Scoping Comment
224

Talburt, Tammy (CTED)

From: Barbara Tombleson [redacted]@coho.net]
Sent: Friday, May 15, 2009 5:08 PM
To: CTED EFSEC
Subject: Concern about Whistling Ridge

Allen Fiksdal
Manager, Energy Facility Site Evaluation Council PO Box 43172
905 Plum Street SE
Olympia , 98504-3172

Dear Mr. Fiksdal, ,

I am writing to comment on the proposed Whistling Ridge Energy Project in Skamania County, Washington.

The proposed project would cause significant negative impacts to sensitive wildlife and plant habitat and would degrade the outstanding scenic beauty of the Columbia River Gorge National Scenic Area.

The Whistling Ridge proposal includes more than 80 wind turbines in two counties, yet the application filed with EFSEC discusses only 50 turbines in Skamania County. The EIS must review the cumulative environmental impacts of all portions of the project, including both the Skamania Co. and Klickitat Co. portions.

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Finally, the proposed project would be located partially within the Columbia River Gorge National Scenic Area. Specifically, the applicant proposes to construct, expand, and improve more than two miles of roads within the National Scenic Area in order to haul industrial materials with gross vehicle weights of up to 53 tons. This proposal to construct and use Scenic Area lands for industrial purposes is prohibited by the National Scenic Area Act and Management Plan, and must be denied.

I support renewable energy, but I am opposed to industrial-scale wind energy development within or adjacent to the Columbia River Gorge National Scenic Area, a designated national scenic treasure.

Barbara Tombleson
[redacted]
Portland, OR 97219

Scoping Comment
225

Talburt, Tammy (CTED)

From: Lauren Miller [redacted]@gmail.com]
Sent: Friday, May 15, 2009 5:24 PM
To: CTED EFSEC
Subject: Concern about Whistling Ridge

Allen Fiksdal
Manager, Energy Facility Site Evaluation Council PO Box 43172
905 Plum Street SE
Olympia , 98504-3172

Dear Mr. Fiksdal, ,

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I support renewable energy, but I am opposed to industrial-scale wind energy development within or adjacent to the Columbia River Gorge National Scenic Area, a designated national scenic treasure.

Lauren Miller
[redacted]
Eugene, OR 97401

Scoping Comment # 226

Talburt, Tammy (CTED)

From: Donna Mooney [redacted]@yahoo.com]
Sent: Friday, May 15, 2009 5:26 PM
To: CTED EFSEC
Subject: Concern about Whistling Ridge

Allen Fiksdal
Manager, Energy Facility Site Evaluation Council PO Box 43172
905 Plum Street SE
Olympia , 98504-3172

Dear Mr. Fiksdal, ,

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I support renewable energy, but I am opposed to industrial-scale wind energy development within or adjacent to the Columbia River Gorge National Scenic Area, a designated national scenic treasure.

Donna Mooney
[redacted]
Troutdale, OR 97060

Scoping Comment
227

Talburt, Tammy (CTED)

From: Cliff Snell [redacted]@comcast.net]
Sent: Friday, May 15, 2009 5:31 PM
To: CTED EFSEC
Subject: Concern about Whistling Ridge

Allen Fiksdal
Manager, Energy Facility Site Evaluation Council PO Box 43172
905 Plum Street SE
Olympia , 98504-3172

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I support renewable energy, but I am opposed to industrial-scale wind energy development within or adjacent to the Columbia River Gorge National Scenic Area, a designated national scenic treasure.

Cliff Snell
[redacted]
Vancouver, WA 98683

Scoping Comment
228

Talburt, Tammy (CTED)

From: Cliff Snell [redacted]@comcast.net]
Sent: Friday, May 15, 2009 5:31 PM
To: CTED EFSEC
Subject: Concern about Whistling Ridge

Allen Fiksdal
Manager, Energy Facility Site Evaluation Council PO Box 43172
905 Plum Street SE
Olympia , 98504-3172

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I support renewable energy, but I am opposed to industrial-scale wind energy development within or adjacent to the Columbia River Gorge National Scenic Area, a designated national scenic treasure.

Cliff Snell
[redacted]
Vancouver, WA 98683

Scoping Comment
229

Talburt, Tammy (CTED)

From: Nancy Platner [redacted]@gorge.net]
Sent: Friday, May 15, 2009 5:44 PM
To: CTED EFSEC
Subject: Concern about Whistling Ridge

Allen Fiksdal
Manager, Energy Facility Site Evaluation Council PO Box 43172
905 Plum Street SE
Olympia , 98504-3172

Dear Mr. Fiksdal, ,

I am writing to comment on the proposed Whistling Ridge Energy Project in Skamania County, Washington.

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I support renewable energy, but I am opposed to industrial-scale wind energy development within or adjacent to the Columbia River Gorge National Scenic Area, a designated national scenic treasure.

Nancy Platner
[redacted]
Hood River, OR 97031

541-386-[redacted]

Scoping Comment
230

Talburt, Tammy (CTED)

From: sherry meier [redacted]@hotmail.com]
Sent: Friday, May 15, 2009 6:04 PM
To: CTED EFSEC
Subject: Concern about Whistling Ridge

Allen Fiksdal
Manager, Energy Facility Site Evaluation Council PO Box 43172
905 Plum Street SE
Olympia , 98504-3172

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sherry meier
[redacted]
hood river, OR 9701

NF

Scoping Comment
231

Talburt, Tammy (CTED)

From: Sue Layton [redacted]@aol.com]
Sent: Friday, May 15, 2009 6:21 PM
To: CTED EFSEC
Subject: Concerns I Have

Allen Fiksdal
Manager, Energy Facility Site Evaluation Council PO Box 43172
905 Plum Street SE
Olympia , 98504-3172

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Sue Layton
[redacted]
Fairview, OR 97024

503-618-[redacted]

Scoping Comment # 232

Talburt, Tammy (CTED)

From: Keith Brown [redacted]@teleport.com]
Sent: Friday, May 15, 2009 6:35 PM
To: CTED EFSEC
Subject: Re: Comment on Whistling Ridge Energy EIS scope
Attachments: EFSEC testimony.smaller.5-6-09; ATT2988828.htm; mcmurtry-deputation-to-standing-committee.pdf; ATT2988829.htm; Mars Hill Nissenbaum.pdf; ATT2988830.htm; MAINE MEDICAL STAFF NEWS RELEASE.doc; ATT2988831.htm

Hello Monica...

We provided hard copy of our first comment letter and the three listed attachments to Tammy during the May 6, 2009 public hearing in Stevenson. We're a little confused as to what it is that you are missing, as there were only two attachments in the email of May 12th, both of which we included in the U.S.P.S. hard copy mailing. Do you not have the hard copies we provided during the May 6th hearing? In case that is so, we are attaching the first comment and the three attachments we provided. The fourth referenced material was a book written by Dr. Nina Pierpont, on 'Wind Turbine Syndrome'. That is available through her website address that we listed in the first comment letter of May 6th.

We'll will call you on Monday morning, May 18th to confirm all documents have transferred satisfactorily. Thank you for your diligence.

Keith Brown and Teresa Robbins

Scoping Comment
233

Bhavnani, Monica (CTED)

From:	Keith Brown [humansol@teleport.com]
Sent:	Tuesday, May 12, 2009 1:33 PM
To:	CTED EFSEC
Cc:	Marvin, Bruce (ATG)
Subject:	Comment on Whistling Ridge Energy EIS scope
Follow Up Flag:	Follow up
Flag Status:	Green
Attachments:	EFSEC update; ATT2837418.htm; 08-11-02 Kamperman-James Ver 2 1 (Wash. EFSEC Council, Skam.pdf; ATT2837419.htm

Dear Council Members:

Attached is a copy of brief comments to be added to our testimony of May 6, 2009. We have also attached the copyrighted **"How To" Guide to Siting Wind Turbines to Prevent Health Risks from Sound** referenced in that testimony as we recently obtained permission from the authors to provide this specifically for Washington EFSEC use. We are also sending, via US mail, hard copies of both documents. We look forward to EFSEC's full use of this information in the scoping and conduction of the EIS, thereby preventing undue negative impacts.

Respectfully submitted,

Keith Brown, Ph.D.
Teresa Robbins

Energy Facility Site Evaluation Council
905 Plum Street SE
P.O. Box 43172
Olympia, WA 98504-3172

May 6, 2009

Dear Council Members:

Thank you for the opportunity to express our thoughts on three issues which we want to make sure are directly addressed within the scope of the EIS for the proposed Whistling Ridge Energy Project.

First, we have a deep concern about the inappropriate siting of industrial wind turbines in rural residential areas. Specifically, we hope you will ensure that such siting not take away a resident's right to enjoy the peace and tranquility of their homesite, nor more importantly, negatively impact their health and well-being. A number of us have been working diligently, hoping to educate and inspire local government officials to consider adopting appropriate noise/vibration limitations and setbacks in the interest of preventing what would surely become a significant problem.

We've done a fair amount of research and have found "The 'How To' Guide To Siting Wind Turbines To Prevent Health Risks From Sound" (authors: George W. Kamperman and Richard R. James, August 28 2008, at www.savethebluffs.ca/archives/files/kamperman-james-8-26-08-report.pdf to be extremely useful. It provides an ecological and scientifically sound approach, which will minimize the likelihood of detrimental impact when industrial wind turbines are to be sited near people's homes.

As you are undoubtedly aware, the proposed Title 21 Zoning Draft for Skamania County was recently appealed and the hearing examiner issued a decision requiring the county to conduct an EIS.

Quoting from page 22 of the *Findings, Conclusions and Decision* of the *Hearing Examiner for Skamania County* in the matter of the appeals of the Friends of the Columbia Gorge, Save our Scenic Area, Gifford Pinchot Task Force, and Columbia Riverkeeper #SEP-08-35:

..."Washington noise standards are based upon land use classification of both the noise and the noise receiver. When the receiver is a residential property the daytime noise limit ranges from 55 to 60 dBA depending on the classification of the noise source. At night the maximum ranges from 45 to 50 dBA. .... Mr. Richard James, an acoustical engineer, provided **credible testimony that wind turbines generate a type of noise that is not adequately measured by the dBA scale used in the Washington noise standards.** *(emphasis added)* The dBA scale is designed to detect noises audible to humans. Wind turbines generate low-frequency noise

(20Hz or lower) that might cause the body to resonate even if it is not audible. Such effects are measurable on the C-weighted scale (dBC). *Testimony of Mr. James."*

Quoting from page 23 of the same decision:

... "Mr. James recommended a minimum distance of 1.2 miles between turbines and residences, based upon health effects research conducted by Dr. Nina Pierpont. *Testimony of Mr. James."*

We strongly feel the half-mile set back is **insufficient,** especially in areas with canyons, bowls, and mountains, as the terrain will contain, amplify and transmit the sound from the wind turbines greater distances than in typically used flatter terrain. A simplistic sound modeling using but two variables, output and distance, is insufficient in determining likely impact. We request that potential noise (dBA) and low-frequency (dBC) impacts be thoroughly investigated through baseline measurements and computer simulations of worst case conditions for producing sound emissions, such as recommended by Kamperman and James, 2008. This would include ambient sound monitoring on all residential properties within and up to a mile of the project property boundary (pages 26–29). A sophisticated, latest technology, and highly reputable sound propagation model should be utilized in the computer simulations. An Independent Qualified Acoustical Consultant (unbiased third party with no financial or other connection to SDS or related companies) should perform all sound monitoring, simulations and projections. With great earnest, we encourage this be done prior to making decisions regarding appropriate setbacks.

Further, if industrial wind turbines are as "quiet" as represented, setting enhanced noise standards should provide no difficulty for developers to meet...and yet, would make a strong statement illustrating the state's commitment to safeguarding the health of its citizens.

