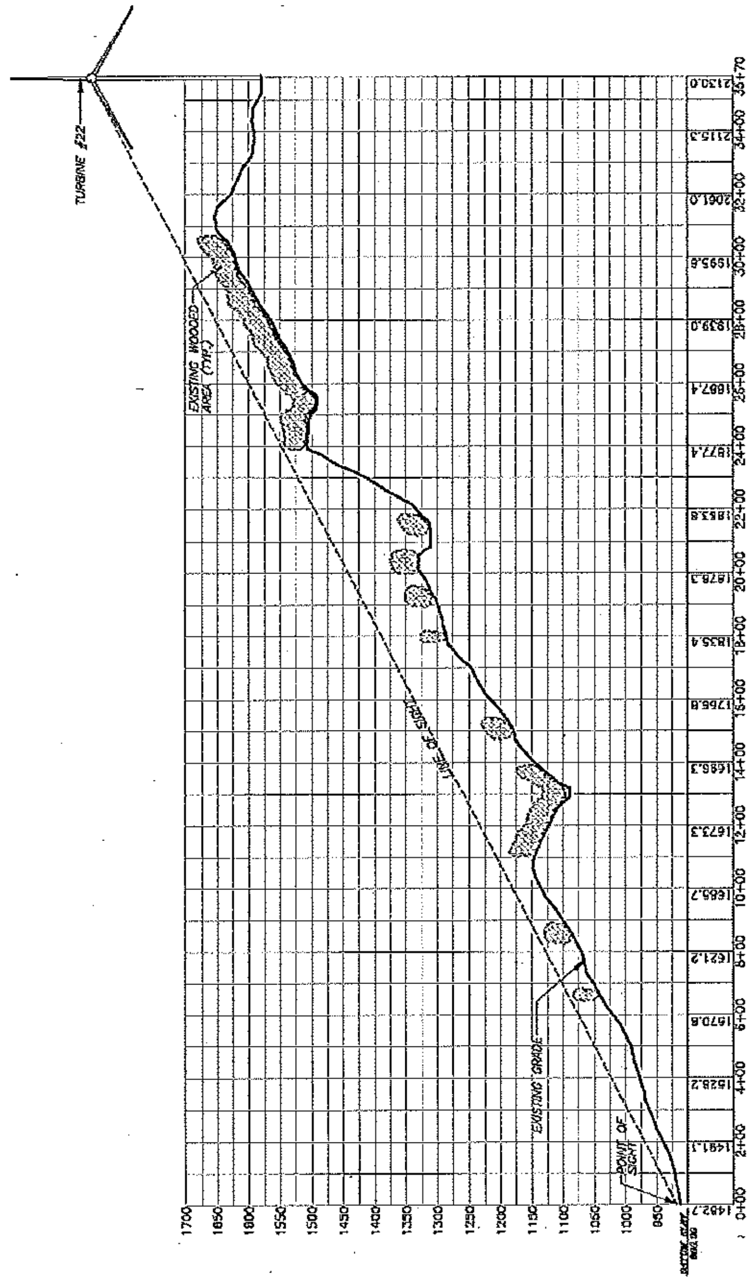

FIGURE D-2 Sample line-of-sight analysis.
SOURCE: NYSERDA 2005b. Reprinted with permission; copyright 2005, prepared by Saratoga Associates under contract for the New York State Energy Research and Development Authority.

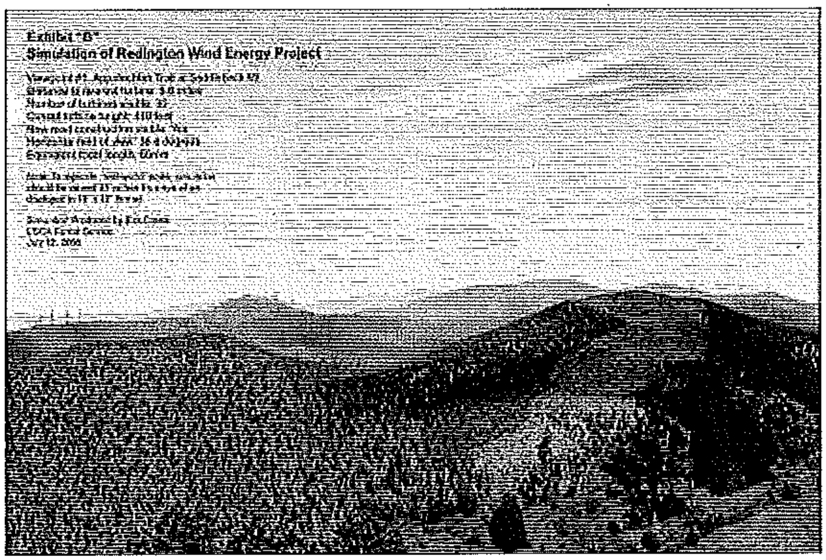

FIGURE D-3 Example of a "virtual" simulation using 3-D Nature Studio software. Whether they are based on photographs or created entirely from a Digital Terrain Model and 3-D software, the image must rely on accurate terrain modeling and GPS (Global Positioning System) point recording, and on an image that represents the equivalent of a 50-mm lens or a field of view of 38.6 degrees.
SOURCE: Erik Crews, Department of Agriculture, National Forest Service.

checked by experts in the field of digital images. Another check is to have at least two independent parties provide simulations from the same point. The following description provides an overview of good practice, but consulting technical experts and developing standards will be important.

Photographs should be taken with a 50-mm lens or digital equivalent that creates a 38.6° angle of view, which most closely matches human visual perception. Shorter focal lengths tend to flatten out topography and the vertical impression of the turbines, while longer focal lengths tend to exaggerate these features. However, the human eye is much sharper than any camera lens, and so photographs should be taken at high resolution, whether a film or a digital camera is used. Clear weather provides the best clarity of the scene as well as "worst-case conditions," which should be represented in all simulations to allow a complete evaluation. Foreground clutter such as power poles should be avoided if possible in the photograph. Global-positioning system (GPS) location points should be recorded for each simulation viewpoint, preferably using a GPS unit with submeter ac-

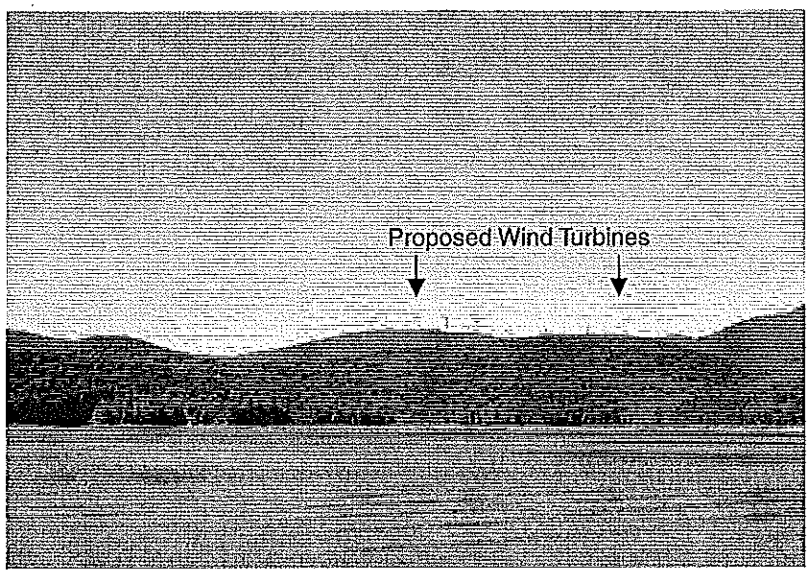

FIGURE D-4 Photographic simulation (photomontage) showing proposed 1.5 MW turbines with existing 0.55 MW turbines (right), Wilmington, Vermont.
SOURCE: Photograph by Jean Vissering, Jean Vissering Landscape Architecture; Simulation by AWS-Truewind for Vermont Environmental Research Associates.

curacy, but at least 3 m accuracy, to ensure repeatability. Some landscape architects fly weather balloons to mark locations of the nacelle in the field, but on windy sites it may be difficult to get a vertical position.

Using a DEM, various 3D programs create accurate digital images of the terrain from a particular point that has GPS coordinates recorded, along with the angle of view. Exact turbine locations as well as roads, meteorological towers, and other project infrastructure can be inserted into the model. Available Geographic Information System (GIS) data may vary from 10- to 30-m digital elevation (DE). For example, 30-m DE is accurate to within 15 m vertically and 12 m horizontally, while 10-m DE can be accurate to within several meters. Once the DEM is created, the photograph that contains important detail information such as structures and vegetative patterns can be superimposed on the DEM. Images of the turbine and other structure can be created on the DEM using programs such as Visual Nature Studio and merged with a photograph using a digital photo-editing program. The color, brightness, shadows, and sharpness of the turbines can be adjusted to appear consistent with the photograph. Depending on lighting conditions, the turbines may appear white, or black if they are silhouetted against the sky. Illustrating various lighting conditions can be helpful.

The relationship between the size of the photograph and the distance of the observer is important for creating a realistic image. A minimum image size of "10×12" can be viewed at a comfortable arm's length, and it is preferable to smaller simulations. Poster-size simulations that can be viewed from about 4-5 feet away are suitable for public display. The formula for determining the correct size of the image in relation to the distance viewed is as follows:

Distance from viewer = Width of image /(2 • tan (HFOV[1] / 2))

HFOV should equal 38.6 when using a 50-mm lens or equivalent. Animated images illustrating the rotation of the blades can be projected using PowerPoint and are particularly useful.

Field Assessment and Inventory of Views

A field inventory of views of all public viewpoints within a 10-mile radius of the project provides the basis for evaluating the extent of visibility as well as the visual characteristics of views in the study area. In addition to photographically documenting and mapping viewing locations, the following information should be recorded: distance from project, duration of view,[2] characteristics of the view (intermittent, panoramic, and foreground, middleground and background elements in the view) (Table D-1). Views should be recorded from parks and recreations areas, hiking trails, natural areas, wilderness areas, designated scenic areas or roads, areas with panoramic views, village or town centers, water bodies, state and federal highways, designated scenic roads, other roads receiving heavy traffic (the U.S. Forest Service defines this as an average of 150 vehicles/day), areas with concentrations of residences, and historic sites. Any sites noted in local, regional, and state planning documents as having scenic, recreational, cultural, or natural values can be considered to be potentially sensitive sites.[3] Some viewpoints are more sensitive than others because of differences in viewer expectations, the duration of view, proximity to the project ridges, or the scenic quality of the viewpoint.

[1]Horizontal field of view.

[2]Duration of view refers to how long an object remains visible while traveling past it. The term applies to mechanized transport as well as non-mechanized activities such as hiking or canoeing.

[3]It is not a problem for wind-energy projects to be visible from these areas; rather how they are seen and the extent to which they degrade the views or the experience of these landscapes by visitors or residents is critical and is discussed below.

TABLE D-1 Sample Summary of the Characteristics of Inventoried Viewpoints

VP#	Location	Distance from Turbines (miles)	Extent of View Duration or Area
1	Rt. 9 East of Wilmington SIMULATION POINT	4.8-8	0.6 mile; intermittent views for 2.5 miles into Wilmington
2	Fire Tower Molly Stark State Park	6.5	Point
3	Stowe Hill Road	6-6.5	0.4 mile; plus 0.4 mile intermittently

Visual assessment is particularly important in sensitive areas. Residential areas generally cannot be inventoried in detail, but information can be provided about the number of residences that may be affected. In addition to views of the project ridges, other scenic features within the study area need to be documented.

Public Participation in Identifying Viewpoints

For people who live, work, and recreate in a region, the landscape consists of layers of meaning that may not be understood by an outside professional conducting a visual assessment. If local residents and other interested parties can participate in the selection of sites to be inventoried

Description of Existing View	Relationship of New Turbines to Existing Context
For travelers heading west on Route 9, views begin near the top of the ridge just east of Molly Stark State Park. Views focus on a sequence of hills to the west including rounded foreground hills and the flat ridge with the existing turbines near the center of this view. This view is relatively narrow. West of Lake Raponda Road, views become difficult to see due to foreground trees, hills, and buildings interfering with the view.	The turbines along the eastern string will be visible along the background ridge, and will be in the center of the view. Several of the western expansion turbines will be visible behind the existing turbines but will be farther away. As travelers descend into the Wilmington valley, closer hills and ridges will increasingly interfere with the view of the turbines. Rt. 9 is the gateway into the Wilmington valley.
The fire tower offers a 360° view of the myriad hills, mountains and ridges in the area. Since it is close to the ridge dividing Wilmington from Marlboro and Brattleboro, it offers views much farther to the east and west than anywhere else in the area. A communications tower can be seen in the foreground. The fire tower is a popular hike especially during the summer and fall.	The proposed towers will be easily visible from this vantage point. They will occupy a small portion of the overall view, and will be seen in the background of the view.
Broad views open up around White Road. Due to trees along the road the views alternate between the southern hills and; or to the northern mountains, Haystack and Mt. Snow. The existing turbines are easily visible but appear as a small part of the overall view. Several houses are in the foreground view.	The larger size of the new turbines will make them more visually dominant. A foreground hill will partially obscure some of the eastern string of turbines. The turbines will not be visible in the northwestern views of Haystack and Mt. Snow.

and the simulations to be produced, the result of the process usually is more widely accepted. Pre-construction surveys of residents, business owners, and tourists can provide a useful complement to public hearings to the degree that they reflect expertise in survey design and are free from bias. Other public-participation techniques are discussed in Chapter 5.

SCENIC RESOURCE VALUES AND SENSITIVITY LEVELS

Evaluating the aesthetic impacts of wind-energy projects ideally begins with an understanding of the elements and locations of the proposed project, as well as particular visual characteristics of the surrounding area that contribute to or detract from scenic or visual quality.