The "How To" Guide referenced above clearly articulates how to go about setting such standards. Simple reliance on the Washington State Environmental Noise Levels, Chapter 173-60 WAC, is not enough. The acoustical experts' "How To" Guide approach is to locate a wind turbine so as to not increase preconstruction/operation background sound levels by more than 5 dBA along the property lines of the receiving non-participating property. And, such that it would not exceed 35 dBA within 100 feet of any occupied structure. (Page 16) Additionally, we refer you to the low-frequency sound limits also depicted on page 16.

Ü

We strongly recommend that the EFSEC become fully informed of the growing documented potential health risks from sound *(find attached "Deputation (by Dr. Robert McMurtry M.D., F.R.C.S (C), F.A.C.S)* to the Standing Committee on General Government Regarding Bill C-150 April 22, 2009 www.wind-watch.org/documents/wp-content/uploads/mcmurtry-deputation-to-standing-committee.pdf), as well as the approach suggested in this "How

To" Guide, by inviting acoustical experts George W. Kamperman and/or Richard R. James to present to the EFSEC and this community, their approach to siting wind turbines in a manner to prevent health risks. This should be completed as part of the EIS.

For your consideration, we have attached a news release (March 4, 2009 www.windaction.org/documents/20306) from the Medical Staff of Northern Maine Medical Center regarding "Health Concerns and the Need for Careful Siting of Wind Turbines". We further reference you to the book *("Wind Turbine Syndrome A Report on a Natural Experiment" published by K-Selected Books)* and work of New York physician Nina Pierpont M.D., Ph.D. at www.windturbinesyndrome.com.

Our **second** area of concern relates to protecting the incredible scenic beauty of the Columbia River Gorge. This area is a local and national treasure. We feel the Whistling Ridge project, as proposed, could have a profoundly detrimental effect on the truly unique and exceptional scenic and recreational resources wisely preserved and protected for the enjoyment of all through the Columbia Gorge National Scenic Area Act. 426 foot-tall wind turbines lining the scenic area would surely denigrate the scenic experience and we feel certain, was not remotely foreseen when determining the scenic area boundaries and thus, would undermine the intent of the Act.

As clearly articulated in the above-mentioned hearing examiner's finding:

...“Landscape aesthetics have measurable, objective standards. It is possible to map aesthetically sensitive areas and use such information when making zoning decisions." (Page 16)

"Based on geographic information system (GIS) mapping prepared by a consultant with significant prior experience with the National Scenic Area... 415 foot tall wind turbines in the southeast portion of Skamania county, but outside the National Scenic Area, would be visible to a 6 foot tall observer from Cook- Underwood Road within the National Scenic Area and from Interstate 84 (I-84) on the Oregon side of the gorge." (Page 17)

"A viewshed analysis was prepared specifically for the Saddleback project... The turbines would be visible for several miles and would be particularly visible from areas to the west and north of the project and from the south side of the Columbia River Gorge (I-84 and environs). Views from Cook-Underwood Road would also be affected." (Page 18)

We ask that the scope of the EIS include a thorough assessment of the aesthetic impact of the proposed placement of wind turbines within the Whistling Ridge project, so that appropriate mitigation measures in said placement can be required.

Thirdly, the scope of the EIS for the Whistling Ridge Project must necessarily

(via SEPA requirements) include considering SDS's proposed lease of four common school trust parcels on adjacent DNR land in western Klickitat County for the purpose of wind power development.† This would be essentially an extension of SDS Timber Company's†proposed†Whistling Ridge Project (formerly known as Saddleback), which currently plans to locate 50 wind turbines on private land in eastern Skamania County.† Therefore, leasing of the school trust parcels would essentially create one large project with 92 proposed turbines.† The EFSEC EIS scope and analysis needs to consider the impact of the entire project fully built out with wind turbines (of which the trust lands would be a part), as opposed to considering individual parts or phases separately.††

As DNR indicated on page 13 of the SEPA checklist (File no. 90-011302), "The entire area of this proposal is environmentally sensitive". Portions of the proposed lease land are designated as Northern Spotted Owl conservation areas. Additionally, SDS's application indicates other sensitive species such as Western Gray Squirrel and Northern Goshawk "have the potential to occur within the project site".

This proposed project is reportedly the first of its kind in forested habitats in Washington. This begs the need for intelligent planning, caution and due consideration given the potentially profound impact on watersheds, wildfire risk, bats, avian species, mammals and humans.

Our dream is that Washington State can and will become a leader, a model for the nation, in the development of wind energy that is in harmony with the environment and the health and quality of life of all its residents.

Respectfully submitted,

Keith Brown, Ph.D. and Teresa Robbins
211 Malfait Tracts Rd.
Skamania County
Washougal, WA 98671
(360) 837-2088

(3) Attachments:
Deputation to the Standing Committee on General Government Regarding Bill C-150, April 22,2009...Robert McMurtry M.D.

Presentation to the Maine Medical Association March 2009...Michael Nissembaum M.D.

Health Concerns and the Need for Careful Siting of Wind Turbines…Medical Staff of Northern Maine Medical Center March 4, 2009

Energy Facility Site Evaluation Council
905 Plum Street SE
P.O. Box 43172
Olympia, WA 98504-3172

Re: Whistling Ridge Energy Project

May 11, 2009

Dear Council Members:

This is to expand upon our testimony of May 6th. We have contacted acoustical experts Richard R. James and George W. Kamperman and have received permission to submit specifically for your use, the complete and latest version (2.1) of ***The "How To" Guide to Siting Wind Turbines to Prevent Health Risks from Sound.*** *(See attached)*

In reviewing the SDS application, segment ***4.1.1 NOISE***, and comparing it with the work of Kamperman and James *(pages 26 – 34)*, we find the SDS methodology lacking in important aspects that are recommended by the acoustical experts. For example, in measuring the existing sound environment *(4.1.1.3)* the sound monitoring was not performed at the property line of effected residential properties, rather at road intersections some distance from the residences. Further, dBC data was not reported. Reiterating, we feel it crucial that all ambient sound monitoring, simulation and projection be conducted by an Independent Qualified Acoustical Consultant, and that a highly reputable sound propagation model which takes into account the varied terrain be utilized.

Applying Kamperman and James methodology to even the current SDS application noise data for receiver ID3 (the closest residential property) shows that the noise level would increase from 26 dBA (using the recommended L_{90} , rather than the L_{eq} – *Table 4.1–2*) to 43 dBA during nighttime operation *(Table 4.1–9)* ...**an increase of 17 dBA.** This considerably exceeds (by more than 3 times) the 5 dBA recommended by Kamperman and James in preventing health risks. A 10 dB increase almost always causes adverse community response *(page 14 of "How To" guide).*

Simply using current and possibly outdated industry practices given the mounting evidence of health implications is insufficient in protecting the citizens of our state, and we fear could border on negligence. We'd be comforted, if we knew our state was using the best science available in determining appropriate and safe setback for industrial wind turbines from residential properties.

Thank you so much for your full consideration and efforts on behalf of Washington residents.

Respectfully,

Keith Brown, Ph.D. and Teresa Robbins
211 Malfait Tracts Road, Washougal, WA 98671
(360) 837-2088

Attachment: The "How To" Guide to Siting Wind Turbines to Prevent Health Risks from Sound

October 28, 2008

Version 2.1

THE "HOW TO" GUIDE TO SITING WIND TURBINES TO PREVENT HEALTH RISKS FROM SOUND

By:

George W. Kamperman, P.E., and Richard R. James, INCE

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"A subset of society should not be forced to bear the cost of a benefit for the larger society."[1]

I. Introduction

A new source of community noise is spreading rapidly across the rural U.S. countryside. Industrial-scale wind turbines (WT), a common sight in many European countries, are now actively promoted by federal and state governments in the U.S. as a way to reduce coal-powered electrical generation and global warming. The presence of industrial wind projects is expected to increase dramatically over the next few years, given the tax incentives and other economic and political support currently available for renewable energy projects in the U.S.

As a part of the widespread enthusiasm for renewable energy, state and local governments are promoting "Model Ordinances" for siting industrial wind farms which establish limits for noise and other potential hazards. These are used to determine where wind projects can be located in communities, which are predominantly rural and often extremely quiet during the evening and night. Yet, complaints about noise from residents near existing industrial wind turbine installations are common. This raises serious questions about whether current state and local government siting guidelines for noise are sufficiently protective for people living close to the wind turbine developments. Research is emerging that suggests significant health effects are associated with living too close to modern industrial wind turbines. Research into the computer modeling and other methods used to determine the layout of wind turbine developments, including the distance from nearby residences, is at the same time showing that the output of the models may not accurately predict sound propagation. The models are used to make decisions about how close a turbine can be to a home or other sensitive property. The errors in the predicted sound levels can easily result in inadequate setback distances thus exposing the property owner to noise pollution and potential health risks. Current information suggests the models should not be used for siting decisions unless known errors and tolerances are applied to the results.

Our formal presentation and paper on this topic (*Simple guidelines for siting wind turbines to prevent health risks*) is an abbreviated version of this essay. The formal paper was presented to the Institute of Noise Control Engineers (INCE) at its July Noise-Con 2008 conference in Detroit, MI, A copy of

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[1] George S. Hawkins, Esq., *"One Page Takings Summary: U.S Constitution and Local Land Use,"* Stony Brook-Millstone Watershed Association; *"...nor shall private property be taken for public use, without just compensation."* Fifth Amendment, US Constitution.

the paper is included at the end of this document. The formal paper covered the community noise studies performed in response to complaints, research on health issues related to wind turbine noise, critiques of noise studies performed by consultants working for the wind developer, and research/technical papers on wind turbine sound immissions and related topics. The formal paper also reviewed sound studies conducted by consultants for governments, the wind turbine owner, or the local residents for a number of sites with known health or annoyance problems. The purpose was to determine if a set of simple guidelines using dBA and dBC sound levels can serve as the 'safe' siting guidelines for noise and its effects on communities and people. The papers considered in our review included, but were not limited to, those listed in Tables 1-4 on pages 2 through 4 of the Noise-Con document.

This essay expands upon the Noise-Con paper and includes information to support the findings and recommended criteria. We are proposing very specific, yet reasonably simple to implement and assess criteria for audible and non-audible sound on adjacent properties and also present a sample noise ordinance and the procedures needed for pre-construction sound test, computer model requirements and follow-up tests (including those for assessing compliance).

The purpose of this expanded paper is to outline a rational, evidence-based set of criteria for industrial wind turbine siting in rural communities, using:

1) A review of the European and other wind turbine siting criteria and existing studies of the prevalence of noise problems after construction;
2) Primary review of sound studies done in a variety of locations in response to wind turbine noise complaints (Table 1);
3) Review of publications on health issues for those living in close proximity to wind turbines (Table 2);
4) Review of critiques of pre-construction developer noise impact statements (Table 3); and
5) Review of technical papers on noise propagation and qualities from wind turbines (Table 4).

The Tables are on pages 2-4 of the formal paper. We also cite standard international criteria for community noise levels and allowances for low-frequency noise.

The specific sections are:

1. Introduction (This section)
2. Results of Literature Review and Sound Studies
3. Development of Siting Criteria
4. Proposed Sound Limits
5. How to Include the Recommended Criteria in Local or State Noise Ordinances
6. Elements of a Wind Energy System Licensing Ordinance
7. Measurement Procedures (Appendix to Ordinance)
8. The Noise-Con 2008 paper "Simple guidelines for siting wind turbines to prevent health risks" with revisions not in the paper included in the conference's Proceedings.

The construction of large WT (industrial wind turbines) projects in the U.S. is a relatively recent phenomenon, with most projects built after 2000. Other countries, especially in Europe, have been using wind energy systems (WES) since the early 1990's or earlier. These earlier installations generally used turbines of less than 1 MW capacity with hub heights under 61 m (200 feet). Now, many of these earlier turbines reaching the end of their useful life, are being replaced with the

larger 1.5 to 3 MW units. Thus, the concepts and recommendations in this article, developed for the 1.5 MW and larger turbines being build in the U.S, may also be applicable abroad.