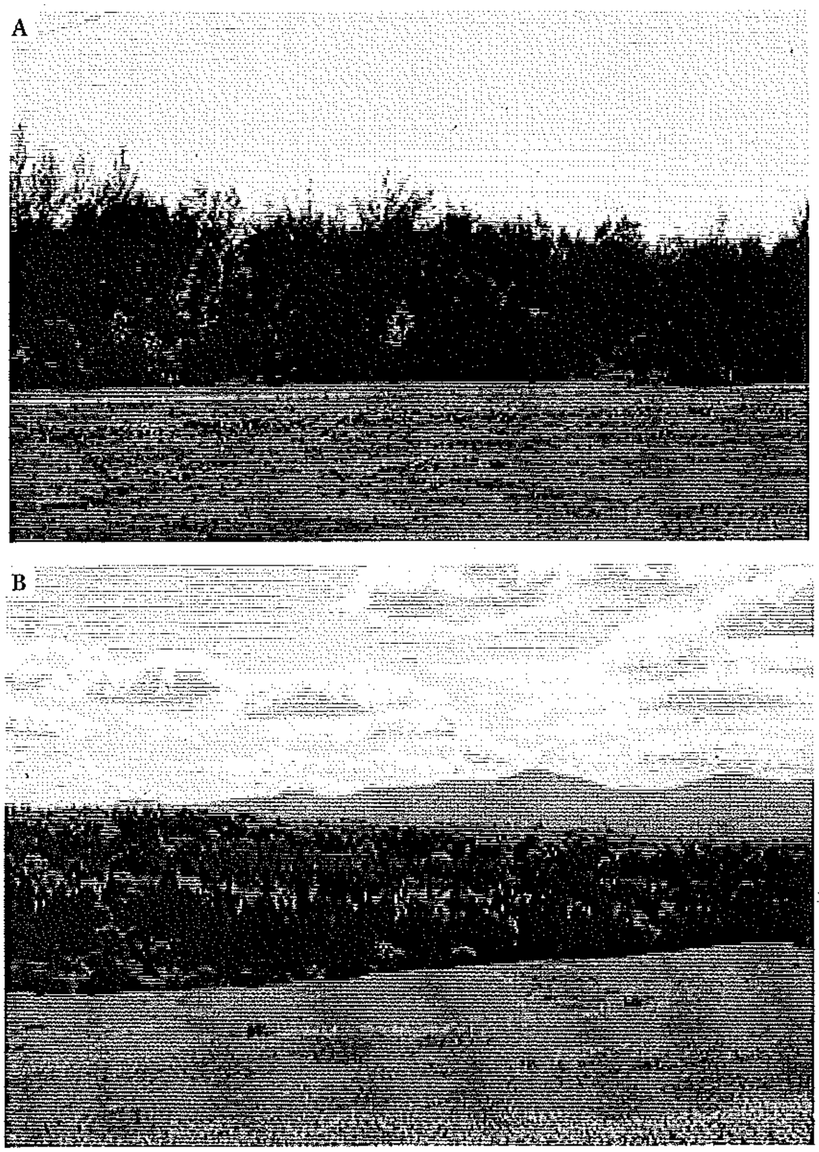

FIGURE D-5 Examples of landscapes of increasing visual diversity. (A) Landscape with no topographic and little vegetative diversity. (B) Increasing topographic diversity, some vegetative diversity (meadow, deciduous, and evergreen) and foreground, middleground, and background distance zones.
SOURCE: Photographs by Jean Vissering, Jean Vissering Landscape Architecture.

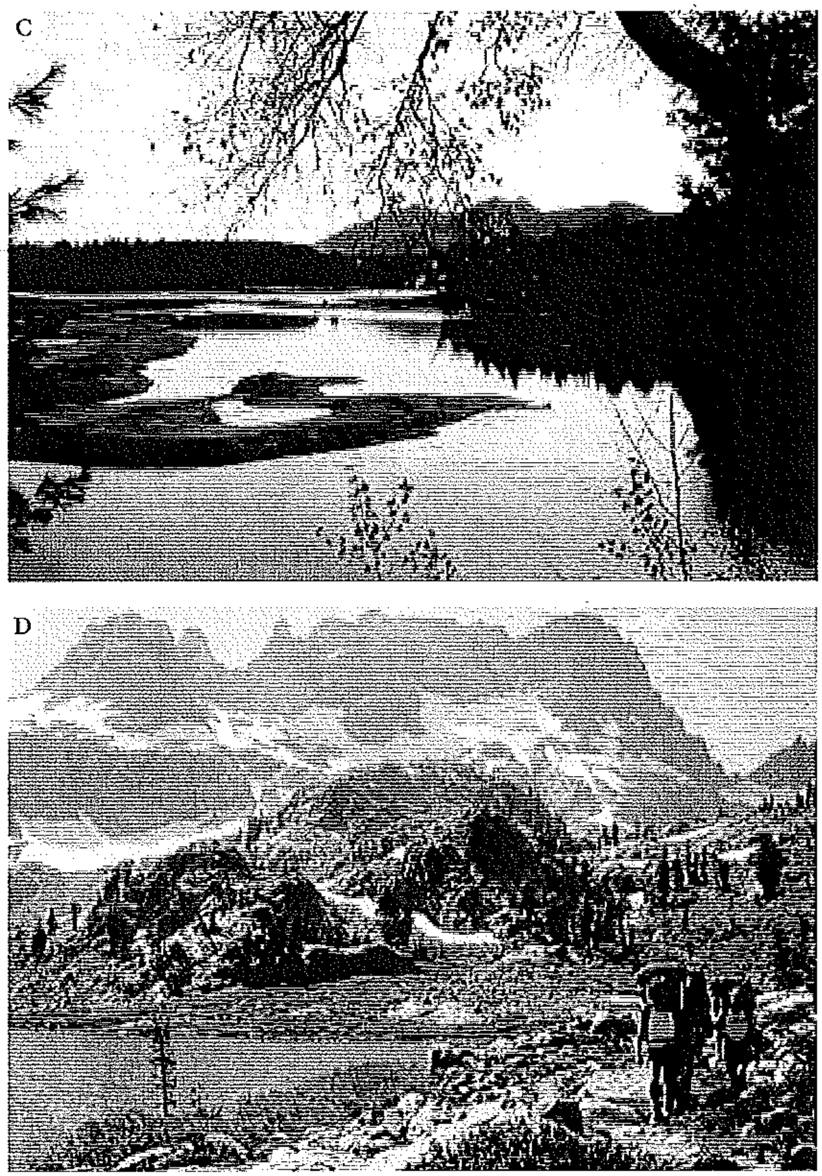

FIGURE D-5 (C) The contrast between high, irregular mountains and the flat lake create a dramatic setting. (D) The combination of highly diverse topography, exposed ledges, water, and vegetation in this scene make it highly scenic.
SOURCE: Photographs by Jean Vissering, Jean Vissering Landscape Architecture.

Regional Landscape Character and Distinctive Features

Landscape character depends on a combination of the natural and human or built landscapes. All landscapes are composed of unique combinations of topography (land form), vegetative patterns, and water features (lakes, rivers, streams, wetlands) that contribute to visual character. Superimposed on the natural landscape is the human or built landscape, also characterized by distinct patterns. For example, patterns of towns or villages may contrast with patterns of farms, fields, and forests. Some regions are characterized by numerous hills and ridges, while others have only a few distinct and prominent ridges or mountains. In some landscapes, certain natural or cultural features become focal points. Forestry practices, mining, suburban development, and recreational structures also are superimposed on the landscape and become part of its overall visual character.

Identifying Important Scenic Resources, Focal Points, and Unique Areas

Processes for determining relative scenic quality are well documented (USFS 1974, 1995; MADEM 1982; RIDEM 1990) (Box D-1). As noted above, however, these processes need to be combined with public review since landscape features that are locally or regionally valued may not be obvious to outside professionals. Identifying areas of high, medium, and low scenic quality is not difficult, although scenic quality is relative. A highly scenic area in upstate New York, for example, looks different from a highly scenic area in the Rocky Mountains. Scenic resources may be of local, regional, statewide, or even national significance. The underlying visual principles, however, are the same. Scenic quality alone is not necessarily sufficient reason to exclude a wind-energy project.

ASSESSMENT OF AESTHETIC IMPACTS

Factors affecting the visual impacts of a wind-energy project are listed below. The first set of factors concerns the particular landscape characteristics of the *site* and its surrounding context that may affect the sensitivity of views and the degree of aesthetic impact. The second set of factors relates to the characteristics of the *project* itself, how it is seen in these views, and how these may affect the overall experience of the landscape context. Visual impact assessments consider the combined effects of a proposed project throughout a region or on a locality as it is seen from all views, and particularly from sensitive viewpoints. No single view is likely to create serious impacts. Wind-energy projects inevitably are visible, but how they are seen within views, their relative prominence as seen throughout the region, and the degree to which they interfere with regional focal points or degrade unique or highly sensitive landscapes are important factors.

BOX D-1
Principles for Determining Scenic Quality

• *Visual Diversity (Variety Type):* The USFS uses the term "variety class" to describe a fundamental principle of landscape aesthetics: the greater the variety or diversity in the landscape, the more scenic it is likely to be. For example, landscapes with greater diversity in vegetation and topography are more likely to be scenic than a flat landscape with uniform vegetation. Water features such as rivers or ponds tend to add diversity, as do natural rock outcroppings. High scenic quality often results from the contrast among landscape features such as field and forest, steep and flat or rolling terrain, village and countryside. Particularly dramatic landscape features often stand out because of their contrast in form, line, color, or pattern (texture) (Figure D-5A-D).

• *Intactness (Order):* The principle of visual diversity relating to scenic quality generally holds for both natural and built landscapes. But in the human landscape too much diversity can lead to visual chaos or clutter (strip development being a good example, where every business vies for attention). Landscapes with a clear underlying order or logic tend to be more visually appealing (Lynch 1960, 1971). Undeveloped landscapes or those that retain 19th- or early 20th-century landscape patterns are becoming increasingly rare, and provide further examples of intact landscapes that may be of value. In some respects, wind-energy projects can provide a sense of order in the landscape because of their logical connections with very windy sites. The repetition of similar elements in many wind-energy projects can result in less visual clutter than the combined effect of other types of development.

• *Focal Points:* Focal points are elements in the landscape that stand out because of their contrasting shape (form), line, color, or pattern. They may also be elements of cultural importance. Often distinct focal points enhance scenic quality. They can be natural elements such as a lake, river, or mountain; or they can be built elements such as an important public building or central green. Some focal points may be locally important, others are regionally important and become landmarks that are visible from many vantage points. Occasionally, built elements that are viewed negatively become focal points, such as large clearcuts, mining operations, or power plants. Appropriate siting and design often can prevent developments from being viewed negatively by preventing them from conflicting with or degrading important regional focal points.

• *Unique Visual Resources:* Some visual resources may not meet the threshold of being highly scenic or sensitive, but may have visual value because of their uniqueness. Examples might include large tracts of wild or undeveloped land, some of which might even appear bleak and desolate.

Factors Affecting the Landscape Context

• *Distance from the Project:* In general, visual impacts are greater when objects are seen at close range (Figure D-6A-B; compare Figure 3-3 for a close view of the Mountaineer facility in West Virginia). In foreground

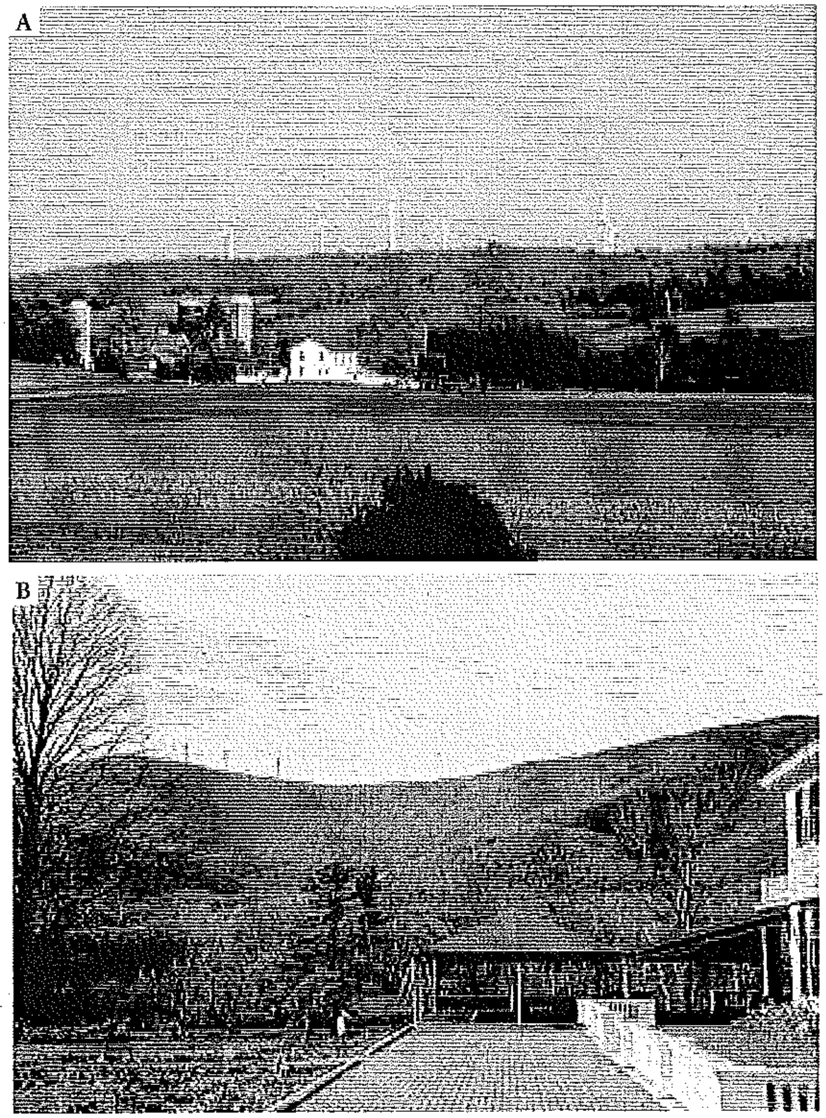

FIGURE D-6 View of wind-energy projects at various distances. (A) Madison Wind Project, Madison, New York from approximately 1 mile. (B) Simulation of proposed Equinox Wind Project in Manchester, Vermont, at 2.4 miles.
SOURCE: Photographs by Jean Vissering, Jean Vissering Landscape Architecture; simulation by EDR for Bennington County Regional Commission.

areas (up to a half-mile away) details can be seen and objects appear large and often occupy a large part of one's overall view.[4] Middle-ground views extend up to 5 miles away.[5] At this distance landscape patterns can be perceived, as can individual wind turbines, although they will appear smaller and part of a larger context than turbines in a foreground view. Background views are those greater than 5 miles where larger landforms tend to dominate the view. Wind turbines may be seen from 15 miles away, and even farther under optimal atmospheric conditions, but they appear very small at such distances, and appear as small portions of a larger panorama. Noise also diminishes with distance, and is of greatest concern within a half-mile (Chapter 4). Shadow flicker is also experienced only within close range (Chapter 4).

- *View Duration:* View duration refers to how long the project is visible as one drives along a road or paddles along a lake, for example. In many cases views of the project may be intermittent and seen through groupings of trees or buildings as one moves through the landscape. As with all considerations, view duration is evaluated along with other factors such as the distance of the project, sensitivity of the viewing area, and prominence of the land feature involved.
- *Angle of View:* Whether the project is seen directly ahead in views or to one side may influence the degree to which it is likely to be a focal point in views. Viewing a project from above usually makes roads and site clearing more visible than if seen from below.
- *Panoramic versus Narrow View:* When one sees a project as part of a wide panorama, it may appear to occupy a relatively small part of the view unless a particular landscape features make it a focal point.
- *Scenic Quality of View:* Highly scenic views are generally those with a high degree of landscape diversity, and with little or no landscape degradation (Figure D-7). Landscape degradation results from development that erodes existing scenic landscape patterns, or land uses that become unintended focal points due to their contrast in form, color or pattern with their surroundings. Panoramic views of high scenic quality are considered to be visually sensitive.

[4]Because of the larger scale—both vertical and horizontal—of more recent wind-energy projects, distance zones may need to be extended, with 2-3 miles considered a "foreground" area of greater potential visual effects.