II. Results of Literature Review and Sound Studies

In the U.K. there are currently about 133 operating WT developments. Many of these have been in operation for over 10 years. The Acoustic Ecology Institute[2] (AEI) reported that a Special Report for the British government titled "Wind Energy Noise Impacts,"[3] found that about 20% of the wind farms in the U.K. generated most of the noise complaints. Another study commissioned by British government, from the consulting firm Hayes, McKensie, reported that only five of 126 wind farms in the U.K. reported problems with the noise phenomenon known as aerodynamic modulation.[4] Thus, experience in the U. K. shows that not all WT projects lead to community complaints. AEI posed an important question: **"What are the factors in *those* wind farms that may be problematic, and how can we avoid replicating these situations elsewhere?"**

As experienced industrial noise consultants ourselves, we would have expected the wind industry, given the U.K. experience, to have attempted to answer this question, conducting extensive research -- using credible independent research institutions -- before embarking on wind power development in the U.S. The wind industry was aware, or should have been aware, that 20% of British wind energy projects provoked complaints about noise and/or vibration, even in a country with more stringent noise limits than in the U.S.

The wind industry complies with stricter noise limits in the U.K. and other countries than it does in the U.S., for example[5]:

- Australia: higher of 35 dBA or L_{90} + 5 dBA
- Denmark: 40 dBA
- France: L_{90} + 3 dBA (night) and L_{90} + 5 dBA (day)
- Germany: 40 dBA
- Holland: 40 dBA
- United Kingdom: 40 dBA (day) and 43 dBA or L_{90} + 5 dBA (night)
- Illinois: Octave frequency band limits of about 50 dBA (day) and about 46 dBA (night)
- Wisconsin: 50 dBA
- Michigan: 55 dBA

Industry representatives on state governmental committees have worked to establish sound limits and setbacks that are lenient and favor the industry. In Michigan, for example, the State Task Force (working under the Department of Labor and Economic Growth) recommended in its "Siting Guidelines for Wind Energy Systems" that the limits be set at 55 dBA or L_{90} + 5 dBA, whichever is higher. In Wisconsin, the State Task Force has recommended 50 dBA.

When Wisconsin's Town of Union wind turbine committee made an open records request to find out the scientific basis for the sound levels and setbacks in the state's draft model ordinance, it found that no scientific or medical data was used at all. Review of the meeting minutes provided

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[2] (http://www.acousticecology.org/srwind.html)

[3] AEI is a 501(c)3 non-profit organization based in Santa Fe, New Mexico, USA. The article is available at http://www.acousticecology.org/srwind.html

[4] Study review available at: http://www.berr.gov.uk/files/file35592.pdf

[5] Ramakrishnan, Ph. D., P. Eng., Ramani, "Wind Turbine Facilities Noise Issues" Dec. 2007 Prepared for the Ontario Ministry of Environment.

under the request showed that the limits had been set by Task Force members representing the wind industry.[6] This may explain why state level committees or task forces have drafted ordinances with upper limits of 50 dBA or higher instead of the much lower limits applied to similar projects in other countries. There is no independent, scientific or medical support for claims that locating 400+ foot tall wind turbines as close as 1000 feet (or less) to non-participating properties will not create noise disturbances, economic losses or other risks.[7] But, there is considerable independent research supporting that this will result in public health risks and other negative impacts on people and property.

To illustrate the way a typical WT developer responds to a question raised by a community committee about noise and health the following example is presented and discussed:

> **Q: 19. What sound standards will EcoEnergy ensure that the turbines will be within, based on the setbacks EcoEnergy plans to implement, and what scientific and peer reviewed data do you have to ensure and support there will be no health and safety issues to persons within your setbacks?**
>
> **Answer:** As mentioned, turbines are sited to have maximum sound level of 45dBA. These sound levels are well below levels causing physical harm. Medical books on sound indicate sound levels above 80-90dBA cause physical (health) effects. The possible effects to a person's health due to "annoyance" are impossible to study in a scientific way, as these are often mostly psychosomatic, and are not caused by wind turbines as much as the individuals' obsession with a new item in their environment.
>
> **From EcoEnergy's "Response to the Town of Union Health & Safety Research Questionnaire"**
> By Curt Bjurlin, M.S., Wes Slaymaker, P.E., Rick Gungel, P.E., EcoEnergy, L.L.C., submitted to Town of Union, Wisconsin and Mr. Kendall Schneider, on behalf of the Town of Union

A serious question was asked and it deserves a responsible answer. The committee, charged with fact-finding, sought answers they presumed would be based on independent, peer-reviewed studies. Instead, the industry response was spurious and misleading, and did not address the question. It stated that the turbines will be located so as to produce maximum sound levels of 45 dBA, the tone and context implying that 45 dBA is fully compatible with the quiet rural community setting. No acknowledgement is made of the dramatic change this will be for the noise environment of nearby families. No mention is made of how the WT, once in operation, will raise evening and nighttime background sound levels from the existing background levels of 20 to 30 dBA to 45 dBA. There is no disclosure of the considerable low frequency content of the WT sound; in fact, there are often claims to the contrary. They fail to warn that the home construction techniques used for modern wood frame homes result in walls and roofs that cannot block out WT low frequencies.

There is no mention of the nighttime sound level recommendations set by the World Health Organization (WHO) in its reports, *Guidelines for Community Noise* [8] and "Report on the third

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[6] Lawton, Catharine M., Letter to Wisconsin's "Guidelines and Model Ordinances Ad Hoc Subcommittee of the Wisconsin Wind Power Siting Collaborative" in Response to Paul Helgeson's 9/20/00 "Wisconsin Wind Ordinance Egroups E-Mail Message," Sept. 20, 2000, a Public Record obtained through Open Meetings Act request by the Town of Union, Wisconsin, Large Wind Turbine Citizens Committee.

[7] It is worth noting that the 2007-06-29 version of the Vestas Mechanical Operating and Maintenance Manual for the model V90 – 3.0 MW VCRS 60 Hz turbine includes this warning for technicians and operators:

> **"2. Stay and Traffic by the Turbine**
>
> Do not stay within a radius of 400m (1300ft) from the turbine unless it is necessary. If you have to inspect an operating turbine from the ground, do not stay under the rotor plane but observe the rotor from the front.
> Make sure that children do not stay by or play nearby the turbine. ...."

[8] Available at http://www.who.int/docstore/peh/noise/guidelines2.html.

meeting on night noise guidelines.[9]" In these documents WHO recommends that **sound levels during nighttime and late evening hours should be less than 30 dBA during sleeping periods to protect children's health**. They noted that a child's autonomic nervous system is 10 to 15 dB more sensitive to noise than is an adult. Even for adults, health effects are first noted in some studies when the sound levels exceed 32 dBA L_{max}. These sounds are 10-20 dBA lower than the sound levels needed to cause awakening.

For sounds that contain a strong low frequency component, which is typical of wind turbines, WHO says that the limits may need to be even lower than 30 dBA to avoid health risks. Further, they recommend that the criteria use dBC frequency weighting instead of dBA for sources with low frequency content. When WT sound levels are 45 dBA outside a home, we may find that the interior sound levels will drop to the 30 dBA level recommended for sleeping areas but low frequency noise only decreased 6-7 dBC from outside to inside. That could create a sleep problem because the low frequency content of the noise can penetrate the home's walls and roof with little reduction. An example demonstrating how WT sound is affected by walls and windows is provided later in this document.

The wind turbine developers in the excerpt above do not disclose that the International Standards Organization (ISO) in ISO 1996-1971 recommends 25 dBA as the maximum night-time limit for rural communities. As can be seen in the table below, sound levels of 40 dBA and above are only appropriate in suburban communities during the day and urban communities during day and night. There are no communities where 45 dBA is considered acceptable at night.

ISO 1996-1971 Recommendations for Community Noise Limits (dBA)			
District Type	Daytime Limit	Evening Limit 7-11pm	Night Limit 11pm-7am
Rural	35dB	**30dB**	**25dB**
Suburban	40dB	35dB	**30dB**
Urban residential	45dB	40dB	35dB
Urban mixed	50dB	45db	40dB

Further, the wind industry claims, "*These sound levels are well below levels causing physical harm. Medical books on sound indicate sound levels above 80-90dBA cause physical (health) effects.*" Concern about sound levels in the 80-90 dBA range is for hearing health (your ears) and not the health-related issues of sleep disturbance and other symptoms associated with prolonged exposure to low levels of noise with low frequency and amplitude modulation such as the sound emitted by modern wind turbines. This type of response is a non-answer. It is an overt attempt to mislead while giving the appearance of providing a legitimate response.

Furthermore, the statement, "*The possible effects to a person's health due to 'annoyance' are impossible to study in a scientific way, as these are often mostly psychosomatic, and are not caused by wind turbines as much as the individuals' obsession with a new item in their environment,*" is both inaccurate and misleading. It ignores the work of researchers such as Pedersen, Harry, Phipps, and Pierpont on wind turbine effects specifically, and the numerous medical research studies reviewed by Frey and Hadden. The studies belie the claims of the wind industry. This "failure to locate" published

[9] Available at: http://www.euro.who.int/Noise/activities/20040721_1 References found in Report on third meeting at pages 13 and others

studies that are readily available on the internet as to make some interpret the claim of "no medical research" as a conscious decision to not look for it. Those companies that do acknowledge the existence of medical research take the position that it is not credible for one or another reason and thus can be ignored.

Making statements outside their area of competence, wind industry advocates, without medical qualifications, label complaints of health effects as "psychosomatic" in a pejorative manner that implies the complaints can be discounted because they are not "really medical" conditions. Such a response cannot be considered to be based in fact. It is, at best, an opinion. It ignores the work of many researchers, including the World Health Organizations, on the effect of sounds during nighttime hours that result in sleep disturbance and other disorders with physical, not just psychological, pathologies.[10,11] Many people find it difficult to articulate what has changed. They know something is different from before the wind turbines were operating and they may express it as feeling uncomfortable, uneasy, sleepless, or some other symptom, without being able to explain why it is happening.

Our review of the studies listed in Tables 1-4 of our Noise-Con paper show that some residents living as far as 3 km (1.86 mi) from a wind farm complain of sleep disturbance from the noise. Many residents living 1/10 of this distance (300 m or 984 ft) from wind farms experience major sleep disruption and other serious medical problems from nighttime wind turbine noise. The peculiar acoustic characteristics of wind turbine noise immissions[12] cause the sounds at the receiving properties to be more annoying and troublesome than the more familiar noise from traffic and industrial factories. Limits used for these other community noise sources are not appropriate for siting modern industrial wind turbines. The residents who are annoyed by wind turbine noise complain of the repetitive, approximately once-per-second (1 Hz) "swoosh-boom-swoosh-boom" sound of the turbine blades and of "low frequency" noise. It is not clear to us whether the complaints about "low frequency" noise are about the audible low frequency part of the "swoosh-boom" sound, the once-per-second amplitude modulation (amplitude modulation means that the sound varies in loudness and other characteristics in a rhythmic pattern) of the "swoosh-boom" sound, or some combination of the two.

Figure 1 of our Noise Con paper, reproduced as Figure 1, below, shows the data from one of the complaint sites plotted against the sound immission spectra for a modern 2.5 MWatt wind turbine; A home in the United States at 2km distance, Young's threshold of perception for the 10% most sensitive population (ISO 0266); and a spectrum obtained for a rural community during a three hour, 20 minute test from 11:45 pm until 3:05 am on a windless June evening near Ubly, Michigan. This is a quiet rural community located in central Huron County (also called Michigan's Thumb). It is worth noting that this sound measurement sample demonstrates how quiet a rural community can be when located at a distance from industry, highways, and airport related noise emitters.