[5]The original Forest Service Visual Management System used 5 miles to define the outer limits of the middleground zone. The more recent Scenery Management System changed this for purely clerical reasons rather than for reasons of visual perception (E. Crews, USFS, personal communication 2006). In fact the boundary is not sharp and particular topographic and air-quality conditions can affect the level of detail and significance of these distances. Nevertheless 5 miles is an appropriate distance, because land-use patterns are clearly visible within 5 miles.

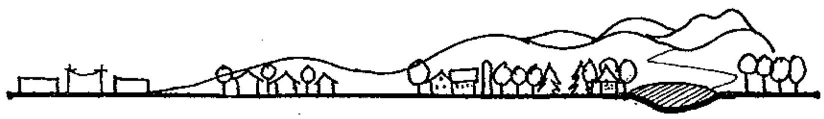

FIGURE D-7 Diagram of increasing scenic quality.
SOURCE: Jean Vissering, Jean Vissering Landscape Architecture.

- *Focal Point within a View:* Distinct cultural or natural focal points often enhance scenic quality (Figure D-8). When a focal point exists, new development will generally be more adversely perceived if it conflicts with or degrades the visual quality and prominence of a focal point.
- *Number of Observers:* Heavily used public areas, such as a heavily traveled road or a popular recreation area, are sometimes considered to be more sensitive than other areas. This criterion needs to be compared with other factors such as viewer expectations (below).
- *Viewer Expectations:* For certain uses there may be expectations for a primitive setting (wilderness camping) or for a natural setting (natural area) (Figure D-9A,B). Recreational areas restricted to non-motorized uses may be more sensitive to changes involving built elements than other settings.
- *Documented Scenic Resources:* Local, regional, or state planning documents that have been publicly adopted and that identify a particular site or area as having particular values merit serious attention. National and state recognition may carry greater weight than local recognition, but the latter still is worthy of attention.

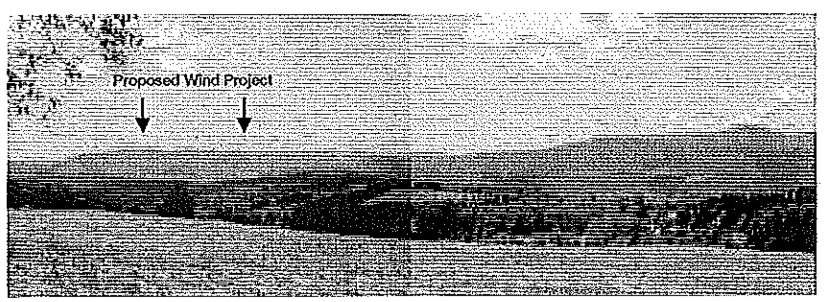

FIGURE D-8 Haystack Mountain is a regional focal point due to its pyramidal shape (right). The proposed wind project would be located quite far away and along a less visually distinct ridgeline.
SOURCE: Photographs by Jean Vissering, Jean Vissering Landscape Architecture.

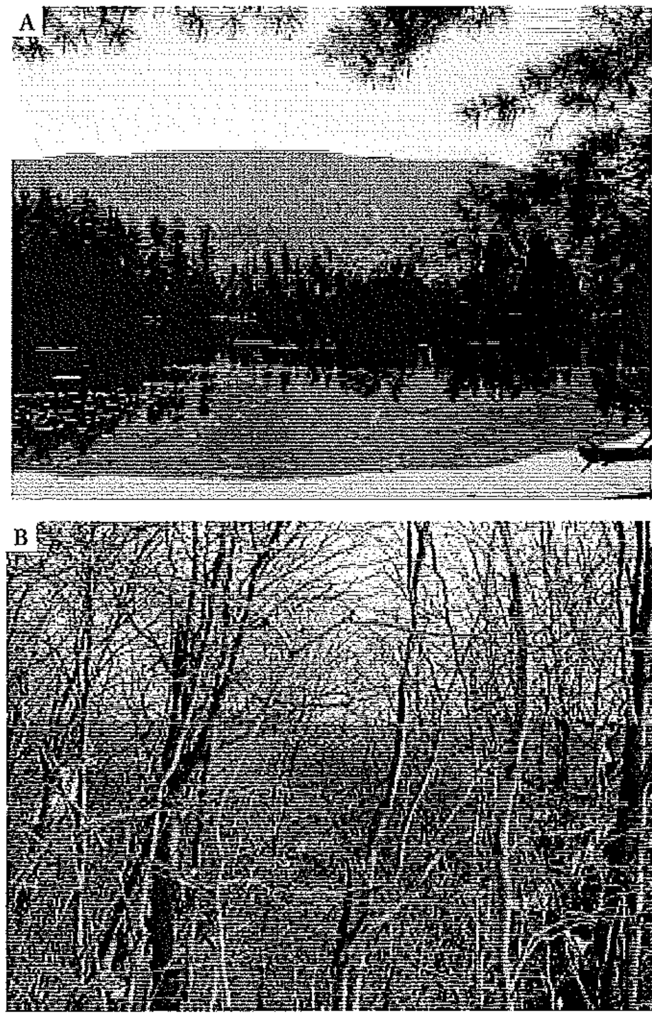

FIGURE D-9 Viewer expectations. (A) Water bodies used exclusively for non-motorized boats may be more visually sensitive than those used predominantly by motorized craft. (B) Wilderness areas can be considered highly visually sensitive, but are often predominantly wooded. Nevertheless, there may be views during leaf-off conditions that should be inventoried.
SOURCE: Photographs by Jean Vissering, Jean Vissering Landscape Architecture.

- *Visibility:* Projects that would be seen with great frequency within the study area may have higher impacts than projects that would be seen infrequently. Visibility must be studied along with the sensitivity, resource values, and prominence of the project within the views for an adequate assessment.
- *Weather Conditions:* Generally, projects are evaluated using "worst-case conditions," e.g., leaf-off visibility and clear skies. An abundance of clear skies makes aesthetic impacts in that area no worse or better than visual impacts in a region that has more cloudy skies. Indeed, a scenic view that is only rarely visible may be even more highly valued than one that usually can be seen.

Project Characteristics That May Affect Scenic Resources

- *Scale:* We perceive the size of an object in relation to its surroundings. The actual size of a wind turbine is less relevant than its perceived size in relation to its surroundings. Vertical scale (apparent height) in relation to the associated landmass, horizontal scale, and the overall project size are relevant. Despite the height of modern wind turbines, it is difficult for most people to distinguish between a 200-foot turbine and a 400-foot turbine unless they are side by side. Both appear much larger than surrounding trees and buildings, but the size becomes relevant in most cases only when it begins to appear to diminish the size and importance of a nearby natural feature such as a ridgeline.[6]

Horizontal scale contributes to the relative prominence of the project throughout the region. Certain western landscapes can accommodate larger projects than eastern landscapes of smaller scale. Projects may be too large when turbines become a constant occurrence within a landscape and when it is difficult to enjoy any views or ridgelines without wind turbines. Overall project size appears to be a significant issue in public acceptance of wind-energy projects in the United States (Figure D-10) (Pasqualetti et al. 2002).

- *Number of Turbines in the View:* The number of turbines visible at any one time may affect the prominence or relative scale of the project (Figure D-11). When wind turbines would be seen looking in all directions, or entirely covering the major landforms within a locality, the project may be viewed negatively, and further study probably will be needed.
- *Visual Clutter:* The accumulation of diverse built elements on a site, especially elements that contrast with their surroundings in form, color, and texture, can result in visual clutter (Figure D-12A,B). While it may seem

[6]Often the larger turbines appear less visually intrusive due to their greater spacing and the smaller numbers required for an equivalent power output.

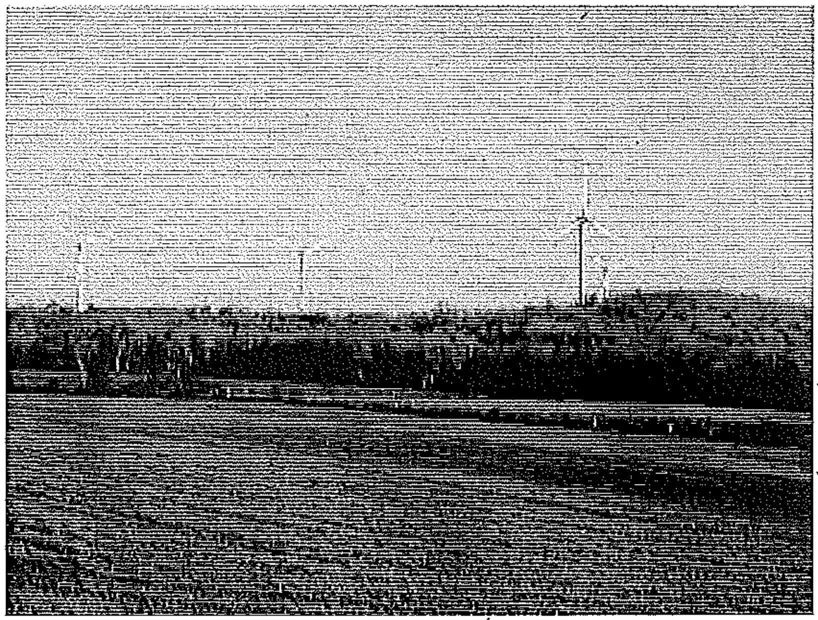

FIGURE D-10 This project in Fenner, New York, generally works well in this high-elevation rolling agricultural landscape. The vertical relationship of turbines to distinct hills or ridgelines needs to be examined in simulations. The ridge above does not appear as prominent from most vantage points, but the issue could arise in other situations.
SOURCE: Photographs by Jean Vissering, Jean Vissering Landscape Architecture.

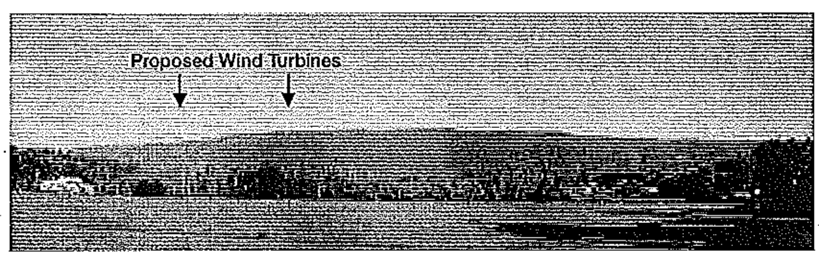

FIGURE D-11 Simulation of a proposed project in the Berkshire Mountains in Massachusetts. The proposed project would occupy only a portion of this longer ridge.
SOURCE: Photographs by Jean Vissering, Jean Vissering Landscape Architecture.

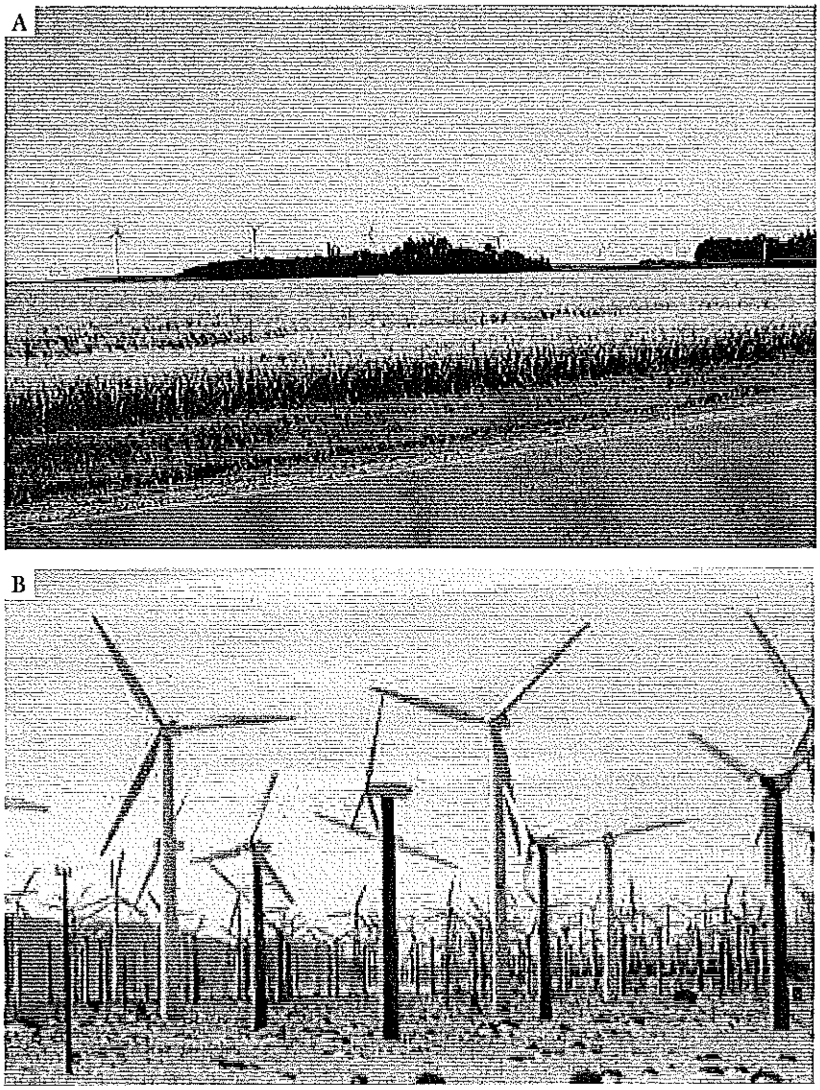

FIGURE D-12 (A) The repetition of identical elements that is characteristic of wind-energy projects helps to create a sense of order. (B) The valley location at San Gorgonio (Palm Springs, CA) diminishes the scale of this large project, but the overall accumulation of different turbine types results in a much more cluttered appearance than is likely in future project planning and maintenance.
SOURCE: (A) Photograph by Sandy Wobeck, East Montpelier Gully Jumper; (B) Photograph by David Policansky.

logical to place wind-energy projects in already-built landscapes, too much development can result in an increasingly chaotic or cluttered landscape. Because wind-energy projects involve the repetition of like elements, they often result in greater unity and less clutter than some other types of development. Even combining wind turbines with cell towers may increase visual clutter and therefore, visual impact. The introduction of different sizes and types of wind turbines over the life of a project can potentially severely degrade a landscape (Gipe 2003).

- *Visibility of Project Infrastructure:* Visibility of project roads, power lines, substations, and other infrastructure can substantially increase visual clutter (see above) and therefore visual impacts. These also increase the perceived scale of a project. In wooded landscapes, clearing resulting from installation of roads, power lines, and grade changes can visually alter a forested landscape.
- *Noise:* To the extent that noise degrades the character and experience of a particular landscape, it is an aesthetic concern. Most modern turbines are relatively quiet, but noise can be an aesthetic concern primarily for residents living within half a mile of a wind-energy project. Careful siting of individual wind turbines as well as selection of turbines rated for low noise can help to reduce these impacts.
- *Lighting:* Night lighting can be one of the most difficult aspects of a wind-energy project to evaluate, and may result in some of the greatest concerns. The importance of changes in landscape depend on where it occurs on the continuum of urban to wild landscape, as well as the project's overall visibility and proximity. In many landscapes where projects have been built or proposed, there currently is little night lighting. Red lights have less contrast than white lights with the night sky in terms of value, but they differ markedly from colors typically observed in the night landscape (except where other objects occur with obstruction lighting).

Other Issues Affecting Visual Impacts

- *Cumulative Impacts:* This issue relates both to the expansion of existing projects and to the addition of new projects within a geographic area. The first possibility raises concerns of the overall project scale and its appropriateness for the particular landscape. The second raises concerns of both scale and overburdening a particular locality with development impacts. Developing state-wide or region-wide siting guidelines can help prevent the undue impacts that may result from numerous projects being proposed over time within certain areas.
- *Meaningful Benefits:* Perceptions of aesthetic attractiveness are often linked to real or tangible benefits. For many people, however, the benefits of "cleaner air" or "less dependence on foreign fuels" may seem

too intangible, and usually they occur at least in part away from the areas subject to aesthetic impacts. Linking wind-energy development to both economic benefits at the local level and a meaningful program of pollution reduction at the state, local, and federal levels can enhance public perception of the benefits of wind energy. Developing direct community participation and links to the wind-energy projects they are hosting also can help these projects become a meaningful part of "place" (Pasqualetti et al. 2002).

Other Methods for Identifying Aesthetic Impacts

Public Participation and Surveys

Communities around the country have used a range of techniques for eliciting public opinions, and the effectiveness of these approaches needs further study. When a specific project is proposed in a particular area, the focus must be on understanding the site and the perceptions of the community members who live and work in the area. Aesthetic effects are site-specific and individual communities react differently. There is considerable evidence that public acceptance increases with a sense of involvement in the project. Involvement includes active efforts to inform neighbors, providing thorough analyses, responding to expressed concerns with alterations in project design, and providing material or monetary benefits to affected individuals or to the community at large.

Much of what we know about public reactions is anecdotal. Statistically valid and independently conducted pre- and post-construction surveys provide useful information about public perceptions of wind-energy projects and help determine what factors are important in public perceptions. Such surveys are commonly conducted in Europe, but much less often in the United States. To permit generalization of information gathered from public perceptions, surveys need to be carefully designed to factor in particular project attributes, site features, and the public processes followed in presenting the project to the public (Priestly 2006). Attitudes of nearby residents and recreational users from elsewhere may be quite different.

Independent and Peer Review

Experts in aesthetics hired by developers may be perceived as biased in favor of the developer. Two approaches have been used for obtaining independent reviews of proposed wind-energy projects. Some state or local governments hire independent experts to conduct visual impact assessments. In other states a process of peer review is used. Two or more independent experts in aesthetics review the work of the developer's consultant. Usually they are presented with project information including visibility maps, simulations, and photographs of landscape character. They are asked to evaluate a number of sensitive viewpoints for which simulations have been prepared and to score the degree of contrast resulting from the proposed project. This process could easily be institutionalized by reviewing bodies. In both cases, the developer generally pays for this independent review process.

MITIGATION TECHNIQUES

Some visual impacts will be inevitable with any wind-energy project. Reducing or minimizing negative impacts can be achieved in a number of ways. A well-sited and designed project will have incorporated some of the techniques into the original application. If there appear to be significant visual impacts resulting from the project, additional mitigation approaches can be used. If none can adequately reduce the visual impacts, the project may be found to be unsuited for the particular site. Mitigation techniques include the following:

- *Appropriate Siting:* This critical mitigation technique involves avoiding a site that is located on valued regional scenic resources, or that appears very prominent throughout a region. Selecting a site that can comfortably accommodate the number of turbines desired without visually overwhelming sensitive scenic resources on or near the site and the region as a whole also is important. Appropriate siting may also need to address potential issues of cumulative impacts (see below) so that a particular area or landscape type is not overburdened with wind-energy development.
- *Downsizing:* Reducing the scale of the project (numbers of turbines or height of turbines)[7] can help the project fit more comfortably into its surroundings. In some cases one or more turbines may be particularly prominent from sensitive viewpoints, or the overall scale of the project may overwhelm the particular land form or surrounding landscape. In most settings the difference in overall turbine height are difficult to distinguish. The difference between a 200-foot turbine and a 360-foot turbine (hub or nacelle height) can be difficult to perceive, especially when the turbines are seen against the sky. Size may make a difference if the height of the landform begins to be overwhelmed by the height of the turbine. Generally, fewer larger turbines can result in a better visual outcome than a larger number of smaller turbines.
- *Relocation:* Moving turbines from one location to another can help, but it may not be possible in all cases. Relocation can be used to

[7]Turbine heights also have effects on project productivity and on avian and bat mortality, which must be balanced with aesthetic issues.

avoid proximity to residences or visual prominence from sensitive viewing areas.[8]

- *Lighting:* The revised Federal Aviation Administration (FAA) lighting guidelines reduce lighting impacts. Lighting impacts often are of greatest concern to residents and recreationists, and should be minimized to the greatest extent possible. Any new technologies or modification of FAA lighting requirements that can further reduce lighting for wind turbines ideally should be incorporated into design standards.
- *Turbine Pattern:* In most cases turbines are located to take advantage of small rises in the land, flatter terrain, or other site features that determine their pattern or organization on the ground. Some studies suggest that turbine configurations can be designed to respond in meaningful or visually pleasing ways to their surroundings. In rolling landscapes a less rigid arrangement that reflects topography may be preferable, while in flatter landscapes, especially with patterns of rectangular fields or roads, a more geometric or linear pattern may work better. Simulations provide a useful way to study the effects of different turbine patterns from sensitive viewing areas.
- *Infrastructure Design:* Paying attention to project infrastructure such as meteorological towers, substations, power poles, and project buildings in addition to the turbines themselves is important. Generally, it is advisable to screen all project infrastructure from view to the greatest extent possible.
- *Color:* A recent FAA study showed that daytime lighting could be eliminated provided that turbines are white. White often is regarded as more cheerful and less industrial than other colors, which may be part of the reason some people find wind turbines more visually appealing than, for example, cell towers. Bright patterns and obvious logos can be avoided. Unobtrusive colors are important in other project infrastructure such as operations buildings, transmission support poles, and road surface materials. In general, darker colors are less noticeable, especially against a background of vegetation.
- *Maintenance:* People find wind turbines more visually appealing when the blades are rotating than when they are still (Pasqualetti et al. 2002). Requirements for immediate repairs of wind turbines can be part of permit requirements. Also the replacement of wind turbines with visually different wind turbines can result in visual clutter, so replacing wind turbines with the same or a visually similar model over the lifetime of the project may be an important requirement. Sufficient funds need to be assured for this purpose.

[8]Moving turbines away from a high point of land often results in minimal aesthetic benefits in contrast to a fairly significant reduction in electrical production.

• *Decommissioning:* Once a project or individual turbine can no longer function, requirements for removing the project infrastructure and reclaiming the site are important. A plan for decommissioning may be required as part of the permit application. In some cases, money is reserved in escrow for this purpose.

• *Non-reflective Materials:* Use of materials that will not result in light reflection may be required, for all project components.[9]

• *Minimizing Vegetation Removal:* Ideally, existing vegetation should be retained to the greatest extent possible. Clearcuts generally have negative visual impacts (Brush 1979). Screening areas of cleared forest may be advisable, as well as maintaining vegetation along roadsides and around turbines.

• *Screening:* While turbines cannot be screened from view, other project infrastructure (roads, power lines, substations, and buildings) can be. Existing vegetation is usually preferable, but plantings may be needed and should incorporate typical indigenous vegetation.

• *Noise:* Noise and siting standards can help reduce impact on residents near the project (generally within half a mile). Noise standards can be set at firm levels such as 40 dB(a)h (decibels corrected or A-weighted for sensitivity of the human ear) nighttime and 50 dB(a) daytime at the property line or at residential structures; or can be set as an increment above ambient noise levels (e.g., a maximum of 5 dB(a) above ambient noise levels). Post-construction monitoring is important here as in many aspects of the impacts of wind-energy facilities.

• *Burial and Sensitive Siting of Power Lines:* Collector lines often are buried between turbines. In very sensitive viewing locations other collector and transmission lines may also need to be buried (see Figures 3-2A and 3-2B).

• *Offsets:* In some cases protecting an offsite visual resource can help to offset the impacts of the project if mitigation cannot be accomplished on site.

DETERMINATION OF ACCEPTABLE OR UNDUE AESTHETIC IMPACTS

Decision makers usually need guidance to evaluate under what circumstances the degradation of aesthetic resources may outweigh the benefits of a proposed project. The immediate question may be: *would this particular project result in undue harm to valuable aesthetic resources in this particular setting?* At a policy level, the question is broader: how can wind-energy projects be accommodated while retaining the valued scenic resources of

[9]Color and reflectivity may also be a consideration for avian and bat mortality.

the state and of individual communities? These questions can be addressed systematically using the process described above and relying on well-established aesthetic principles. Many sites are likely to be suited to wind-energy development, and where these occur, the question becomes: *does this project as designed work on this site or will mitigation be required*? Mitigation possibilities are discussed above, but there will be circumstances when mitigation techniques fail to address critical problems with the site itself. Visibility alone generally does not result in a wind-energy project's being perceived as unacceptable. If the project appears to result in many issues, to involve important regional scenic resources, and to significantly affect the ability of people to enjoy these resources, then the project may be perceived as or judged to be unacceptable. Some questions to consider in revieweing wind-energy projects are listed below. Assuming that a high-quality wind site is involved, decision-making agencies may feel more comfortable in concluding that the aesthetic impacts are undue if more than one of the following concerns is involved. Ideally, the criteria will be weighed against the overall public benefits of the project and along with the general suitability of the site in other respects (see Box D-2 and Chapter 5 of this report).

Questions to Consider in Determining Acceptability of Visual Impacts

- Is the project located within an area of identified scenic or cultural significance?[10]
- Would the project significantly degrade views or scenic resources of regional or statewide significance?
- Is the project on or close to a natural or cultural landscape feature that is a regional focal point?
- Is the project in a landscape area that is visually distinct and rare or unique?
- Is the project unreasonably close (usually less than a half-mile) to many residences that would be severely affected, especially as a result of noise, shadow flicker, or by being completely surrounded by wind turbines?
- Will the project occupy an area valued for its wildness and remoteness? If these values have been specifically documented, then consideration of the appropriateness of a wind-energy project becomes even more important.
- Would the project's scale in terms of turbine height or numbers

[10]Preferably the scenic values have been identified in public documents rather than merely identified through the aesthetic impacts assessment process. However, few states or localities have taken steps to document scenic resources, so a careful visual impact assessment process may be the only available tool.

BOX D-2
Maine's Department of Environmental Protection Visual Impact Assessment Criteria (MEDEP 2003)

- *Landscape Compatibility:* Which is a function of the subelements of color, form, line, and texture. Compatibility is determined by whether the proposed activity differs significantly from its existing surroundings and the context from which they are viewed such that it becomes an unreasonable adverse impact on the visual quality of protected natural resources as viewed from a scenic resource.
- *Scale Contrast:* Which is determined by the size and scope of the proposed activity given its specific location within the viewshed of a scenic resource.
- *Spatial Dominance:* Which is the degree to which an activity dominates the whole landscape composition or dominates landform, water, or sky backdrop as viewed from a scenic resource.

of turbines overwhelm the landscape in which it occurs? (For example, would scenic views that are free of turbine remain throughout the region, or would wind turbines occupy all or most notable ridgelines within view of the area?)

- Will the project result in unreasonable visual clutter due to its combination with existing built features that already degrade landscape features? This is an issue of cumulative impacts.
- Has the applicant used reasonable and available mitigating techniques that would reduce the project's impacts?
- Does the project violate a clear, written community standard intended to protect the aesthetics or scenic beauty of the area? Such a standard ideally will be legally adopted by a community or state, and provide clear guidance to developers and be based on sound principles of aesthetic resource assessment.

SAMPLE PEER REVIEW EVALUATION SHEET[11]

Panel Member: ____________________
Date: ____________________

Viewpoint #: __________
Viewpoint Description: ____________________

Visual Impact:
Rate the Project's contrast with existing conditions on a scale of 1 (completely compatible) to 5 (strong contrast). Under comments, explain the reason for rating focusing on the elements of line, scale, color, texture, and form. Then provide your overall assessment of the project's aesthetic impact from this viewpoint.

Landscape Component	Contrast	Comments
Vegetation		
Land Use		
Land Form		
Viewer Activity		
Water		
Total		
Average Score		

Overall Aesthetic Impact:
____

[11]This form was adapted from one used by Michael Buscher ASLA of T. J. Boyle and Associates.

Whistling Ridge
Public Comment
#352

Talburt, Tammy (UTC)

From:	Daniel H. Lichtenwald <grayback2@earthlink.net>
Sent:	Sunday, January 16, 2011 12:00 AM
To:	EFSEC (UTC); Talburt, Tammy (UTC)
Cc:	Daniel Lichtenwald
Subject:	WREP comments
Attachments:	WREP comments 011511.pdf

Washington Energy Facility Site Evaluation Council (EFSEC)
P.O. Box 43172
Olympia, Washington 98504-3172

15 January 2010

(e-mailed to efsec@utc.wa.gov, ttalburt@utc.wa.gov)

To whom it may concern:

My comments below are made with regard to a project application which EFSEC is evaluating for approval. The project is the Whistling Ridge Energy Project (WREP), proposed in Skamania County, just west of the White Salmon river.

The project is ill considered, as in its present form it will severely conflict with purposes of the Columbia River Gorge National Scenic Area (NSA).

Principally, the proposal to erect an array of towers bearing enormous moving machinery within and over the landscape conflicts with the scenic component of the NSA set of values statutorily mandated for protection. Such a wall of moving machinery, towering over the gorge, visible from countless vantage points within the NSA to hikers, nature explorers, seekers of the inspiring views and escapes from the psychic insults of the industrialized world, damages the NSA. True as it may be that the proposed project is not **within** the NSA, it nevertheless damages the scenic value of a significant part of it. Is it enough that it isn't in the NSA?

No doubt the statute that created the NSA grew from a time when such a form of development wasn't considered as needing to be addressed. Nevertheless, the placement of a wall of industrial machinery 400+ feet into the air, today, on the ridges that form the boundary between sky and land would be a significant, indeed a disastrous, alteration of the character and intangible values of a large portion of the NSA.

The EFSEC must recognize that what one sees in the sky above the NSA is also part of the NSA. Would it make sense to tap into the geothermal resource affecting the geyser and hot spring attractions at Yellowstone, degrading or damaging the activity of the geysers, hot springs and other surface geothermal phenomena, only to say that the development of the geothermal resource was performed outside the park boundary and that the park itself "hasn't been touched"? The EFSEC must bring wisdom and reflection to its decision that isn't simply a process of robotically applying political expediency and short-sighted interpretation of land-use policies that haven't yet faced this kind of conflict.