The line representing the threshold of perception is the focus of this graph. The remaining graphs show sound pressure levels (dB) at each of the frequency ranges from the lowest inaudible sounds at the left, to sounds that "rumble" (20Hz to about 200 Hz) and then those in the range of communication (200Hz through about 4000Hz) through high pitched sounds (up to 10,000 Hz). At

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[10] WHO European Centre for Environment and Health, Bonn Office, "Report on the third meeting on night noise guidelines," April 2005.

[11] According to Online Etymology Dictionary, *psychosomatic* means "pertaining to the relation between mind and body, ... applied from 1938 to physical disorders with psychological causes."

[12] *Emissions* refer to acoustic energy from the viewpoint of the sound emitter, while *immissions* refer to acoustic energy from the viewpoint of the receiver.

each frequency where the graphs of sound pressures are above (exceed) the graph showing perception the wind turbine sounds would be perceptible or audible. The more the wind turbine sound exceeds the perception curve the more pronounced it will be. When it exceeds the quiet rural background sound level (L_{A90}) it will not be masked or obscured by the rural soundscape.

The over-all sounds from each of the frequency bands are summed and presented on the right hand side of the graph. These are presented with corrections for A-weighting (dBA) and C-weighting (dBC). These show that if only dBA criteria are used to assess and limit wind turbine sound the low frequency content of the wind turbines emissions are not revealed. Note that in many cases the values for dBC are almost 20 dB higher than the dBA values. This is the basis for the WHO warning that when low frequency sound content is present outside a home dBA is not an appropriate method of describing predicted noise impacts, sound limits, or criteria.

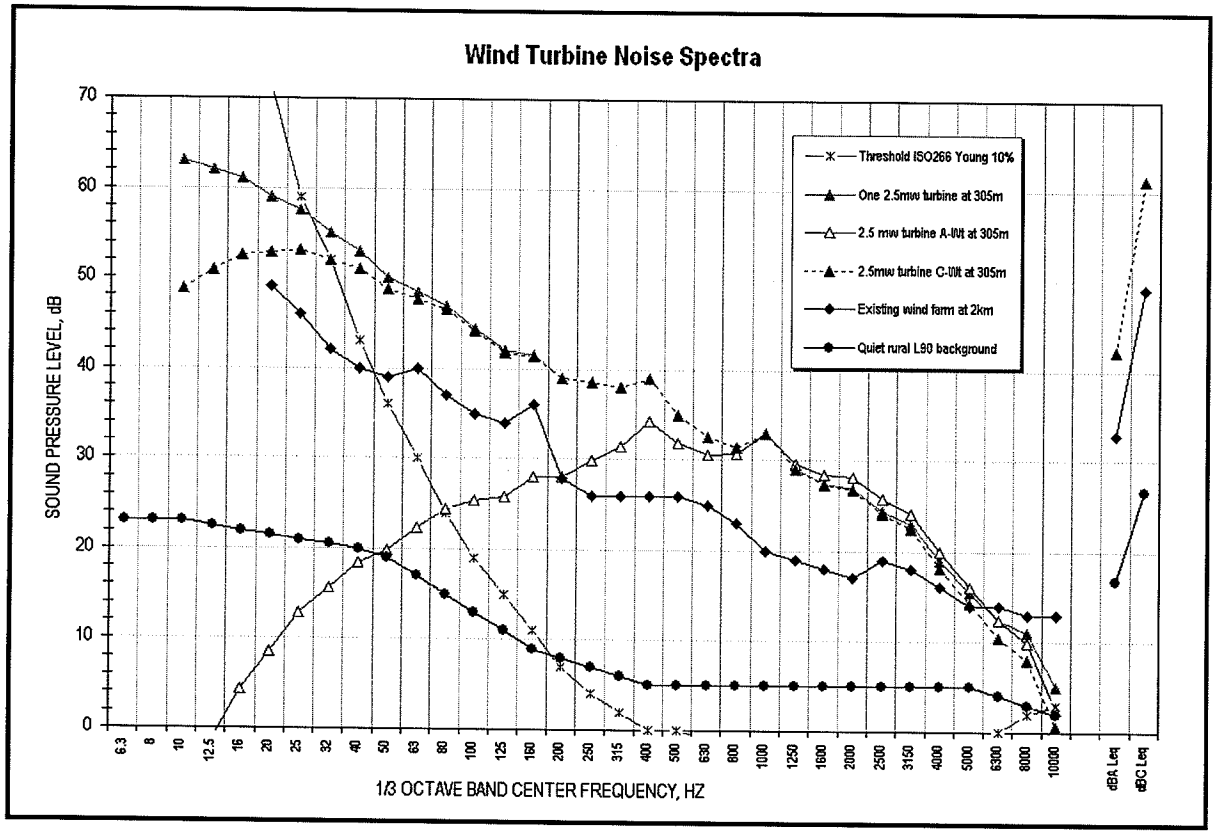

Figure 1-Graph Of Wind Turbine Sounds Vs. Rural Background And Threshold Of Perception

(Note: The lowest L_{Aeq} and L_{Ceq} shown at right are measured background L_{A90} and L_{C90}. The Leq values could be 0-5 dB higher)

Our review of the studies listed in Tables 1-4 in the Noise-Con paper at the end of this document, provided answers to a number of significant questions we had, as acoustical engineers, regarding the development of siting guidelines for industrial-scale wind turbines. They are provided below for easy of reading and continuity:

Do international, national, or local community noise standards for siting wind turbines near dwellings address the low frequency portion of the wind turbines' sound immissions? No. State and local governments are in the process of establishing wind farm noise limits and/or wind turbine setbacks from nearby residents, but the standards incorrectly assume that limits based on dBA levels are sufficient to protect the residents.

Do wind farm developers have noise limit criteria and/or wind turbine setback criteria that apply to nearby dwellings? Yes. But the industry-recommended wind turbine noise levels (typically 50-55 dBA) are too high for the quiet nature of the rural communities and may be unsafe for the nearest residents. An additional concern is that some of the methods for pre-construction computer modeling may predict sound levels that are too low. These two factors combined can lead to post-construction complaints and health risks.

An example of a condition that complies with

Are all residents living near wind farms equally likely to be affected by wind turbine noise? No. Children, people with certain pre-existing medical conditions, and the elderly are likely to be the most susceptible. Some people are unaffected while nearby neighbors develop serious health problems caused by exposure to the same wind turbine noise.

How does wind turbine noise impact nearby residents? Wind turbine-associated symptoms include sleep disturbance, headache, ringing in the ears, dizziness, nausea, irritability, and problems with memory, concentration, and problem solving, as described in the first paper in this volume.

What are the technical options for reducing wind turbine noise immission at residences? There are only two options: 1) increase the distance between the source and receiver, or 2) reduce the source sound power emission. Either solution is incompatible with the objective of the wind farm developer, which is to maximize the wind power electrical generation within the land available.

Is wind turbine noise at a residence much more annoying than traffic noise? Yes. Researchers have found that, "Wind turbine noise was ... found to cause annoyance at sound pressure levels lower than those known to be annoying for other community noise sources, such as road traffic. ...Living in a clearly rural area in comparison with a suburban area increases the risk of annoyance with wind turbine noise.[13]" In other papers by Pedersen wind turbine noise was perceived by about 85% of respondents to the study at sound levels as low as 35.0–37.5 dBA.[14] Currently, this increased sensitivity is believed to be due to the presence of amplitude modulation in the wind turbine's sound emissions which limits the masking effect of other ambient sounds and the low frequency content which is associated with the sounds inside homes and other buildings.

Amplitude modulation is a continuing change in the sound level in synchronization with the turning of the wind turbine's blades. An example of amplitude modulation is shown in the figure 2 below. This figure shows the constantly varying dBA sound level in the graph at the top. The sound level varies from a low of 40 dBA to a high of 45 dBA repeating every 1.3 seconds continuously when the turbine is operating. The turbine is located approximately 1200 feet from the farmhouse. The photo shows the turbine that was dominant during this test.

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[13] Pedersen E, Bouma J, Bakker R and Van den Berg F, "Wind Farm perception- A study on acoustic and visual impact of wind turbines on residents in the Netherlands;" 2nd International Meeting on Wind Turbine Noise, Lyon France; Sept. 20-21, 2007 (Pages 2 and 3)

[14] Pedersen E and Persson Waye K. 2004. Perceptions and annoyance due to wind turbine noise -- a dose-response relationship. J Acoust Soc Am 116(6): 3460-3470

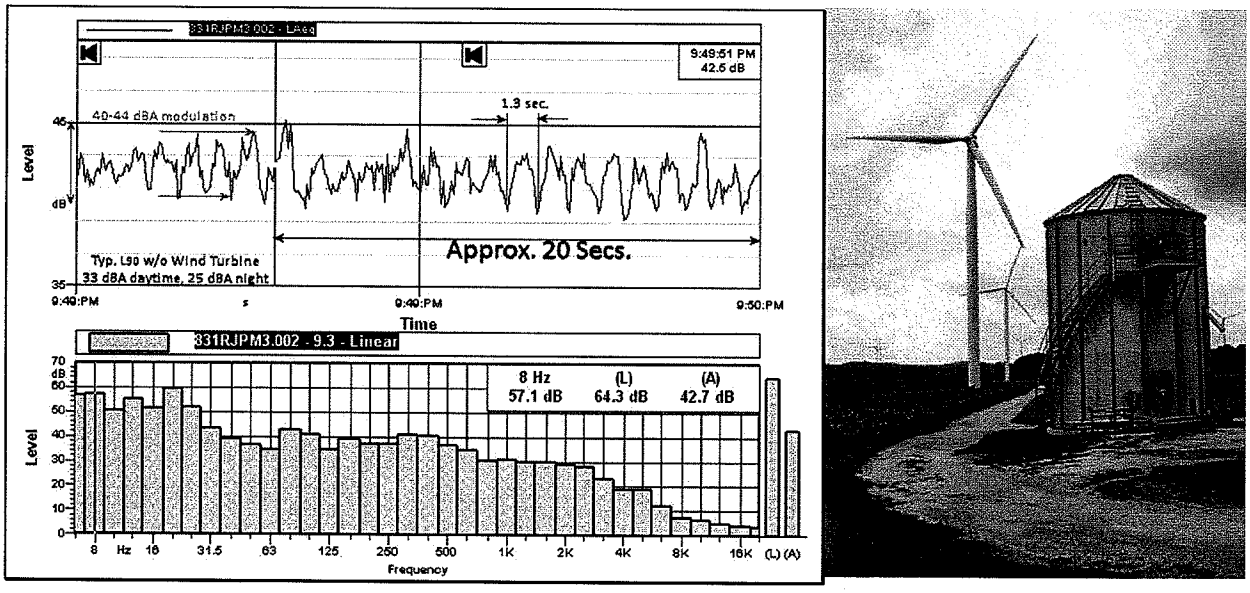

Figure 2 Amplitude Modulation at a farmhouse (Study sponsored by CCCRE, Calumet, Wisconsin)

It is worth noting that this measurement averages about 43 dBA (L_{eq}) which is very close to the sound level predicted for a single turbine at 1000 feet in Figure 1 (solid red line with solid triangle markers). The lower graph shows the frequency spectrum at approximately 9:49 PM at a low point in the amplitude modulation. (The frequency chart's cursor is the vertical line at the upper graph's midpoint.) Note the dominance of sound energy in the lower frequency range. This was also present in the model's predictions in Figure 1.

It is not hard to understand why many people in this community feel that they have been forced to accept noise pollution as a side effect of the wind project. Even though the 40 to 45 dBA sound levels in this example may comply with the 50 dBA limits adopted by the host county from the Wisconsin Model Ordinance the impact on the people near the wind project are subjected to noise pollution. This example demonstrates why criteria set at 50 dBA or higher do not protect the health and economic welfare of people living in the host communities. Adopting criteria such as those recommended later in this essay can prevent these situations from occurring.

Low frequency noise is a problem inside buildings

When low frequency sound is present outside homes and other occupied structures, it is often more an indoor problem than an outdoor one. This is very true for wind turbine sounds.