Please deny approval for the WREP.

Thank you for the opportunity to submit my comment

Daniel Lichtenwald
PO Box [redacted]
Goldendale, Washington 98620-1200
[redacted]@earthlink.net
509-773-[redacted]

Talburt, Tammy (UTC)

From: Daniel H. Lichtenwald <grayback2@earthlink.net>
Sent: Sunday, January 16, 2011 12:59 AM
To: Talburt, Tammy (UTC)
Cc: Daniel Lichtenwald
Subject: email to EFSEC fails

Hello Ms Talburt . . .

Late yesterday 1/15/11, after several attempts, I submitted an email with PDF attachment for my comment regarding the Whistling Ridge Energy Project (WREP) currently before the EFSEC for approval.

I had word that emails to the EFSEC mailbox were failing delivery, and this indeed was the case with the email I mention, above. I understand that the deadline for comment on WREP was 11:59 PM 1/15/11, which was when I resent my emailed comment to include you as an addressee. (It had been suggested that you also be included as an addressee, which I finally did, just before midnight.) I hope that you will forward my comment on WREP appropriately, as I received only failed delivery responses when I tried sending to EFSEC@utc.wa.gov several times earlier, before the deadline. Given that the EFSEC email channel hasn't been open, maybe it would be considered to extend the period for filing comments on WREP?

Further, I just sent another email from the hot link at the EFSEC Website requesting that I be put on the WREP mailing list. That email was also returned (sent to EFSEC@utc.wa.gov) as a failed delivery.

Please advise how I can be signed-up for the WREP mailing list (for email).

Thanks

Daniel Lichtenwald
Goldendale, Washington

Whistling Ridge
Public Comment
#354

Talburt, Tammy (UTC)

From: Will Bloch [redacted]@gorge.net>
Sent: Tuesday, January 18, 2011 9:46 AM
To: EFSEC (UTC)
Subject: comments of Whistling Ridge
Attachments: 2nd note to WEFSEC.doc

Dear Council,

Please accept the attachment in the record of comments on the Whistling Ridge Wind Power Project. It deals with some issues in more detail than was possible in the recent Underwood hearing. The wa.gov server rejected three efforts to send it on Jan. 14 and 15. A hard copy, which should have a Jan. 15 postmark, should reach you within a few days.

I should appreciate an acknowledgment which makes clear whether this document will be in the official record for Whistling Ridge.

Thanks for all your hard work and patience on a contentious issue.

Will Bloch
[redacted] El Camino Real
White Salmon, WA 98672
509-493-[redacted]
[redacted]@gorge.net

BEFORE THE STATE OF WASHINGTON ENERGY FACILITY SITE EVALUATION COUNCIL (WEFSEC)

In the Matter of Application
No. 2009-1

Whistling Ridge Energy LLC

Whistling Ridge Energy Project

Comments by
Will Bloch, private citizen
[redacted] El Camino Real
White Salmon, WA 98672

Date: January 14, 2011

Commenter sent the WEFSEC an email on 8/27/10 critiquing the Draft Environmental Impact Statement (DEIS) for the project above. An effort is made here not just to re-state old arguments, but rather to bring something new (to the commenter, at least) to the discussion. The current comments focus on four other sources of information: (a) **Wind Farm Noise: 2009 In Review**, a Feb. 2010 survey of the relevant scientific literature by Jim Cummings, Acoustic Ecology Institute (acousticecology.org), hereafter referred to as **Cummings 2009**; (b) a Draft report from the Northwest Power and Conservation Council, **The Effects of an Increasing Surplus of Energy Generating Capacity in the Pacific Northwest** (1/3/11), available at the NPCC website; (c) the considerable roster of articles and blogs in **The New York Times, Online Edition** regarding the experience of other communities with wind power projects; (d) widely distributed information on the Web describing the over 40 wind projects in Oregon and Washington operating, under construction, planned, or proposed for the near future. Following is a list of the **TimesOnline** items which may be considered in the discussion below.

#1 (12/01/10) Tom Zeller Jr.: *Maine Officials Say Turbines Too Loud*
#2 (11/30/10) Peter Behr: *Integrating Wind and Water Power, an Increasingly Tough Balancing Act*
#3 (10/06/10) Tom Zeller Jr.: *For Those Living Nearby, That Miserable Hum of Clean Energy*
#4 (09/20/10) Stanley Fish: *Windfall In New York*
#5 (08/02/10) William Yardley: *Bonanza or Blight? Oregon's Wind Debate*
#6 (07/31/10) William Yardley: *Turbines too Loud? Here, Take $5000*
#7 (12/16/09) John Lorinc: *Study: No Health Impact From Wind Turbines*
#8 (12/10/09) Kate Galbraith: *$1.4 Billion Oregon Wind Deal Announced*

#9 (12/04/09) Green, A Blog About Energy and the Environment: *Study: No Impact on Property Values From Wind Turbines*
#10 (07/22/09) Kate Galbraith: *Slow, Costly, and Often Dangerous Road to Wind Power*

In what follows, references to **Times Online** submissions will use the ordinal numbers next to the citations above. My discussion is organized according to topic, not source. The five topics are "Impact on Northwest Green Power Economics", "Employment and County Revenue Impact", "Sound Pollution", "View Pollution", and "Who's In Charge?".

Impact on NW Green Energy Economy

Comparison of Whistling Ridge Output to Total Green Power Supply

Whistling Ridge might contribute as much as 75 MW to the Northwest power grid. How does that compare to all the other wind-power capacity proposed, planned, approved, under construction, or operating in WA and OR? It would be about 0.68% of the wind capacity in both states and 1.7% of the WA capacity. These fractions probably are overestimates because I have failed to identify some wind farms. The only way I had to estimate total capacity was to scour the Web, including the WEFSEC, Oregon EFS, Iberdrola, Caithness, Wikipedia, BPA, Northwest Power and Conservation Council (NPCC), American Wind Energy Association, and Whistling Ridge websites. No website listed all projects. I also directly browsed the names I had discovered for various northwest wind projects, primarily to verify capacity estimates. Some projects displayed a range of power ratings, generally attributable to multi-phase approval and construction, combined with out-of-date websites.

Approximately 4423 MW of wind-power capacity are proposed, approved, under construction, or operating in WA, ranging in size from the 6 MW Coastal project planned in Grays Harbor Co. to the 1250 MW Snake River project under construction or approved in Garfield and Columbia Cos. Approximately 6542 MW of wind-power capacity are proposed, approved, under construction, or operating in OR, ranging in size from the 25 MW Vansycle Ridge project operating in Umatilla Co. to the 845 MW Shepherds Flat project under construction in Gilliam and Morrow Cos. Note that these data exclude wind-power generation in Montana and Idaho, included by the NPCC in its evaluation of the Northwest power supply. Adding in the rapidly growing wind-power capacity of these two states would reduce the quantitative significance of Whistling Ridge even more.

Why should we care about the mathematical insignificance of the planned output of the Whistling Ridge project? Because it is unique in its location immediately next to one of the world's scenic treasures and, according to the DEIS, will cause significant damage to the views toward the east end of the most scenic part of the Gorge. It's a simple matter of benefit/cost. For the benefit of a less than 0.7% increase in Northwest wind power capacity, the public pays a significant and essentially permanent degradation of a scenic wonder; and the door has been opened to widespread invasion of the Gorge by wind machines. Of course, the benefit becomes even less when you consider as well the hydropower capacity of Northwest dams. The estimated 10970 MW of total wind power operating or in the pipeline in OR and WA (available an average of a bit less than a third of the time) is only 1/3 of the 33000 MW of Northwest hydropower, available an average of about half the time. As a percentage of total wind and hydro capacity, uncorrected for availability, Whistling Ridge is only 0.17%. Correction for availability reduces this figure to 0.12%. Of course, renewable power is only a fraction of total Northwest electric power generation, so from the perspective of the total available power supply, Whistling Ridge is really the flea on the elephant's rump. Whistling Ridge is dwarfed by other wind power facilities in WA and OR which are located on more suitable terrain for such installations, for the most part land lacking the natural beauty, wildlife, and relatively wild condition of the Columbia Gorge. Our need for energy independence and reduced greenhouse gas emissions does not require us to sow wind towers on every acre where they might produce juice and conveniently deliver the juice into the grid.

There is another power-grid consideration which militates against adding more wind power at any environmental cost. As reported by **TimesOnline #2**, the Northwest Power and Conservation Council is concerned about the growing challenge of finding enough alternative power sources to balance the fluctuations in wind power availability in order to be sure that the total power supplied to the grid changes only in response to demand fluctuation. It is clear from cruising the NPCC web site that this is a technical issue well beyond my expertise or motivation to master, but it certainly is one which the WEFSEC must take into account.

Comparison of Projected Total Green Power Supply to Demand

Compare the preceding analysis with the relevant material on p.1-4 to p.1-6 of the DEIS. Nowhere in the DEIS can one get a sense of the quantitative insignificance of Whistling Ridge in the overall Northwest power-supply picture. This part of the DEIS tries to create the impression that Whistling Ridge would help meet Northwest power demand over the next 20 years. It quotes an NPCC estimate that Northwest demand for electricity should grow by about 6.5 GW between 2007 and 2030, at an average annual rate of 1%. We have seen above that one can identify about 11 GW of wind power expected to be online in OR and WA alone, significantly before 2030. Of course, by 2030, additional wind power will have come online that has not yet been proposed. According to the US DOE website, Wind Powering America, there were about 2GW of installed wind power capacity in OR and WA in 2007. Therefore, wind projects already in the works will have added about 9 GW to 2007 Northwest capacity well before 2030, comfortably in excess of the projected 6.5 GW growth in demand. Of course, this analysis fails to consider all the other sources of electric power and how they will change in this period. There is no need to correct the supply projection for the estimated 28 to 32% availability of wind power, because the grid has to be designed to supply the necessary balancing juice from non-wind, mostly non-hydro, sources.

Independent and authoritative support for the preceding argument is found in NPCC Draft document 2011-1: **The Effects of an Increasing Surplus of Energy Generating Capacity in the Pacific Northwest** (1/3/11), available at the NPCC website. This report (a) summarizes experience with so-called "excess energy events" which tend to occur in the spring, usually under conditions of low electrical load, high stream flow and high wind; (b) reviews projections of increased Northwest electricity production over the next 20 years; and (c) surveys approaches to mitigating the conditions leading to such events, which have multiple adverse economic consequences. These crises arise because of federal limits on air entrainment in river water, damaging to fish migrating downstream, which results from water spillage over dams rather than through power-generating turbines. During periods of low load, high water, and high wind, hydro and wind generators essentially compete for limited power demand, with hydro likely to be prioritized in order to minimize fish deaths. In addition to wasting some combination of hydro and wind generating capacity, these events depress electricity prices and can affect the ability of utilities to reap the financial rewards of various governmental incentives for green power production. [Without these subsidies, few wind or solar developers would consider their projects to be sufficiently profitable.] In effect, the rapid and ongoing build-out of wind-power facilities threatens to trigger the "bust" phase of a boom-and-bust cycle resulting from inadequate regional planning and regulation of wind-farm construction. To return to the Whistling Ridge context, this project would go online during a period in which net demand for wind power is leveling off and subject to episodic dramatic drops. The imbalance between green power supply and demand will be greatest in the next decade because most of the several-fold wind-power build-out currently is expected to occur in the next decade, whereas demand is expected to grow at a constant, leisurely, annual rate of less than 1%. Any resulting financial stress on wind-power suppliers is likely to be most severe in this period.

Figure 3 of the NPCC report confirms the estimates above of (a) 2 GW of operating wind power in the Northwest in 2007 and (b) the addition of about 9 GW of wind-power capacity by 2030, most of it by 2020. Exactly how much additional capacity (ranging from 8 to 11 GW) is likely to depend on the level of governmental financial incentives for green power generation.

It is easy to anticipate how wind-power boosters will attack the use of the NPCC's excess-energy-event data. It will be claimed that these rare crises do not significantly affect the overall trends in the need for green power. However, a more conservative regulatory response would be the following. Excess energy events are the canary in the coal mine. They already occur regularly, if seasonally, before completion of the current and projected rapid build-out of regional wind-power capacity. As the mathematical imbalance between regional electricity supply and demand grows in the next decade, competition among various power sources for limited demand is likely to occur more frequently than it did in 2010. Currently total hours/year of excess energy approximate 360 (equivalent to 15 full days but probably distributed over twice that many). Depending on green-power subsidy levels and spring run-off volume, these numbers could grow to between 600 hr (25 full day equivalents) and 1000 hr (42 full day equivalents) over the next decade. From an economic viewpoint, adding a month of low-demand wind-power down time is equivalent to increasing the current 8 months of availability (low-supply) down time to about 9 months.

Comparison to Daily Fluctuation in NW Power Supply and Demand

Figure 2 of the NPCC report suggests still another way to gauge the quantitative insignificance of proposed Whistling Ridge output: daily fluctuation of total Northwest electric power demand, closely tracked by wind-power production during an energy-excess period in 2010, was 4-6 GW, 50 to 75 times the Whistling Ridge output.

Comparison to Short-term (1-10 min) Fluctuation in NW Power Supply and Demand

Commenter is interacting with NPCC and BPA staff to try to understand the noise component in the time trace for total NW (or at least mid-Columbia) electric load (or supply). It appears that there may be two noise specs, one for successive 1-minute power averages (probably measurement noise) and one for 10-minute power averages (probably rapid aggregate load fluctuations). The BPA spec for the former appears to be 80MW. If this is a correct interpretation, then the 75 MW proposed Whistling Ridge output would be within the measurement uncertainty of total Northwest power generation or consumption. That is a scientist's ultimate criterion for insignificance: when a signal component is no greater than noise.

Bottom Line

According to the trace in Figure 2 of NPCC Draft doc. 2011-1, mid-day total electricity demand during the sampled period in June, 2010 averaged over 200 times projected Whistling Ridge output. Hydro electricity generation was shut down for 1-2 day intervals during this period. When hydro did produce power, its output was about 1/8 of wind output even though currently hydro capacity is about 8 times wind capacity. Already there is so much extra wind-power capacity that it can drive hydro power off the grid under some conditions. If projected increases in wind power are more than sufficient to meet projected Northwest demand, then clearly there is no NEED for the minute additional amount of electricity which Whistling Ridge might supply. The Northwest can and will export a lot of surplus electricity to other areas, like CA. Whistling Ridge might well end up providing some of that surplus, making money for SDS Lumber but not really helping to fill a Northwest need.

Employment and County Revenue Impact

New Jobs

Proponents of the Whistling Ridge Project, like wind-energy boosters generally, wax lyrical about the quality "green jobs" they provide. In the end, this stand depends on a subjective judgment about what represents a significant number of new jobs. What little job information I've found on the Web for wind projects in OR and WA does not support the position that Whistling Ridge would generate a significant boost in local employment.

The numbers provided by Iberdrola Renewables (Portland, OR) for its Klondike I, II, III, and IIIa projects in Wasco Co., OR are as follows: 18 permanent workers for a total of 242 turbines rated at 400 MW, or 1 permanent worker per 13 turbines.