Why do wind turbine noise immissions of only 35 dBA disturb sleep at night? Affected residents complain of the middle- to high-frequency, repetitive swooshing sounds of the rotating turbine blades at a constant rate of about 1 Hz, plus low frequency noise. The amplitude modulation of the "swooshing" sound changes continuously. Residents also describe a thump or low frequency banging sound that varies in amplitude up to 10 dBA in the short interval between the swooshing sounds. This may be a result of sounds from multiple wind turbines with similar spectral content combining to increase and decrease the sound over and above the effects of modulation. [Note: These effects (e.g. phasing and coherence effects) are not normally considered in predictive models.] It may also be a result of turbulence of the air and wind on wind turbine operations when the blades are not at an optimum angle for noise emissions and/or power generation. It is also a result of sounds penetrating homes and other buildings at night and at other times where quiet is needed. When low frequency sound is present outside homes and other occupied structures, it is

often more likely to be an indoor problem than an outdoor one. This is very true for wind turbine sounds.

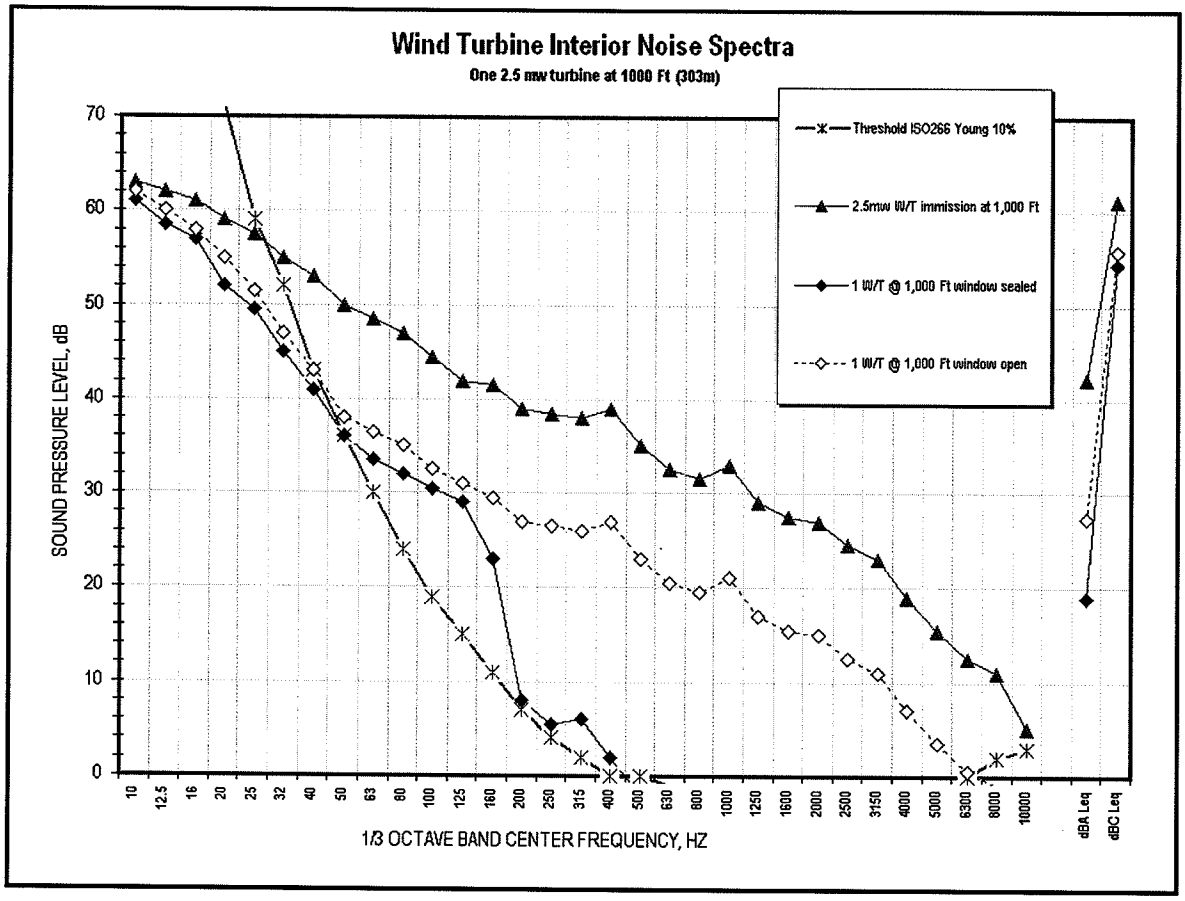

Figure 3-A Single Wind Turbine Sound Inside Home @ 1000 Feet

The usual assumption about wall and window attenuation being 15 dBA or more, which is valid for most sources of community noise, may not be sufficiently protective given the relatively high amplitude of the wind turbines' low frequency immission spectra. Figures 2 and 3 demonstrate the basis for this concern.

To demonstrate the effects of outdoor low frequency content from wind turbines we prepared Figure 1 showing the effect of a single turbine (propagation model based on sound power level test data) at 1000 feet and then in Figure 4 projected the impact of ten (10) similar turbines at one (1) mile. We applied the façade sound isolation data from the Canada Research Council to the wind turbine example used in our Noise-Con 2008 paper and shown in Figure 1 above. The graphs each show the outdoor sound pressure levels predicted for the distance of 1000 feet and one mile as the upper graph line respectively. The curve showing the threshold of human perception for sounds at each 1/3 octave band center is also plotted. When the graphs representing wind turbine sound have data points above this threshold curve the sounds will be perceptible to at least 10% of the population (which includes most children).

In addition to the top graph line representing the sounds outside the home there are two other graph lines for the sounds inside the home[15]. One curve represents the condition of no open windows and the other represents one open window.

With just one turbine at 1,000 feet there is a significant amount of low frequency noise above hearing threshold within rooms having exterior walls without windows or very well sealed windows. Even with the windows closed the sound pressure levels in the 63 Hz to 200 Hz one-octave bands still exceed the perception curve, in many cases by more than 10 dB. Note the perceptible sound between 50 and 200 Hz with a wall resonance frequency at 125 Hz (2 X 4 studs on 16 inch centers) for the "windows closed" condition. This would be perceived as a constant low rumble, which would be present inside homes whenever the turbines are operating.

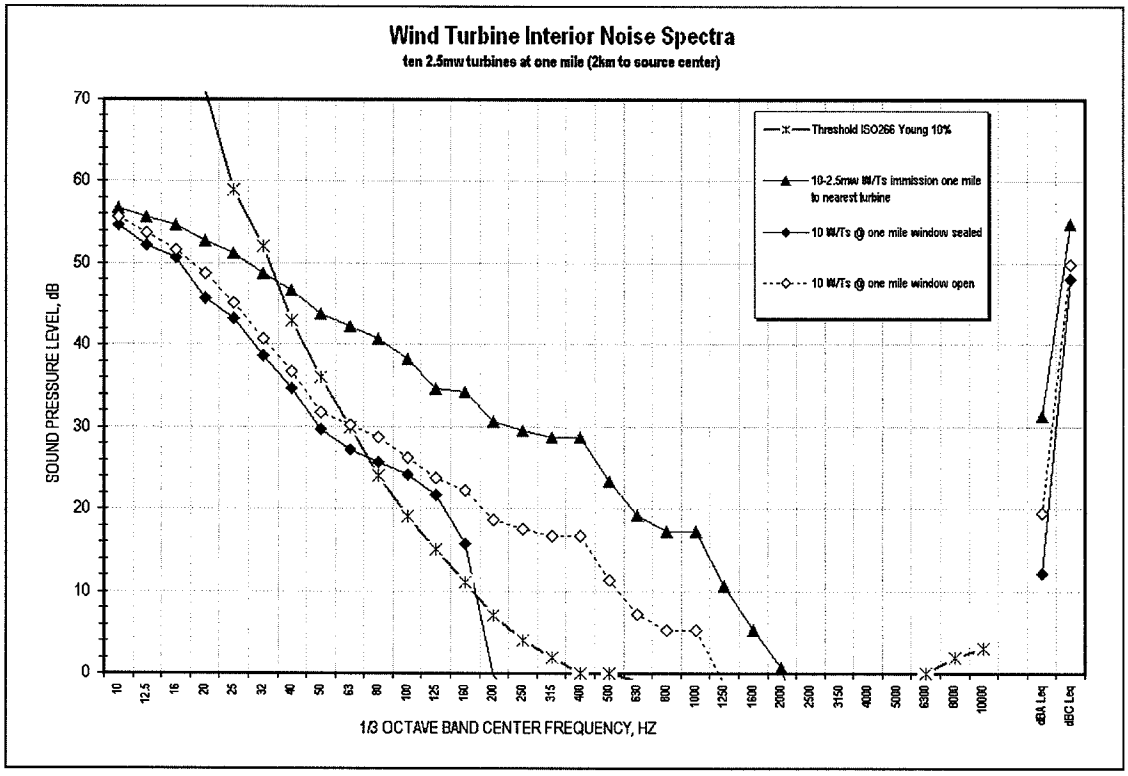

Figure 4-Sound from Ten (10) Wind Turbines inside home at One Mile

When comparing the dBC values the difference between inside sounds and outside is much less. The maximum difference in this example is only 7 dBC and that is for the situation with windows closed. With windows open the sound inside the home would be 56 dBC while it is 61 dBC outside; a difference of only 5 dBC[16],[17],[18]. If we looked only at dBA it would appear that the home's

[15] The typical wood stud exterior used in modern home construction is vinyl siding over 1/2 inch OSB or rigid fiberglass board applied to 2 X 4 studs with the stud space filled with thermal and 1/2 inch gypsum board applied on the exposed interior side. This has a mass of about 3-4 lbs/sq ft and low 26 STC.

[16] The basis for these predictions includes reports on aircraft sound insulation for dwellings and façade sound isolation data from the Canada Research Council.

[17] "On the sound insulation of wood stud exterior walls" by J. S. Bradley and J. S. Birta, institute for Research in Construction, National Research Council, Montreal Road, Ottawa K1A 0R6, Canada, published: J.Acoust. Soc. Am. 110 (6), December 2001

walls and roof provide a reduction of 15 dBA or more. But, that that would be misleading because it ignores the effects of low frequency sound.

We next increased the number of 2.5 Mw turbines from one to ten and moved the receiver one mile from the closest turbine. We assumed the acoustic center for the ten turbines to be 2km (1-1/4 miles) from the receiver. These results are presented in Figure 4. We were surprised to find that the one mile low frequency results are only 6.3 dB below the 1,000 foot one turbine example.

There is one other characteristic of wind turbine sound that increases the sleep disturbance potential above that of other long-term noise sources. The amplitude modulation of the sound emissions from the wind turbines create a repetitive rise and fall in sound levels synchronized to the blade rotation speed. Many common weather conditions increase the magnitude of amplitude modulation. Most of these occur at night. The graph in Figure 5 shows this effect in the first floor bedroom of a farm home in the U.K. The home is located 930 meters (3,050 feet) from the nearest turbine. The conditions documented by an independent acoustical consultant show the sound level varying over 9 dBA range from 28 to 37 dBA. The pattern repeats approximately every second often for hours at a time. For many people, especially seniors, children and those with pre-existing medical conditions, this represents a major challenge to restful sleep.

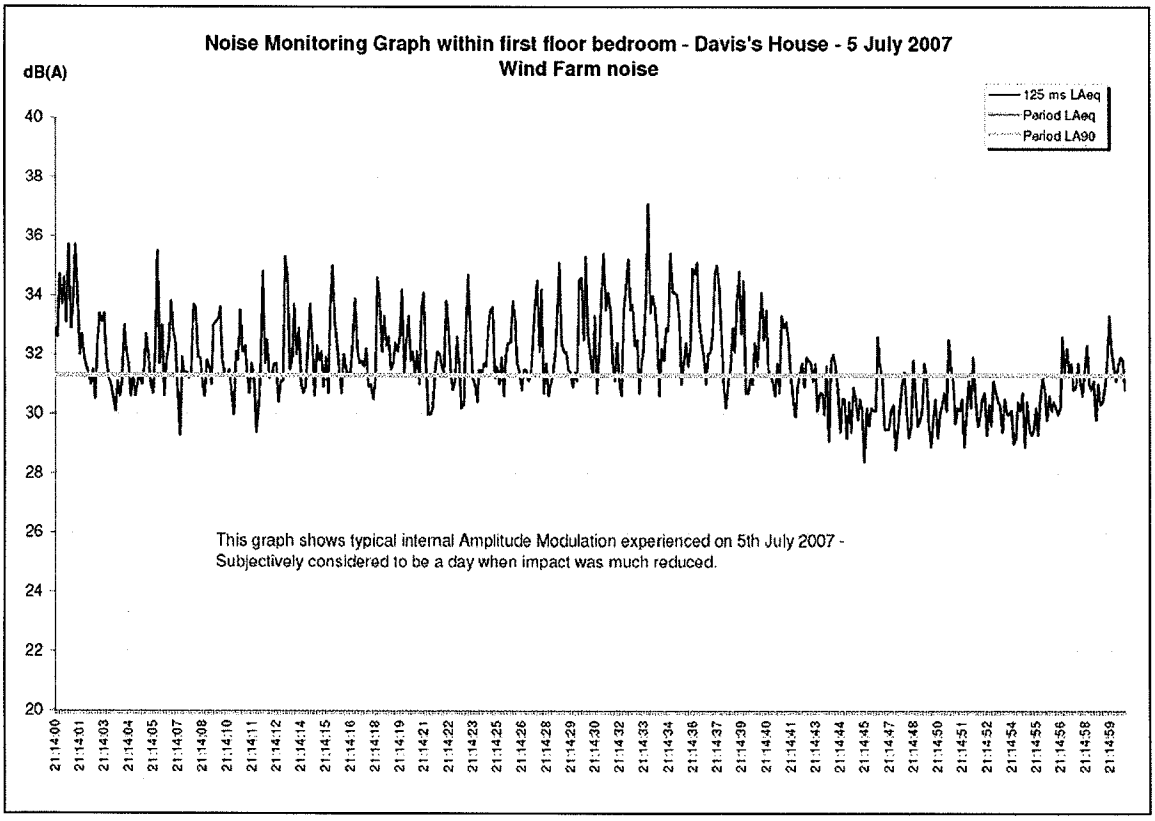

Figure 5- Amplitude modulation in a home 930 meters (3000 feet) from the nearest turbine.[19]

This may explain why some residents as far as two (2) miles from a wind farm find the wind turbines sounds highly annoying. It also demonstrates the primary reason why relying on dBA

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[18] Dan Hoffmeyer, Birger Plovsing: "Low Frequency Noise from Large Wind Turbines, Measurements of Sound Insulation of Facades." Journal no. AV 1097/08, Client: Danish Energy Authority, Amaliegade 44, 1256 Copenhagen

[19] This chart used with permission of Mike Stigwood, MIOA, FRSH, MAS Environmental, U.K. and the Davis family.

alone will not work for community noise criteria. It is the low frequency phenomena associated with wind turbine emissions that makes the dBC test criteria an important part of the proposed criteria[20].

III. Development of Siting Criteria

Basis For Using L_{A90} To Determine Pre-Construction Long-Term Background Sound

We began our research into guidelines for proper siting by reviewing guidelines used in other countries to limit WT sound emissions. A recent compendium of these standards was presented in the report "Wind Turbine Facilities Noise Issues."[21] We found common ground in many of them. Some set explicit not-to-exceed sound level limits, for example, in Germany, 40 dBA nighttime in residential areas and 35 dBA nighttime in rural and other noise-sensitive areas. Other countries use the existing background sound levels for each community as the basis for establishing the sound level limits for the WES project. This second method has the advantage of adjusting the allowable limits for various background soundscapes. It makes use of a standard method for assessing background sound levels by measuring over a specified period of observation to determine the sound level exceeded 90% of the time (L_{90}) during the night. The night is important because it is the most likely time for sleep disturbance. Then, using the background sound level as the base, the WES project is allowed to increase it by 5 dBA. It is this second method (L_{90} + 5 dBA) that was adopted for the criteria in this document. It has the advantage of adjusting the criteria for each community without the need for tables of allowable limits for different community types. The focus is only on the nighttime criteria. This is because the WES will operate 24 hours a day and the nighttime limits will be the controlling limits whether or not there are other limits for daytime.

Wind turbine noise is more annoying than other noises and needs lower limits

Since many rural communities are very quiet, it is possible that some will have L_{90} values of 25 dBA or lower. This may seem extreme when compared to limits usually imposed on other sources of community noise. However, wind turbine sounds are not comparable to the more common noise sources of vehicles, aircraft, rail, and industry. Several studies have shown that annoyance to wind turbine sounds begins at levels as low as 30 dBA.[22] This is especially true in quiet rural communities that have not had previous experience with industrial noise sources. This increased sensitivity may be due to the periodic 'swoosh' from the blades in the quiet rural soundscape, or it may be more complex. In either case, it is a legitimate response to wind turbine sound documented in peer-reviewed research.

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[20] Hessler Jr., George F., "Proposed criteria in residential communities for low-frequency noise emissions from industrial sources," 52(4), 179-185, (July-Aug 2004)

[21] Ramani Ramakrishnan, Ph.D., P. Eng., "Wind Turbine Facilities Noise Issues," December 2007. Prepared for the Ontario Ministry of Environment.

[22] Eja Pedersen, "Human response to wind turbine noise: perception, annoyance and moderating factors." Dissertation, Occupational and Environmental Medicine, Department of Public Health and Community Medicine, Goteborg University, Goteborg, Sweden, 2007, and

Van den Berg F, Pedersen E, Bouma J, and Bakker R, Wind Farm Perception, Final Report Project no. 044628, University of Gothenburg and Medical Center Groningen, Netherlands June 3, 2008

Noise criteria need to take into account low frequency noise
In the table to the right are a series of observations and recommendations by the World Health Organization (WHO) supporting the need for stricter limits when there is substantial low frequency content in outdoor sound. Our review of other studies, and our own measurements, has demonstrated that wind turbine sound includes considerable low frequency content. We include a dBC limit in our guidelines to address the WHO recommendation that when low frequency sound may be present, criteria based on measurements using a C-weighting filter on the sound level meter (dBC) are needed in addition to dBA criteria.

The World Health Organization recognizes the special place of low frequency noise as an environmental problem. Its publication "Community Noise" (Berglund et al., 2000) makes a number of references to low frequency noise, some of which are as follows:

- "It should be noted that low frequency noise... can disturb rest and sleep even at low sound levels.
- For noise with a large proportion of low frequency sounds a still lower guideline (than 30dBA) is recommended.
- When prominent low frequency components are present, noise measures based on A-weighting are inappropriate.
- Since A-weighting underestimates the sound pressure level of noise with low frequency components, a better assessment of health effects would be to use C-weighting.
- It should be noted that a large proportion of low frequency components in a noise may increase considerably the adverse effects on health."

WHO also states: "The evidence on low frequency noise is sufficiently strong to warrant immediate concern."

Available at http://www.who.int/docstore/peh/noise/guidelines2.html, References found at pages ix, xii through xv and others.

IV. Proposed Sound Limits

The simple fact that so many residents complain of low frequency noise from wind turbines is clear evidence that the single A-weighted (dBA) noise descriptor used in most jurisdictions for siting turbines is not adequate. The only other simple audio frequency weighting that is standardized and available on sound level meters is C-weighting or dBC. A standard sound level meter set to measure dBA is increasingly less sensitive to low frequency below 500 Hz (one octave above middle-C). The same sound level meter set to measure dBC is equally sensitive to all frequencies above 32 Hz (lowest note on grand piano). It is generally accepted that dBC readings are more predictive of perceptual loudness than dBA readings if low frequency sounds are significant.

We are proposing to use the commonly accepted dBA criteria that is based on the pre-existing background sound levels allowing the wind turbine development to increase this by 5 dB (e.g. L_{90A} +5) by the audible sounds from wind turbines. According to the New York State Energy Research & Development Authority:

- "... A change in sound level of 5 dB will typically result in a noticeable community response; and
- "... A 10 dB increase is subjectively heard as an approximate doubling in loudness, and almost always causes an adverse community response." [23]

To address the lower frequencies that are not considered in A-weighted measurements we are proposing to add limits based on dBC that follow the same scheme as used for dBA limits. The Proposed Sound Limits are presented in the text box at the end of this section.

For the current industrial grade wind turbines in the 1.5 to 3 MWatt (or over) range, the addition of the dBC requirement may result in an increased distance between wind turbines and the nearby

[23] (*Wind Energy Development: A Guide for Local Authorities in New York*; page 30; New York State Energy Research & Development Authority, Albany, NY October 2002)

residents. For the conditions shown in Figure 1, the distances would need to be increased significantly. This would result in setbacks in the range of 1 km or greater for the current generation of wind turbines if they are to be located in rural areas with little or no low frequency sound from man-made noise sources and where the L_{A90} background sound levels are 30 dBA or lower. In areas with higher background sound levels, turbines could be located somewhat closer, but still at a distance greater than the 305 m (1000 ft.) or smaller setbacks commonly seen in U.S. based wind turbine standards set by many states and used for wind turbine developments.

Following are some additional Questions and Answers that summarize the major points of this discussion relevant to criteria.

What are the typical wind farm noise immission criteria or standards? Limits are not consistent and may vary even within a particular country. Examples are listed above in the section on Results of Literature and Sound Studies.

What is a reasonable wind farm sound immission limit to protect the health of residences? We are proposing a not-to-exceed immission limit of 35 L_{Aeq} and a site-specific limit of L_{A90} + 5 dBA at the closest property line, whichever is exceeded first. We also propose the use of C-weighted criteria to address complaints of wind turbine low frequency noise. For the C-weighted criteria, we propose a site-specific limit of L_{C90} + 5 dBC. We also require that the site-specific L_{Ceq} (dBC) sound level at a receiving property line not exceed the pre-existing L_{A90} dB background sound level + 5dB by more than 20 dB. In other words, the dBC operating immission limit (as L_{Ceq}) at the receiving property line should not be more than 20 dB above the measured dBA (as L_{A90}) pre-construction long-term background sound level + 5dB.[24] This criterion prevents an Immission Spectra Imbalance that often leads to complaints about rumble or other low frequency problems. We also include a not-to-exceed immission limit of 55 and 60 L_{Ceq} at the receiving property line.[25] Use of the multiple metrics and weightings will address the audible and inaudible low frequency portions of wind turbine sound emissions. Exceedances of any of the limits establish non-compliance.

Why should the dBC immission limit not be permitted to be more than 20 dB above the background measured L_{A90}+5 dB? The World Health Organization and others[26] have determined that if a noise has a measured difference between dBC and dBA more than 20 dB, the noise is highly likely to create an annoyance because of the low frequency component.

Isn't L_{A90} the <u>minimum</u> background noise level? Not exactly. This is the sound level that represents the quietest 10% of the time. It is often considered to be the sound level that represents the sounds one hears late in the evening or at night when there are no near-by or short term sounds present. It is very important to establish this "long term background" noise environment at the property line for a potentially impacted residence (L_{A90}) during the **quietest** sleeping hours of the night, between 10 p.m. and 4 a.m.. Why? Because nighttime sleep disturbance has generated the majority of wind farm noise complaints throughout the world those conditions should guide the design of wind projects. ANSI standards define the "long term background sound" as excluding all short term sounds from the test sample using carefully selected sampling times and conditions using ten (10) minute long samples. This means that nature sounds not present during all seasons and wind noise are not to be included in the measurement. Following the procedures in ANSI S12.9, Part 3 for long term background sound the L_{A90} and L_{C90} can be measured with one or more 10-minute

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[24] Hessler Jr., George F., Proposed criteria in residential communities for low-frequency noise emissions from industrial sources, Noise Control Engineering Journal; 52(4), pg. 180 in "2. Purpose of Proposed Criteria," (July-Aug 2004)

[25] Ibid, pg. 180 in "3. Proposed Criteria."