Iberdrola predicts a similar result for a project about half that size, Big Horn, in eastern Klickitat Co.: 9-11 permanent staff (76% local) for 133 turbines rated at 200 MW, or 1 permanent worker per 13 turbines. Big Horn Wind Power Project also is expected to employ about 2000 construction workers (60% local), presumably for about a year. If labor requirements are proportional to turbine number, these numbers work out to about 4 permanent workers (3 local) and 75 construction workers (45 local) over about a year for Whistling Ridge if it actual deploys the expected 50 turbines.

Caithness estimates that its 338 turbine (845 MW) Shepherds Flat facility in Gilliam and Morrow Counties, OR will employ 35 permanent workers, or 1 permanent worker per 10 turbines, scaling to 5 permanent workers at Whistling Ridge. Note the approximate constancy in turbines per permanent worker over a 2.5-fold range of project size, supporting the validity of proportional scaling down to the size of the Whistling Ridge Project. A reported figure of 400 construction workers for Shepherds Flat would extrapolate proportionately to only 59 construction workers at Whistling Ridge.

However one massages these numbers, 4-5 permanent workers, and 60-75 construction workers (not all local) for about a year, do not add up to a significant boost in Columbia Gorge payrolls. As with the quantitative analysis of Northwest wind power capacity, the ultimate issue here is benefit/cost. In order to add 4-5 permanent paychecks and less than 100 temporary paychecks into the local economy, should we degrade, relatively permanently, the scenery which is a major reason many of us live here and many more people travel here to relax and recreate?

The DEIS (pp. 3-253-255 and p.3-256) provides its own estimate of the local jobs provided by the Whistling Ridge project. The approximately 14 months of construction are predicted to employ an average of about 143 workers/month, of which only about 30% (about 50) would be local. Permanent employment during operation is estimated at 8-9 full-time or part-time, which is too vague a description to allow a conclusion with respect to full-time-equivalents and economic impact; it could mean as few as 2-3 full-time-equivalents. "Part-time" does not even have to mean half-time. Approximately 7 of these 8-9 ?-time workers would be local. If a more candid estimate yielded a figure of as many as 6-7 permanent FTE's, SDS Lumber should be pressed to explain why its labor requirements, normalized to wind-site size, exceed Iberdrola's by a factor of about 2.

It should be noted that in the Cumulative Impact Analysis on p.3-285, the DEIS has upgraded the permanent work-force number to "9 full-time workers". Now it is the DEIS authors/editors who have some explaining to do: not just the internal inconsistency in the document but also how Whistling Ridge operations could require three times as many workers per turbine as Iberdrola installations a bit farther east along the Columbia. I cannot imagine a more perfect example of the subtle shadings of meaning which permeate the DEIS and leave a strong taste of bias in the reader's mouth. Still, one should not fixate on the exact job numbers. Compared to unemployment figures for Skamania, Klickitat, and Hood River Cos. (data tables at the Washington Employment Security Division and Oregon Employment Department websites), any reasonable number is just a drop in the bucket.

Full-year unemployment figures for the three counties totaled 1538 in 2007, 1857 in 2008, and 2826 in 2009. Where one can compare the county figures with values in DEIS Table 3.13-3, the latter are systematically a bit higher, but not enough to affect interpretation. County-specific unemployment percentages for 2010 available at the US Bureau of Labor Statistics website suggest that local unemployment did not change significantly from 2009 numbers. There is no easy way to predict how the slow economic recovery will affect local unemployment figures for the period of construction and operation of the project; but any way you cut it, Whistling Ridge is not going to improve the numbers significantly. Reducing local unemployment by less than 2% seems like a poor return for damaging a scenic resource which thrills many thousands, perhaps even millions, of people a year.

Local Tax Revenue

Whistling Ridge backers have aggressively promoted the idea that the project would deliver major tax revenue to Skamania Co. However, the tax narrative in Section 3.13 of the DEIS is too incomplete to know what the likely local tax benefit might be. There appear to be just three categories of state/local tax which a wind-power generator would pay: a 3.852% public utility tax on power sales; local/state sales/use tax on goods and services consumed in building and operating the facility; and local/state property tax.

Public Utility Tax

This tax, imposed in place of a B&O tax, applies only to sales within the state; sales to Oregon or (more likely) California would be exempt in WA. More importantly, 100% of electricity sales tax receipts go into the state general fund; none of this revenue would benefit Skamania Co. directly. The DEIS mentions rather vaguely in passing (p.3-260) that some sales tax would be paid on electricity sales, not mentioning the public utility tax by name. This statement is completely misleading to the degree that it hints at financial benefit to the county – another subtle authorial or editorial shading of meaning?

Sales Tax

Construction projects in WA normally pay large sales/use taxes on the associated goods and services. However, as described on DEIS p. 3-255, there is a state sales/use-tax exemption on equipment used for wind power generation, including towers, turbines, transformers, electric cables, substations; 90% of the remaining procurements are expected to be applied directly to power generation. According to the DEIS, the approximately $150M total of equipment sales supplying Whistling Ridge might include as little as $1.32M of taxable sales. If so, the DEIS estimates that Skamania County's sales-tax share should approximate $6600 (less to the degree that materials are purchased outside Skamania County), too little to impact the total County budget, reported by the County to exceed $50M in total and $18M for current expenses in 2010. The DEIS narrative on annual sales tax revenue from continuing operations (pp.3-259-260) is a bit confusing, but even the largest sum would be quite small in comparison to existing sales-tax revenue and the County's total budget. Additionally, the WEFSEC should be alert to a general situation in the counties along the OR border: massive sales tax avoidance by buying in OR. I cannot evaluate the degree to which companies like SDS Lumber do this, but it is so common for personal retail purchases that many retailers will not even bother to set up shop in southern WA.

Property Tax

The remaining (and major) tax feedback to Skamania County from Whistling Ridge would be property tax, the majority of which goes to local government. The DEIS property-tax discussion on pp. 3-260-261 appears to be inaccurate. Total Skamania Co. assessed property tax in 2007 was $9.7M, of which 79%, or about $7.7M, would have been returned to the County; the State takes 21%. The $731,500 estimated increase once the completed Whistling Ridge facility went online, would be the boost in total assessed tax, not the increase in County property-tax revenues as stated in the DEIS. The County share of this increase would be $577,885, $560,863 of which is itemized at the bottom of p. 3-260 and top of p. 3-261.

The DEIS description of the 2008 County budget in Table 3.13-5 also could mislead a reader. The total revenues of $13.7M and expenditures of $19.4 M were just for the current expense fund. Budgets of all the other County funds totaled almost twice the size of the current expense fund. In 2010, the relevant budgets were $18M for current expenses and $50.6M total. Another way to understand the communication problem here is to compare the $2.8M general property tax revenue (2008) in Table 3.13-5 with the $9.6M collected property tax (2007) on p. 3-260. The former value is just for the current expense fund budget, whereas the latter is the entire property-tax revenue, 79% of which feeds the entire County budget. The effect of scaling expenditures to the current expense fund (p. 3-251) and revenue to the total budget (p.3-260) is to increase the apparent significance of the revenue increase which the wind project would generate. Now $600k additional revenue (most of the additional County income generated by this project) is quite a nice boost for a county with a small tax base and approximately 12% unemployment, but it is only 1.2% of the entire County budget.

What is clear is that SDS estimates a total (land and improvements) post-construction project property value of $87.5M (p.2-260), about half the estimated construction cost (improvements) of $150M. A 1/13/11 conversation with Neil Cook, an assessment expert in the WA Department of Revenue, suggests that there is so little experience with assessing wind farms, where the conventional market-value approach makes no sense, that it is hard to predict exactly how the Skamania Co. Assessor would value this facility. SDS Lumber is likely to push for valuation based on income-generating potential, as a hedge on a possible bust in the Northwest green power economy. In the event of a bust, the County could experience its own budgetary crisis. Of course, SDS Lumber, like any well run business, would depreciate equipment value as aggressively as possible, so property-tax revenue probably would decline over a time span of about 25 years. For the residual lifetime of the wind farm, the only taxable property might be the land itself, normally valued much less than the improvements on it. Combining all that is known and unknown about how Whistling Ridge would boost Skamania County revenue, dreams of sugarplums seem premature.

There are better ways to increase County revenue AND pump more personal earnings into the local economy: vigorously recruit high-tech companies to set up business in the urban areas set aside in the Gorge, following the impressive model of InSitu. The Gorge is one of the most livable environments in the country. That should be a major magnet for companies with young, well educated employees who love outdoor recreation and would treasure the proximity to one of the country's most vibrant cities.

Sound Pollution

According to p.3-119 of the DEIS, there are only two existing and one potential residence within about 1 mile of the wind farm; acoustic consultants have suggested that 2 km, a little over a mile, represent a conservative sonar set-back for wind turbines in general. [**TimesOnline #3**] Most residences in Willard, Mill A, Underwood, and the settlement along Northwestern Lake lie over a mile from the turbine site and therefore are much less likely to experience acoustic impacts. The simplest response to the potential for serious sound pollution is the following. The WEFSEC or other appropriate state agency should attach a condition to project approval that the project developer is under legal obligation via arbitration to mitigate any sound-pollution complaints by any of these three property owners by any means, including as a last resort purchase of an affected property at fair market value. However, it could happen that idiosyncrasies of weather or geography create unacceptable acoustics at a subset of the more distant homes, where significantly more people might experience harm. Therefore project approval also should require a second condition: that if noise complaints involving sleep disruption are made by any of these more distant residents, the project developer is under legal obligation via arbitration to resolve them by purely operational means (as opposed to buy-out).

Remedies most likely would involve only night-time operation, and might not even result in reduced power production, given the many options for staggering the rotational phases of turbines in a way that cancels or attenuates the pulsing turbine sound which is most likely to cause trouble.

The compromise suggested above strikes a balance between two fairness principles. On the one hand, it seems unfair and disproportionate to prevent development because of an uncertain harm that additionally is unlikely to be felt by more than a very small number of people. On the other, it is unfair to reduce the quality of life or health of existing neighbors without remediation or due compensation; and the injury is multiplied if, through miscalculation or willfulness, the site developer or the EIS authors fail to anticipate a serious environmental impact. Certainly one would hope that the WEFSEC, ultimately responsible for an EIS it sponsors, would feel obliged to make whole those neighbors of the wind farm who suffered from an adverse effect said EIS claimed could not happen. The more residents are involved, the less fair it is to disrupt their lives by buy-out. The practical underpinning of this compromise is that the odds of adverse acoustic impact go down approximately in inverse proportion to the square of the distance from the turbines [the rate of decline with distance is much less for a line of turbines approximately perpendicular to the vector from the center of the line to the dwelling in question]; the project developer is very unlikely to have to deal with more than one or two disgruntled neighbors. It should be noted that this is a moderation of my position at the time of my 8/27/10 comments. I felt then that any risk of harm to nearby residents from wind-turbine sound provided sufficient grounds for denying the project application.

However, the task at hand is not to find a practical and politically acceptable solution to a potential pollution problem, but to try to improve the EIS and, thereby, the factual basis for the WEFSEC's final recommendation. Why bother? Because the WEFSEC almost certainly will confront sound-pollution issues in the future, and the sound-pollution deficiencies of this DEIS are site-independent. The acoustic science conventionally applied to wind turbines is largely irrelevant. It was developed to deal with relatively time-independent ("uniform") noise, possibly punctuated with random louder sounds, in industrial, urban, or transportation contexts. Environmental acoustics is focused primarily on preventing permanent harm by very loud noise to the ears or, in extreme cases, other organs. Wind farms' major acoustic consequence appears to be sleep loss triggered by relatively low-amplitude, repetitive sound imposed over low-amplitude background noise in a largely rural setting. The rest of this section of these comments elaborates on this position.

In my 8/27/10 critique, I suggested that the real sound pollution problem has to do with the brain's uncontrollable arousal when presented with repetitive sound pulses recurring on the time scale of seconds, a phenomenon many of us have experienced as insomnia induced by a dripping faucet or ticking clock. The repetitive sound does not have to be loud. Sensitivity to the pulses is heightened in the dark, is heightened when other ambient noise is reduced, and varies widely among individuals. The brain does not habituate reliably to this auditory disturbance, probably because the sleep disruption originally had great adaptive value to our hunter-gatherer ancestors who lived (and slept) in a hostile world full of nocturnal predators (but no wind farms). Following is more evidence from the literature to support this explanation of why some neighbors of wind farms find their lives to be devastated by the associated sound pollution.

(1) Cummings 2009 should be the starting point for any attempt to understand the acoustic impact of wind farms on nearby residents. Wind-energy proponents may dismiss this report as politically biased because it (a) takes proponents to task for dismissing legitimate complaints of harm from wind-turbine sounds and (b) critiques current technical methods and standards for evaluating wind-farm acoustic effects. However, the document hardly hews to the party line of wind-farm opponents. In a nutshell, Cummings concludes that the issues are more complicated than the political combatants will admit, but that the detailed claims of health damage are too widespread, consistent, and uncorrelated with political position to be dismissed. Cummings seems in tune with the notion that the most serious problem is insomnia induced by nocturnal turbine-noise amplitude modulation.

Part of the complexity of wind-farm sound pollution is the fact that different people living within a mile or so of wind turbines report such a range of reactions, some claiming to be unaffected and others being so bedeviled that they must abandon their homes. Although some protagonists in the wind-farm debate have proposed the existence of a disorder called "Wind Turbine Syndrome", and some have suggested the importance of ultra-low-frequency noise, one does not have to employ any imagination to home in on a sufficient reason for concern. The sleep loss consistently reported by a subset of wind-farm neighbors can be severe enough to destroy quality of life and threaten health. Nothing mysterious about that: physicians understand that minds and bodies need a pretty uniform amount of quality sleep to thrive. It's not just the total hours spent sleeping, but that a large fraction of that time should be spent in uninterrupted deep sleep. The wide variation in reported sleep sensitivity to wind-turbine sounds is partly due to normal human biological variation, related to genetics, age, health, emotional state, and probably ambient light levels. It also is influenced by geographic and micro-meteorological differences among home-sites, including not just distance from the nearest turbine, but also angular relationship to the rotor axis. [So-called "amplitude modulation", a pulsing sound with a repetition rate in the range of 60/minute, 3 times the rotor rpm, is reported to be strongest in the plane of the blades and weakest along the rotor axis.] It also should be influenced by the number of turbines, their relative positions, their angular velocity distribution, and the rotational phase relationships among them. The orientation of the rotor axes, angular velocity distribution, and phase relationships are likely to vary widely over time, especially on the time scale of days.