[26] Ibid

measurements during any night when the atmosphere is classified as stable with a light wind from the area of the proposed wind farm. The basis for the immission limits for the proposed wind farm would then be the Nighttime Immission Limits, which we propose to be the minimum ten (10) minute nighttime L_{A90} and L_{C90} plus 5 dB, a test for Spectra Imbalance, and not-to-exceed limits for the period of 10 p.m. to 7 a.m. Daytime Limits (7 a.m. to 10 p.m.) could be set using daytime measurements, but unless the wind utility only operates during the day, the nighttime limit will always be the limiting sound level. Thus, daytime limits are not normally needed.

A nearby industrial scale wind utility meeting these noise immission criteria would occasionally be audible to the residents during nighttime and daytime. However, it would be unlikely for it to be an indoor problem.

The method used for establishing the background sound level at a proposed wind farm in many of the studies in Table 1, does not meet the requirements set by ANSI S12.9 Part 3 for outdoor measurements and determination of long-term background sound levels. Instead, they use unattended noise monitors to record hundreds of 10-minute or one-hour un-observed measurements that include the short term sounds from varying community and wind conditions over a period of days or weeks. The results for daytime and nighttime are usually combined to determine the average wind noise at the microphone as a function of wind velocity measured at a height of ten (10) meters. This provides an enormous amount of data, but the results have little relationship to wind turbine sound immissions or to potential for turbine noise impacts on nearby residents. They also do not comply with ANSI standards for methodology or quality and as such are not suitable for use in measurements that will be used to assess compliance with other standards and guidelines. This exhaustive exercise often only demonstrates how much 'pseudo-noise' is generated by instruments located in a windy environment that exceeds the capability of the instrument's wind screen to protect the microphone. In many cases, this unqualified data is used to support a claim that the wind noise masks the turbines' sound immissions.

The major complaints of residents living near wind farms is sleep disruption at night when there is little or no wind near ground level and the wind turbines located at a much higher elevation are turning and generating near or at maximum power and maximum noise emission. There is usually more surface wind and turbulence during daytime caused by solar radiation. Thus, the use of averaged data involving one or more 24-hour periods is of little value in predicting conditions that will result in people who cannot sleep in their homes during the night because of loud intrusive wind turbine noise.

The methodology used to predict the sound propagation from the turbines into the community also fails to represent the conditions of maximum turbine noise impact on nearby residents. This should be expected given the limitations of models based on ISO 9613-2[27]. They also do not consider the effects of a frequent nighttime condition when winds at the ground are calm and the winds at the hub are at or above nominal operating speed. This condition is often referred to as a "stable" atmosphere. During this condition, the wind turbines can be producing the maximum or near maximum power while the wind at ground level is calm and the background noise level is low. The Michigan rural night test data in the earlier figure shows how quiet a night can be in the absence of wind at the ground. This common condition is known to directly cause chronic sleep

[27] The ISO 9613-2 sound propagation model formulas have known errors of 3 dB even when the conditions being modeled are a perfect match to the limiting conditions specified in the standard. Wind turbines operate far outside the limits for wind speed, height of the noise source above the ground, and other factors identified in the standard thus increasing the likelihood for error above the specified 3 dB. In addition, there are known measurement errors in the IEC61400-11 test that add another 2 dB of uncertainty to the model's predictions.

disruption. Further, the studies report average sound levels and do not disclose the effects of amplitude modulation or low frequency sound which makes the turbine's sound more objectionable and likely to cause sleep problems.

Are there additional noise data to be recorded for a pre-wind turbine noise survey near selected dwellings? Yes. The precision measuring sound level meter(s) need to be programmed to include measurement of L_{Aeq}, L_{A10}, L_{A90}, L_{Ceq}, L_{C10}, and L_{C90}, with starting time and date for each 10-minute sample. The L_{10} results will be used to validate the L_{90} data. For example, on a quiet night one might expect L_{10} and L_{90} to show similar results within 5 to 10 dB between L_{10} and L_{90} for each weighting scale. On a windy night or one with nearby short term noise sources the difference between L_{10} and L_{90} may be more than 20 dB. There is also often a need to obtain a time-averaged, one-third octave band analysis over the frequency range from 6.3 Hz to 10 kHz during the same ten minute sample. The frequency analysis is very helpful for identifying and correcting for extraneous sounds such as interfering insect noise. An integrating averaging sound level meter meeting ANSI or IEC Type 1 standards has the capability to perform all of the above acoustic measurements simultaneously and store the results internally. There is also a requirement for measurement of the wind velocity near the sound measurement microphone continuously throughout each 10-minute recorded noise sample. The 10-minute maximum wind speed near the microphone must be less than 2 m/s (4.5 mph) during measurements of background noise (L_{90}), and the maximum wind speed for noise measurements during turbine operation must be less than 4 m/s (9 mph). Measurements should be observed (without contaminating the data) and notes identifying short-term noises should be taken for these tests.

Is there a need to record weather data during the background noise recording survey? One weather monitor is required at the proposed wind farm on the side nearest the residents. The weather station sensors are at the standard 10 meter height above ground. It is critical that the weather be recorded every 10 minutes, synchronized with the clocks in the sound level recorders without ambiguity, at the start and end time of each 10 minute period. The weather station should record wind speed and direction, temperature, humidity and rain.

Why do Canada and some other countries base the permitted wind turbine noise immission limits on the operational wind velocity at the 10m height wind speed instead of a maximum dBA or L_{90} + 5 dBA immission level? First, it appears that the wind turbine industry will take advantage of every opportunity to elevate the maximum permitted noise immission level to reduce the setback distance from the nearby dwellings. Including wind as a masking source in the criteria is one method for elevating the permissible limits. The background noise level does indeed increase with surface wind speed. When this happens, it can be argued that the increased wind noise provides some masking of wind turbine noise. However, this is not true if the surface winds are calm. After sunset, when the ground cools (e.g. in the middle of the night), the lower level atmosphere can separate from the higher-level atmosphere. Then, the winds at the ground will be calm while wind at the turbine hub is very strong. Under this condition, the wind velocity at a 10-meter high wind monitoring station (such as those often used for weather reporting) may be ¼ to ½ the speed of the wind at the hub, yet drop to calm at ground level. The result is that no ground level wind noise is present to mask the sound of the wind turbines, which can be operating at or close to full capacity.

This condition is one of the major causes of wind turbine related noise complaints for residents within 3 km (1.86 miles) of a wind farm. When the turbines are producing high sound levels, it is quiet outside the surrounding homes. The PhD thesis of G.P. van den Berg, *The Sounds of High*

Winds, is very enlightening on this issue (Table 3). See also the letter by John Harrison in Ontario "On Wind Turbine Guidelines.[28]"

What sound monitor measurements would be needed for enforcement of the wind turbine sound ordinance? A similar set of sound tests using the ten (10) minute series of measurements would be repeated, with and without the operation of the wind turbines, at the location where noise was measured before construction, which is closest to the resident registering the wind turbine noise complaint. If the nighttime background (L_{90}) noise level (turbines off) was found to be slightly higher than the measured background prior to the wind farm installation, then the results with the turbines operating must be corrected using standard acoustical engineering methods to determine compliance with the pre-turbine established sound limits.

Who should conduct the sound measurements? An independent acoustics expert should be retained who reports to the County Board or other responsible governing body. This independent acoustics expert should be responsible for all the acoustic measurements including setup and calibration of instruments and interpretation of recorded results. He or she should perform all pre-turbine background noise measurements and interpretation of results to establish the nighttime (and daytime, if applicable) industrial wind turbine sound immission limits, and to monitor compliance.

At present, the acoustical consultants are retained by, and work directly for, the wind farm developers. This presents a serious problem with conflict of interest on the part of the consultants. The wind farm developer would like to show that a significant amount of wind noise is present to mask the sounds of the wind turbine immissions. The community is looking for authentic results showing that the wind turbine noise will be only barely perceptible, and then only occasionally, during the night or daytime.

Is frequency analysis required either during the pre-construction background noise survey or for compliance measurements? Normally one-third octave or narrower band analysis would only be required if there is a complaint of tones immission from the wind farm. Although only standardized dBA and dBC measurements are required to meet the proposed criteria, the addition of one-third octave band analysis is often useful to validate the dBA and dBC results.

The following summarizes the criteria necessary when siting wind turbines to minimize the risk of adverse impacts from noise on the adjacent community[29]. For those not familiar with acoustical annotation the table and its formulas may seem overly complex, but the criteria are defined in this manner to be as unambiguous as possible. They will be clear for those who are familiar with acoustical terminology. Definitions are provided in a later section of this essay.

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[28] Harrison, J., *Wind Turbine Guidelines,* available at http://amherstislandwindinfo.com/

[29] The authors have based these criteria, procedures, and language on their current understanding of wind turbine sound emissions, land-use compatibility, and the effects of sound on health. However, use of the following, in part or total, by any party is strictly voluntary and the user assumes all risks. Please seek professional assistance in applying the recommendations of this document to any specific community or WES development.

NOISE CRITERIA FOR SITING WIND TURBINES TO PREVENT HEALTH RISKS[29]

1. Establishing Long-Term Background Noise Level

a. Instrumentation: ANSI or IEC Type 1 Precision Integrating Sound Level Meter plus meteorological instruments to measure wind velocity, temperature and humidity near the sound measuring microphone. Measurement procedures must meet ANSI S12.9, Part 3 except as noted in Section 4. below.

b. Measurement location(s): Nearest property line(s) from proposed wind turbines representative of all non-participating residential property within 2.0 miles.

c. Time of measurements and prevailing weather: The atmosphere must be classified as stable with no vertical heat flow to cause air mixing. Stable conditions occur in the evening and middle of the night with a clear sky and very little wind near the surface. Sound measurements are only valid when the measured wind speed at the microphone is less than 2 m/s (4.5 mph).

d. Long-Term Background sound measurements: All data recording shall be a series of contiguous ten (10) minute measurements. The measurement objective is to determine the quietest ten minute period at each location of interest. Nighttime test periods are preferred unless daytime conditions are quieter. The following data shall be recorded simultaneously for each ten (10) minute measurement period: dBA data includes L_{A90}, L_{A10}, L_{Aeq} and dBC data includes L_{C90}, L_{C10}, and L_{Ceq}. Record the maximum wind speed at the microphone during the ten minutes, a single measurement of temperature and humidity at the microphone for each new location or each hour whichever is oftener shall also be recorded. A ten (10) minute measurement contains valid data provided: Both L_{A10} minus L_{A90} and L_{C10} minus L_{C90} are not greater than 10 dB and the maximum wind speed at the microphone is less than 2 m/s during the same ten (10) minute period as the acoustic data.

2. Wind Turbine Sound Immission Limits

No wind turbine or group of turbines shall be located so as to cause wind turbine sound immission at any location on non-participating property containing a residence in excess of the limits in the following table:

Table of Not-To-Exceed Property Line Sound Immission Limits [1]			
Criteria	**Condition**	**dBA**	**dBC**
A	Immission above pre-construction background:	$L_{Aeq} = L_{A90} + 5$	$L_{Ceq} = L_{C90} + 5$
B	Maximum immission:	35 L_{Aeq}	55 L_{Ceq} for quiet[2] rural environment 60 L_{Ceq} for rural-suburban environment
C	Immission spectra imbalance	L_{Ceq} (immission) minus (L_{A90} (background) +5) $\leq$ 20 dB	
D	Prominent tone penalty:	5 dB	5 dB
Notes			
1	Each Test is independent and exceedances of any test establishes non-compliance. Sound "immission" is the wind turbine noise emission as received at a property.		
2	A "Quiet rural environment" is a location >2 miles from a major transportation artery without high traffic volume during otherwise quiet periods of the day or night.		
3	Prominent tone as defined in IEC 61400-11. This Standard is not to be used for any other purpose.		