There are at least three things wrong with conventional acoustic studies of wind-farm noise, including those described in the DEIS. (1) Acoustic engineers ignore amplitude modulation, measuring noise energy in a time-averaged manner which lumps sound pulses together with whatever other, more uniform, background noise is present. (2) Therefore acoustic engineers fail to study how background noise influences our sensitivity to amplitude modulation (e.g., the difference between urban and rural environments). (3) Conventional acoustic studies rarely control for all the relevant variables and often may not be able to, simply because (a) there are too few households in a given population (within the approximately ½ to 1 mile sound range of a turbine) to create statistically significant comparisons;(b) micro-meteorological phenomena, such as thermal inversions and wind shear, which promote sound travel at ground level, are inconstant; and (c) geographic variables like elevation differences, land contours, and vegetation are hard to control. The optimal acoustic variable for wind-turbine studies probably varies directly with pulse intensity and inversely with background noise intensity. A corollary of this set of observations is that the conventional legal limits on ambient nocturnal sound in residential areas, generally in the 40-50 dBA (time-averaged) range, do not accurately predict the ability of wind-turbine sound to disrupt sleep.

Of particular value is the discussion on p.10 of **Cummings 2009** of so-called "annoyance curves", empirical psychophysical estimates of listener sensitivity to various noise sources as a function of noise intensity in dBA. The following discussion is based on Cummings's reproduction of a published annoyance curve comparing human sensitivity to sound from four sources: wind turbines, aircraft, trains, and highways. Because wind-farm proponents often compare wind turbines to other common sources of ambient noise, these curves are especially instructive. The data show unambiguously that daytime aversion to wind turbines becomes significant at approximately half the time-averaged dBA generating a reaction to the other three stimuli. This finding alone suffices to invalidate any simple time-averaged, source-independent, noise threshold, such as 50 dBA, as a criterion for controlling wind-turbine sound pollution or preventing insomnia. The basis for the difference probably is simple and more mathematical than acoustic: time-averaged dBA understates the perceived sound intensity in amplitude modulation (because the latter, the most likely aversive stimulus, concentrates the sound energy into just a fraction of the time domain). Another telling feature of annoyance curves is that they are concave-upward; the percentage of responders to a sound source rises at an increasing rate, with no sign of leveling off, as noise intensity increases. For wind-turbine sound in the study discussed by Cummings, 35% of the subjects reported annoyance at the maximum sound level, which was completely below the dBA range of traffic, aircraft, or railroad noise causing annoyance. This effect rules out a common position of wind-farm proponents: that the folks seriously disturbed by wind-turbine noise are a small, emotionally disturbed or politically motivated, fraction of the population. A more reasonable interpretation is that humans, being highly diverse biologically, show a wide, probably normally distributed, range of sensitivity to aversive sound.

It would not add much for me to give a more detailed summary or interpretation of **Cummings 2009**, because the original discussion is so clear. Especially valuable are brief critical discussions of the relevant publications, fully cited, which appeared in 2009. This bibliography allows one to access the original reports and form one's own interpretations. One of the report's few forays into social policy deserves brief comment. As wind energy proliferates, society is left with the need to make a difficult policy decision: how much individual annoyance and harm to tolerate in the name of social goods like energy independence and global warming reduction? What Cummings does not mention is that with respect to other kinds of pollution, especially air pollution, the general public position has been (somewhat imperfectly) to respect the needs of society's most vulnerable (e.g., asthmatics, the immuno-compromised, infants, and the elderly). Environmental regulation is not scaled to the vulnerability of the average inhabitant.

(2) Times Online #3 reports on recent local political conflicts over wind-farm sound pollution. It focuses on the widely publicized experience of Vinalhaven, ME, but mentions similar conflicts in DeKalb County, IL and elsewhere, including a case in Rennes, France, where a court ordered wind-turbines to be idled from 10PM to 7AM in order to minimize sleep disturbance. The worst aspect of the Vinalhaven case (like similar ones elsewhere) is the degree to which it has shredded comity in a formerly tight-knit community. Here as elsewhere, wind-farm opponents consist almost entirely of former proponents who were unpleasantly surprised when, contrary to developer promises, turbine noise turned out to be not only significant, but practically intolerable. Richard James, of the consulting firm E-Coustic Solutions, suggested a simple way to minimize such conflicts: keep wind turbines at least 2 km away from residences. Wind developers prefer siting criteria based on measured noise levels, but that is likely to be a less reliable and less conservative approach as long as acoustic analysis has the problems I described above.

(3) Times Online #1 reports the outcome of state review of the Vinalhaven conflict: a Maine Department of Environmental Protection order that the site developer do whatever is necessary to bring the wind farm into legal compliance with night-time noise limits. The state order identifies a micro-meteorological phenomenon, nocturnal wind shear, as the likely cause of project noncompliance. Not addressed in the article is the probability that legal compliance with a (time-averaged) 45 dBA night-time maximum noise standard will not eliminate the adverse effects. Daytime noise also appears to be aversive to many neighbors, given the low background noise levels in this remote island setting. This probably is a case where the spatial constraints of island living resulted in construction too close to residences.

(4) Times Online ##5&6 describe an ongoing wind-turbine noise conflict much closer to home, in Ione, OR. It has some idiosyncratic features: the de-funding of the Oregon state agency responsible for enforcing state noise ordinances leaves local government responsible for enforcement. The developer of this 900 MW project is worried enough to offer opponents each $5000 to shut up.

(5) Times Online #7 illustrates the power of an uncritical reading and a misleading headline. It reports on a study of alleged health impacts of wind turbine noise (**Colby *et al.*, Wind Turbine Sound and Health Effects: An Expert Panel Review**). The fact that the study, really a literature review and analysis, was commissioned by two leading wind-energy business associations is reason enough to suspect editorial, if not scientific, bias. **Cummings 2009** (p.13) offers a brief but devastating critique, references a much more detailed analysis at the Acoustic Ecology Institute website, **and gives the web address of the full study**. One should study the original full study report before drawing or accepting any conclusions from it.

Colby is an exercise in the straw-dog strategy. It focuses on discounting the hypothetical Wind Turbine Syndrome and the alleged health significance of low-frequency sound, notions which have received little attention so far from rigorous clinical researchers. It almost ignores sleep deprivation, a well documented and easily understood phenomenon which can have devastating health effects. Although none of the three MD's, three PhD's, and one MSc among the authors is a psychiatrist or clinical psychologist, the most important single conclusion is a mental-health one: that annoyance by wind-turbine sounds is all in your head, a psychosomatic condition arising from prior bias against wind power, adverse publicity re. wind power, a self-fulfilling fear of harm, or some other kind of irrationality.

Some of **Colby's** conclusions and recommendations betray underlying bias: a factually false allegation that wind-turbine noise does not differ from ambient noise in general (despite the study's clear description of amplitude modulation); a focus on time-averaged noise levels rather than sound pulses; a failure to acknowledge that ambient noise context (e.g., urban vs. rural) has an effect on sound-pulse sensation; and an amazing final recommendation that no further research into wind-turbine noise effects on human health is needed. Although the study cites the literature on empirical annoyance curves [see above], it fails to make the connection that these dose-response curves show that humans must be more sensitive to the pulsing turbine sound than to the more continuous and random noise from the other three sources. A possible reason for this oversight is that annoyance is dismissed as "subjective" and medically unimportant. The authors also fail to recognize that the existence of a concave-upward dose-response curve is inconsistent with their notion that adverse reactions to wind-turbine noise concern only a small population of emotionally disturbed individuals.

Colby mentions sleep disruption in three places. On p.3-13, it cites a US EPA standard threshold for time-averaged ambient noise, thought to suffice for avoiding sleep disruption, averaging 45dBA in the day and 35 dBA at night). Interestingly, an adjacent paragraph describes dripping faucets as a source of annoyance (but not sleep deprivation), failing to note that a dripping faucet can disrupt sleep effectively at low sound intensity or that wind-turbines and the dripping faucets produce sounds with mathematically similar time profiles. On p.4-2, the report acknowledges that wind-turbine sound pulses are the source of most auditory annoyance, but claims that these are rare cases. On p.4-3, the study goes so far as to admit that "the main health effect of noise stress is disturbed sleep, which may lead to other consequences", implying, however, that only a few sensitive people are likely to suffer this outcome. These brief statements contain all the pieces for putting together a factually and theoretically sound understanding of wind-turbine sound pollution, but making the connections would have required the authors of **Colby** to reach a conclusion their sponsors would not accept. Key issues which the panel does not address objectively are (a) the fraction of the population showing this sensitivity [the annoyance-curve literature suggests that this fraction should depend on pulse intensity], and (b) the vulnerability of populations society tends to protect, such as the elderly and the infirm.

(6) Times Online #9 provides another classic example of a misleading headline and uncritical reading. It reports on (and accepts uncritically) a large-scale study (**Hoen *et al*,, The Impact of Wind Power Projects on Residential Property Values in the United States: A Multi-Site Hedonic Analysis)** of the effect of wind farms on approximately 5000 residential home sales as far away from the sites as 5 miles; properties farther away than 5 miles constituted a reference group for some of the comparisons. The DEIS cites this report on p.3-258. **Hoen** concluded that property values showed no statistically significant dependence on proximity to wind farms. This is a logically complex study containing multiple statistical comparisons, the main point of which was not just to see if proximity to wind farms reduces property values, but to try to tease out contributions of various subjective factors, like view degradation and nuisance (e.g., noise), to any property-value loss.

Cummings 2009 (p.15) critiques **Hoen** and **gives the web address of the entire report**, pointing out that the study authors themselves thought that further concentration on home sales within a half mile of the wind farms might deliver statistically significant nuisance effects. Given its statistical and logical complexity, it is unwise to interpret or cite **Hoen** without examining the entire original document. Even then, I challenge the methodologically sophisticated reader to come up with confident conclusions. Such a study faces a daunting array of design challenges, some of which may be intrinsic and insuperable. Basically, one is driven to aggregate data from large numbers of sites, multiple contexts, and multiple time frames in order to create sample sizes large enough for robust statistical analysis. However, such aggregation can end up drowning real effects in the statistical noise from irrelevant data, mooting the rationale for the original aggregation. Conventional statistical analysis assumes that all the data are drawn from a few normally distributed populations, but the site aggregates may be far from normally distributed. The simplest way to minimize this problem is to subdivide the data into groupings chosen to isolate the most likely independent variables, but such subdivision often reduces sample size to the point that normal variability masks any trends in the data.

Hoen provides an impressively detailed account of the massive information collected on a large and diverse study population. The 10 residential areas studied (impinged by 24 wind farms), distributed over 10 states in almost every sector of the country, occupied geography ranging from open plains to rolling hills to ridgelines, with population densities ranging from sparse rural to suburban. Site size ranged from 7 to 582 turbines (median = 45), but the larger site sizes are misleading because they aggregate multiple wind farms distributed around extended communities. The report does not allow a confident conclusion with regard to the range of wind-turbine numbers experienced by the homes, but it probably is about 7 to 100 turbines per home. One site included no home sales within a mile of a turbine, and two sites had 30-35 homes within that radius. Another hidden variable is sale price, which ranged from $10,000 (an arbitrary lower bound) to over $600,000. For all its effort to build a large population to enable valid statistical analysis, **Hoen** really deals with a geographically and economically diverse set of real-estate markets, with no effort (or ability) to control for comparable value, purchaser socioeconomics [beggars cannot be choosers], or context.

Hoen accepted sales data in the time range of about two years before wind farm construction announcement to about four years after construction completion, recognizing that the sale date relative to other developments might be an important independent variable. However its inconsistent effort to resolve temporal effects may provide the most telling indictment of the study as a whole. Figure ES-4 (p.xvi of the report) displays a mysterious depression of home sale prices within 1 mile of a wind farm for every time frame from over 2 years pre-announcement to 2 years post-construction relative to home sales more than 5 miles distant in the time frame of 2 or more years before construction. The strange part of this result is the inference that home buyers close to a future wind farm knew about the pending development even 2 or more years prior to its announcement with enough confidence to discount property value by about 15% on an average. Another explanation makes more sense; wind turbines may tend to be erected on land which previously was so remote or otherwise undesirable as to command lower land prices, such that nearby home-sites were preferred by lower-income people, building cheaper homes. This is the sort of confound which can arise when data are not controlled for differences in property value: erroneous assumption of uniform socioeconomic distribution. **It also seems quite likely that by being heavily weighted toward home sales relatively close to the time of wind-farm construction, the study missed the real property-value action because it takes more than a few years for the market to recognize how serious a nuisance is, especially given that human sensitivity to nuisances like wind-turbine sound is quite variable.** Thanks to human diversity, property value probably is a very insensitive indicator of the nuisance factor.

Impact on Scenery

The evaluation of Scenic Resources degradation by the proposed wind farm in my 8/27/10 Comments focused on two issues, (a) the arbitrariness and pseudo-scientific nature of the DEIS effort to objectify project impact on viewers and (b) the importance of three mechanisms in visual cognition which necessarily will enhance viewer impact over anything that can be predicted from two-dimensional view simulations. The latter topic was largely New Matter, touched on only briefly by the other commenters. My oral discussion of the cognitive issues with other people in the intervening months suggests that the general public, perhaps including members of the WEFSEC, simply does not recognize or understand some basic phenomena which are well known to professional cognitive scientists, mostly academics. Therefore, the present comments focus on this second topic.

Issues in Visual Cognition: Mind vs. Camera

Practically everyone has experienced the "moon illusion", the sensation that a full moon near but above the horizon looms especially large, much larger than the same moon looks when it is high in the sky. A significant subset of us will have tried to catch the huge "harvest moon" photographically, only to be disappointed because in the photograph it appears of quite ordinary size, even rather small. This is a perfect example of tricks the mind plays, a visual illusion – and of how photographic representations can fail to meet mental expectations. Some assume, erroneously, that the effect of position in the sky on the apparent size of a distant object is the physical result of refraction by the atmosphere – that light from the object travels through a thicker layer of air when the object is close to the horizon. Several observations show why this effect is not part of the moon illusion. (1) Atmospheric refraction would distort the object's shape – not seen as long as the moon is significantly above the horizon. Lensing often is seen as the sun or moon pass into or out of the horizon, but that is not the mental enlargement involved in the moon illusion. (2) A photograph would capture any effect of refraction. (3) You can create your own version of the moon illusion if you have a view of a mountain, such as Mt. Hood or Mt. Ranier, from a window. As you walk backwards from the view, such that the mountain increasingly fills the window, you will feel that the mountain is growing larger; the laws of perspective qualitatively would predict the opposite, though at the distances involved, the perspective effect would be mathematically negligible. In this case, the mind tricks itself into considering the window frame to be the horizon. Atmospheric refraction cannot be an issue because the mountain is not nearly as far away as the moon.

Some people might consider the moon illusion to be "subjective", something generated by the mind and therefore highly variable among viewers. Yes, it is a mental artifact; but no, it does not vary significantly among viewers; and people do not habituate to it. It does not lessen with experience. The moon illusion is objective, in the sense that a cognitive psychologist can do experiments to show that everyone has about the same experience, even in a quantitative sense. A simple version of such an experiment applied to wind-tower visual impact would use the technical tools which generated the controversial view simulations of the DEIS Section 3.9, only several versions of each view would be created using wind-tower simulations of varying size. Then human viewers at the corresponding viewpoint would be asked to compare the pictures with the view and select the picture which seems to match reality the best.

The attraction to motion experienced by the mental machinery processing vision also is "subjective" in the sense that the mind unconsciously homes in on minor evidence of motion against a complex and much larger static background, but everyone with normal sight has this experience. Your attention is drawn to the moving object, even if its share of the visual field is quite small. A commonplace example: most people rapidly will detect a deer moving against a camouflaging background some distance away under low illumination. First you sense the motion, often in a corner or edge of the visual field; then your mind focuses attention on the movement; finally your image-recognition circuits identify the moving object as a deer, often as much from the scale and rhythm of the motion as from the actual shape seen. This is another example of a mental phenomenon which everyone experiences, and to a similar degree. At several places in Sections 3.9.1.3 and 3.9.3.1, the DEIS view analysis low-ranks the viewer impact of turbines which are partly or largely obscured by foreground or are far from the viewpoint [see, for example, the discussions of Viewpoints 11, 12, 13, 17, and 19]. What the analysis fails to recognize is that the mind will direct attention to moving turbine blades even if they are not completely in view or visually dominant in the conventional sense of static view analysis. Furthermore, a competition for mental attention is set up between the marvelous scenery and the moving object, in this case enhanced by both the color contrast between the towers and the background and the silhouetting of the turbines along a ridgeline. Because visual sensitivity to motion is strongest at the edge of the visual field, rotating turbines can attract visual attention even when you are concentrating on nearby scenery. You might want to focus on the scenery, but the mind keeps trying to draw attention back to the movement. Now Gorge viewing already experiences visual distraction caused by moving trains, towboats and highway traffic in the distance; but that does not justify adding another source of distraction, especially one which offers such small economic benefit. Furthermore, trains, towboats and traffic are not silhouetted and do not approach 400 ft in height. In fact, the immense scale discrepancy between distant transportation machinery and Gorge landforms, plus the fact that the machinery generally is located at the bottom of any view, may enhance our appreciation of the latter. The peaks, ridges, and bluffs make even a mile-long train seem tiny.

The elevated location and large scale of the Whistling Ridge wind towers are unlikely to result in diminished visual impact.

Finally, there is the issue of wind-tower silhouetting to create large irregularities in a generally smooth ridgeline, where the 400 ft scale of visual line interruption dwarfs the profile complications of clear-cuts and high-tension power towers. The cognitive issue goes well beyond the evidence for profile interruption revealed in photographic simulation or manipulated by view choice. The point I'm trying to make that the mind directs visual attention toward profile interruptions, the same way it attracts your tongue to explore the hole in the tooth-line after an extraction. Again, a mental competition is set up for visual attention, distracting the viewer from the scenery.

Section 3.9 of the DEIS bends over backwards to find no significant degradation of Gorge scenic resources, relying on photographic view simulations (and their interpretations) which landscape architects have found deficient. My points about visual cognition lead to the following conclusion: even unbiased view simulation would significantly understate the actual visual impact because it ignores mental processing of the perceived image. For many of the views analyzed, plus others which might have received attention in an unbiased treatment, the cognitive effects might upgrade visual impact from low to moderate or moderate to high. Because, at the end of the day, the scenic cost of installing wind towers at the very edge of the central Gorge depends on the reactions of viewers, not cameras, the DEIS treatment of scenic resources will be technically and legally deficient until cognitive issues receive a full airing.

I do want to raise here three issues regarding the view simulations and their evaluation.

Population Size vs. Population Density

A major element of the DEIS choice of viewpoints to analyze appears to be the population density of candidate locations. For example, views from highways are preferred over views from hiking trails, residential streets, residences, or the interiors of other structures because the traffic on the former is expected to expose more people to wind-farm observation. As a practical matter for the purpose of view choice and analysis logistics, this approach might seem reasonable. However, with respect to the logic and mathematics of scenery degradation, what counts is the total number of people exposed, not their density. The location of the wind farm almost directly across the river from a metropolitan area guarantees that a lot of people will be exposed, all day every day, weather permitting, to views of the wind towers, even if their population density often is well below that of a busy highway. Interestingly, the DEIS bias in favor of highway views creates a Catch-22 in visual-impact estimation. It was assumed arbitrarily that the fact that a viewer is moving in a vehicle reduces the visual effect of what she sees from the windows. That assumption does not square with the experience of me, my wife, or many of our friends. Every time we drive toward or through the land-form gate presented by Underwood Mt. and Mt. Defiance, our hearts are lifted by the combined visual effects of river, ridges, foliage (in season), and sky. So if highway viewing increases impact because of population density but decreases impact because of viewer preoccupation with travel, maybe there is no reason to bias scene selection in favor of highway viewpoints. Maybe it is more important to sample more completely all the population whose views will be affected than to focus on the highway-traveling population.

Now one might be able to devise an algorithm, coupled with another handful of view simulations, which allows estimation of visual impact on a large area of low-density viewers, e.g., in Hood River and along the river's view corridors. However, an intellectually more honest approach would be to stop trying to achieve quantitative objectivity by photographic view analysis. The method just is unable to achieve consensus on whether a given visual impact is low, moderate, high, or somewhere in between, and the arguments over what views are important are interminable and unresolvable. DEIS authors/editors always can resort to the riposte, "it's subjective", to justify their choices and discount critics'. What the photographic methodology is able to do is show the potential for view impact and the areal extent of the impact. It is valuable to know that the towers would be out of sight from Dog Mountain and much of the central Gorge, and equally valuable to know whether many residents, shoppers, workers, and vacationers in Hood River would see the structures, many of them on many days of the year (as opposed to transiently or one-time on rare road trips through the Gorge).

Viewing Frequency or Duration

Time is a usually hidden variable in the discussion of visual impact. The DEIS justifies downgrading highway views because of the putative transience of the visual experience (without suggesting a temporal threshold between a discountable transient experience and a quality viewing time). It justifies excluding views from relatively low-density locations, ignoring the fact that for the residents, these are likely be long-duration viewings, repeated day after day. Failure to fold time more consistently into view selection and impact estimation is just one more fatal flaw in the Scenic Resource section of the DEIS, contributing to the "heads I win, tails you lose" tone of the entire document.

Benefit/Cost vs. Benefit/Risk

We often lump together these two criteria for decision-making, but they really entail a subtle but crucial distinction. Should the WEFSEC compare the putative economic benefits of Whistling Ridge to confidently quantifiable costs, or should it prioritize risk, the likelihood of a cost, over cost itself? I would argue that the greater the uncertainty of the outcome, the longer the potential duration of negative impacts, or the more severe their potential alteration of present conditions, the greater the obligation of decision-makers to look at risk. The evaluation of the visual impact scores provides a perfect opportunity to apply this principle. Wind-farm proponents and the DEIS authors/editors appear to place great significance on the fact that the wind towers in many of the views analyzed (4 of the 12) were found to have low-to-moderate or moderate-to-low impact. In my book, this terminology implies that there is a risk that the impact could be moderate. It also implies that a cost cannot be evaluated; the uncertainty is too great. If you accept the position that this is a situation where risk trumps cost, you should evaluate these impacts as moderate. When most viewpoints experience a risk of at least moderate impact, it adds up to serious modification of a view-shed recognized around the world to be exceptional.

Who's In Charge?

In the simplest possible terms, controversial siting decisions require a comparison of project benefits and costs/risks to assess the balance between them. Given the written and oral testimony before the WEFSEC, a siting decision on Whistling Ridge clearly requires the resolution of controversy. My, and I've always assumed everyone's, expectation of an EIS has been that it would try to describe benefits and costs/risks as objectively as possible. However, the present DEIS does not fit that image. The description of economic benefits is unqualified, and the DEIS seems to find that there simply are no significant costs or risks. This outcome is a bureaucrat's dream. If there are no costs or risks, benefit/cost and benefit/risk become infinite, regardless the magnitude of the benefit. Therefore there is no need to evaluate benefit completely or accurate. How can so many people (the hundreds of project opponents sufficiently motivated to address the WEFSEC), including experts in the relevant fields, have been so wrong?

Following are some of the instances where the DEIS authors/editors appear to have hung up their critical caps or deliberately slanted the presentation.

(1) In the discussion of need for the project (Section 1.2), only the global need for increased green energy production in the Northwest was addressed. No effort appears to have been made to discover how much wind generation already was in the pipeline or to consider the possibility that there could be too much wind-power capacity. The first task just requires a little data collection; the latter requires some comparative judgment. This sort of superficiality might be expected in a local newspaper op-ed piece, but hardly in an instrument of the state agency responsible for managing the state's contribution to the region's energy supply. To be fair, the NPCC's report on excess wind-power capacity just came out, about a year after drafting of the EIS; but the information about energy supply is so accessible on the Web that even an amateur like the commenter can dig it up in just a day's work. The NPCC has been sweating the problem of balancing inconstant green power sources like wind and hydro for quite a while. This issue alone should raise a flag that there might be such a thing as too much wind power. In addition, the authors/editors of DEIS Section 1.2 saw no need to compare the scale of the proposed project to the scale of Northwest power supply and demand, an action crucial to forming a judgment about whether the economic benefits justify the environmental costs/risks. This inertia contrasts starkly with the willingness of the authors/editors of Section 3.9 to make evaluative judgments regarding view pollution.

From an adversarial viewpoint, these errors of omission make sense for project supporters and government agencies mandated to grow the regional power supply. From a governance perspective, such inertia sets the stage for a power-market bust, in which wind-power overcapacity combined with environmental mandates preferencing hydro power result in the idling of wind facilities and the depression of power prices to unprofitable levels. Chronic electricity over-supply could shut down many wind farms, probably starting with small projects like this one, and bankrupt many wind-power investors. The fundamental governance failure here is that WEFSEC and BPA are supposed to function as regulators as well as facilitators, but in the present DEIS seem to be filling only the latter role. The WEFSEC and BPA should need no reminder of the nation's last three major failures of government regulation, two of which had to do with energy suppliers (offshore oil platforms and Appalachian coal mines) and one of which nearly created a worldwide economic depression. Perhaps the greatest long-term price of such governance failure is widespread loss of confidence in government institutions, even among people, like myself, inclined to believe in the necessity of government regulation.

(2) In the minds of many local Whistling Ridge supporters, the most important benefits of the project are local jobs and increased tax revenue for financially strapped Skamania Co. These may not be priority issues for the WEFSEC, but they will have a lot to do with the political acceptance of the final siting decision. For that reason alone, getting the numbers right and making the relevant comparisons is important. The polity may embrace a range of political and economic opinions and values, but it should operate from a single set of reliable facts.

Clearly a crucial issue is how many jobs the project will generate in both the short and long runs, but only in comparison to local unemployment numbers. The authors/editors of DEIS Section 3.13 provided the basic unemployment figures, ignoring structural unemployment; but they failed to compare them to Whistling Ridge job estimates. Omission of this final task allows project proponents to guard their mythology about job creation; the polity as a whole is not encouraged to make another benefit-to-cost/risk comparison; and the WEFSEC is spared the need to perform that comparison. The DEIS also allowed the project developer to blur the permanent job projection to the point of uninterpretability, distorted the permanent job projection in its cumulative impact analysis, and failed to present employment results for other, nearby, wind projects – numbers which provide powerful benchmarks for evaluating developer candor. Here, as always, the distortion favored the case for the project.

The DEIS summarizes, unclearly and inaccurately, the various components of local tax revenue which would be affected by Whistling Ridge. No attempt was made to summarize all of the tax components. The estimated increase in County property-tax revenue attributable to the project was inflated by confusing total revenue with the County's share of it. The County budget was shrunken (by almost 2/3) by showing only the portion due to the current expense fund. The treatment fails to compare the revenue increase to the budget in order to highlight the significance of the former, and the disinformation it contains would result in an inaccurate perception (favoring the project) by any reader motivated to perform the comparison on his own.

Here as with the DEIS treatment of project need, the passive approach to crucial (perhaps THE crucial) comparisons contrasts strongly with the aggressively benign evaluation of costs/risks in Section 3.9, concerning view pollution.

(3) It may seem unfair to fault the acoustic analysis of wind-farm noise impact for narrow vision. Shifting acoustic engineers' attention from time-averaged noise to amplitude modulation is going to take time, effort, and probably more successful efforts to limit wind-farm operation in order to protect neighbors' sleep (because project developers underestimated noise impacts). The DEIS is not responsible for the inadequacy of state and federal permissible noise thresholds. However, Section 3.7 of the DEIS can be faulted for over-simplification – for failing to emphasize the limitations to acoustic prediction in the complex geographic and micro-meteorological setting, or the extreme unpredictability of sound from a large number of turbines experiencing variable wind directions and velocities, angular velocities, and rotational phase relationships. There is not even any mention of the fact that the attenuation of noise over distance differs mathematically for linear turbine arrays relative to single turbines, depending on the orientation of the listener relative to the array axis. The DEIS would lead one to believe that there are no acoustic uncertainties. Such confidence does not even make legal sense. What if something in the optimistic prediction is terribly wrong?

(4) The widely criticized one-sidedness at every stage in the view analysis, from viewpoint selection to impact scoring to score interpretation hardly requires further elaboration. Apparently experts in the field even find deficiencies in the photographic technology, such as choice of focal length. In my mind, the worst failure of critical judgment was to omit any discussion of how the degree of visual impact, convoluted with the number of viewpoints showing given degrees of impact, should affect decision about what represents unacceptable impact. The authors'/editors' judgment is made clear in the last sentence on DEIS p. 3-176:" The visual impact analysis showed that the project had potential to create low to moderate

levels of visual impact." A more accurate reading of Table 3.9-2 would be the following. "The visual impact analysis showed that the project has the potential to create low to high visual impact. Seven of the 13 views analyzed were predicted to experience at least moderate visual impact, and the impact at another 4 sites might reach the level of moderate. It should be recognized that the sites selected represent such a small fraction of the view-shed exposed to wind-turbine views that these results are only suggestive and not at all determinative."

How can such a critical document end up being so uncritical? Who's in charge? Once the DEIS morphs into a final EIS, the buck clearly stops at the desks of the appointed WEFSEC members, although the fact that there are so many bosses means that there is no boss. For now, responsibility for the DEIS is dispersed over two WEFSEC staffers, three BPA staffers, and 30 staff in 7 different consulting companies. Although this diversity complicates the evaluation of influence over the final product, the authorial (as opposed to editorial) responsibility picture seems simple for three of the classes of environmental impact which have concerned me most. Single individuals appear to have been responsible for socioeconomic analysis (Carroz), view simulation (Watson), and acoustic analysis (Storm). Such simplicity lies in stark contrast to the situation for the biological sections of the report, which appears to have required an army of specialists.

I have no direct experience with the organizational and political dimensions of assembling a DEIS as complex as this one, but a professional lifetime doing academic and industrial science has yielded one relevant perception. When a major task is assigned to a single individual instead of a team, the product usually suffers from a lack of discussion and debate benefiting from a diversity of viewpoints. Individuals are less likely than teams to experience self-correction.

The preceding observation is about as charitable a comment as I can muster about this DEIS. A much darker interpretation would be that the uniformity with which document errors and biases favor project development cannot have arisen by chance.