[1] Procedures provided in Section 7. Measurement Procedures (ANSI 12.9 Part 3 with Amendments) of the most recent version of "**The How To Guide To Siting Wind Turbines To Prevent Health Risks From Sound**" by Kamperman and James and the apply to this table.

3. Wind Farm Noise Compliance Testing

All of the measurements outlined above in 1. Establishing Nighttime Background Noise Level must be repeated to determine compliance with 2. Wind Turbine Sound Immission Limits. The compliance test location is to be the pre-turbine background noise measurement location nearest to the home of the complainant in line with the wind farm and nearer to the wind farm. The time of day for the testing and the wind farm operating conditions plus wind speed and direction must replicate the conditions that generated the complaint. Procedures of ANSI S12.9- Part 3 apply except as noted in Section 4. The effect of instrumentation limits for wind and other factors must be recognized and followed.

4. ANSI S12.9 Part 3 Selected Options and Requirement Amendments

For measurements taken to assess the preceding criteria specific options provided for in ANSI S12.9-Part 3 (2008) shall be followed along with any additional requirements included below:

5.2 Background Sound: Use definition (1): 'long-term'

5.2 long-term background sound: The L_{90} excludes short term background sounds

5.3 basic measurement period: Ten (10) minutes $L_{90(10\ min)}$

5.6 Sound Measuring Instrument: Type 1 Precision meeting ANSI S1.43 or IEC 61672-1. The sound level meter shall cover the frequency range from 6.3 Hz to 20k Hz and simultaneously measure dBA L_N and dBC L_N. The instrument must also be capable of accurately measuring low-level background sounds down to 20 dBA.

6.5 Windscreen: Required

6.6(a) An anemometer accurate to ± 10% at 2m/s to full-scale accuracy. The anemometer shall be located 1.5 to 2 meters above the ground and orientated to record maximum wind velocity. The maximum wind velocity, wind direction, temperature and humidity shall be recorded for each ten (10) minute sound measurement period observed within 5 m. of the measuring microphone.

7.1 Long-term background sound

7.2 Data collection Methods: Second method with observed samples to avoid contamination by short term sounds (purpose: to avoid loss of statistical data)

8. Source(s) Data Collection: All requirements in ANSI S12.18 Method #2, Precision to the extent possible while still permitting testing of the conditions that lead to complaints. The meteorological requirements in ANSI S12.18 may not be applicable for some complaint tests. For sound measurements in response to a complaint, the compliance sound measurements should be made under conditions that replicate the conditions that caused the complaint without exceeding instrument and windscreen limits and tolerances.

8.1(b) Measuring microphone with windscreen shall be located 1.2m to 1.8m (1.5 preferred) above the ground and greater than 8 m. from large sound reflecting surface.

8.3(a) All meteorological observations required at both (not either) microphone and nearest 10 m. weather reporting station.

8.3(b) For a ten (10) minute background sound measurement to be valid the wind velocity shall be less then 2m/s (4.5 mph) measured less than 5 m. from the microphone. Compliance sound measurements shall be taken when winds are less than 4m/s at the microphone.

8.3(c) In addition to the required acoustic calibration checks, the sound measuring instrument internal noise floor, including microphone, must also be checked at the end of each series of ten minute measurements and no less frequently than once per day. Insert the microphone into the acoustic calibrator with the calibrator signal off. Record the observed dBA and dBC reading on the sound level meter to determine an approximation of the instrument self noise. Perform this test before leaving the background measurement location. The calibrator-covered microphone must demonstrate the results of this test are at least 5 dB below the immediately previous ten (10) minute acoustic test results, for the acoustic background data to be valid. This test is necessary to detect undesired increase in the microphone and sound level meter internal self-noise. As a precaution sound measuring instrumentation should be removed from any air conditioned space at least an hour before use. Nighttime measurements are often performed very near the meteorological dew point. Minor moisture condensation inside a microphone or sound level meter can increase the instrument self noise and void the measured background data.

8.4 The remaining sections, starting at 8.4 in ANSI S12.9 Part 3 Standard do not apply.

V. How to Include the Recommended Criteria in Ordinances and/or Community Noise Limits

The following two sections present the definitions, technical requirements, and complaint resolution processes that support the recommended criteria. Following the formal elements is a section discussing the measurement procedures and requirements for enforcement of these criteria. For the purpose of the following sections the government authority will be referred to as the Local Government Authority (LGA) as a place marker for State, County, Township or other authorized authority. The abbreviation 'WES' is used for industrial scale wind energy system.

The authors have based these criteria, procedures, and language on their current understanding of wind turbine sound emissions, land-use compatibility, and the effects of sound on health. However, use of the following, in part or total, by any party is strictly voluntary and the user assumes all risks. Please seek professional assistance in applying the recommendations of this document to any specific community or WES development.

VI. ELEMENTS OF A WIND ENERGY SYSTEMS LICENSING ORDINANCE FOR SOUND

I. Purpose and Intent.

Based upon the findings stated above, it is the intended purpose of the LGA to regulate Wind Energy Systems to promote the health, safety, and general welfare of the citizens of the Town and to establish reasonable and uniform regulations for the operation thereof so as to control potentially dangerous effects of these Systems on the community.

II. Definitions.

The following terms have the meanings indicated:

"**Aerodynamic Sound**" means a noise that is caused by the flow of air over and past the blades of a WES.

"**Ambient Sound**" Ambient sound encompasses all sound present in a given environment, being usually a composite of sounds from many sources near and far. It includes intermittent noise events, such as, from aircraft flying over, dogs barking, wind gusts, mobile farm or construction machinery, and the occasional vehicle traveling along a nearby road. The ambient also includes insect and other nearby sounds from birds and animals or people. The near-by and transient events are part of the ambient sound environment but are not to be considered part of the long-term background sound.

"American National Standards Institute (ANSI)" Standardized acoustical instrumentation and sound measurement protocol shall meet all the requirements of the following ANSI Standards:

ANSI S1.43 Integrating Averaging Sound Level Meters: Type-1 (or IEC 61672-1)

ANSI S1.11 Specification for Octave and One-third Octave-Band Filters (or IEC 61260)

ANSI S1.40 Verification Procedures for Sound Calibrators

ANSI S12.9 Part 3 Procedures for Measurement of Environmental Sound

ANSI S12.18 Measurement of Outdoor Sound Pressure Level

IEC 61400-11 Wind turbine generator systems -Part 11: Acoustic noise measurements

"**Anemometer**" means a device for measuring the speed and direction of the wind.

"**Applicant**" means the individual or business entity that seeks to secure a license under this section of the Town municipal code.

"**A-Weighted Sound Level (dBA)**" A measure of over-all sound pressure level designed to reflect the response of the human ear, which does not respond equally to all frequencies. It is used to describe sound in a manner representative of the human ear's response. It reduces the effects of the low with respect to the frequencies centered around 1000 Hz. The resultant sound level is said to be "A-weighted" and the units are "dBA." Sound level meters have an A-weighting network for measuring A-weighted sound levels (dBA) meeting the characteristics and weighting specified in ANSI Specifications for Integrating Averaging Sound Level Meters, S1.43-1997 for Type 1 instruments and be capable of accurate readings (corrections for internal noise and microphone response permitted) at 20 dBA or lower. In this document dBA means L_{Aeq} unless specified otherwise.

"**Background Sound (L_{90})**" refers to the sound level present at least 90% of the time. Background sounds are those heard during lulls in the ambient sound environment. That is, when transient sounds from flora, fauna, and wind are <u>not</u> present. Background sound levels vary during different times of the day and night. Because WES operates 24/7 the background sound levels of interest are those during the quieter periods which are often the evening and night. Sounds from the WES of interest, near-by birds and animals or people must be excluded from the background sound test data. Nearby electrical noise from streetlights, transformers and cycling AC units and pumps etc must also be excluded from the background sound test data.

Background sound level (dBA and dBC (as L_{90})) is the sound level present 90% of the time during a period of observation that is representative of the quiet time for the soundscape under evaluation and with duration of ten (10) continuous minutes. Several contiguous ten (10) minute tests may be performed in one hour to determine the statistical stability of the sound environment. Measurement periods such as at dusk when bird and insect activity is high or the early morning hours when the 'dawn chorus' is present are not acceptable measurement times. Longer term sound level averaging tests, such as 24 hours or multiple days are not at all appropriate since the purpose is to define the quiet time background sound level. It is defined by the $L_{A\,90}$ and $L_{C\,90}$ descriptors. It may be considered as the quietest one (1) minute during a ten (10) minute test. $L_{A\,90}$ results are valid only when $L_{A\,10}$ results are no more than 10 dB above $L_{A\,90}$ for the same period. $L_{C\,10}$ less $L_{C\,90}$ are not to exceed 10 dB to be valid.

The background noise environment consists of a multitude of distant sources of sound. When a new nearby source is introduced the new background noise level would be increased. The addition of a new source with a noise level 10 below the existing background would increase the new background 0.4 dB. If the new source has the same noise level as the existing background then the new background is increased 3.0 dB. Lastly, if the new source is 3.3 dB above the existing background then the new background would have increased 5 dB. For example, to meet the requirement of L_{90A} + 5 dB = 31 dBA if the existing quiet nighttime background sound level is 26 dBA, the maximum wind turbine noise immission contribution independent of the background cannot exceed 29.3 dBA L_{eq} at a dwelling. When adding decibels, a 26 dBA background combined with 29.3 dBA from the turbines (without background) results in 31 dBA.

Further, background L_{90} sound levels documenting the pre-construction baseline conditions should be determined when the ten (10) minute maximum wind speed is less than 2 m/s (4.5 mph) near ground level/microphone location 1.5 m height.

"**Blade Passage Frequency**" (BPF) means the frequency at which the blades of a turbine pass a particular point during each revolution (e.g. lowest point or highest point in rotation) in terms of

events per second. A three bladed turbine rotating at 28 rpm would have a BPF of 1.4 Hz. [E.g. ((3 blades times 28rpm)/60 seconds per minute = 1.4 Hz BPF)]

"**C-Weighted Sound Level (dBC)**" Similar in concept to the A-Weighted sound Level (dBA) but C-weighting does not de-emphasize the frequencies below 1k Hz as A-weighting does. It is used for measurements that must include the contribution of low frequencies in a single number representing the entire frequency spectrum. Sound level meters have a C-weighting network for measuring C-weighted sound levels (dBC)meeting the characteristics and weighting specified in ANSI S1.43-1997 Specifications for Integrating Averaging Sound Level Meters for Type 1 instruments. In this document dBC means L_{Ceq} unless specified otherwise.

"**Decibel (dB)**" A dimensionless unit which denotes the ratio between two quantities that are proportional to power, energy or intensity. One of these quantities is a designated reference by which all other quantities of identical units are divided. The sound pressure level (Lp) in decibels is equal to 10 times the logarithm (to the base 10) of the ratio between the pressure squared divided by the reference pressure squared. The reference pressure used in acoustics is 20 MicroPascals.

"**Emission**" Sound energy that is emitted by a noise source (wind farm) is transmitted to a receiver (dwelling) where it is immitted (see "immission).

"**Frequency**" The number of oscillations or cycles per unit of time. Acoustical frequency is usually expressed in units of Hertz (Hz) where one Hz is equal to one cycle per second.

"**Height**" means the total distance measured from the grade of the property as existed prior to the construction of the wind energy system, facility, tower, turbine, or related facility at the base to its highest point.

"**Hertz (Hz)**" Frequency of sound expressed by cycles per second.

"**Immission**" Noise immitted at a receiver (dwelling) is transmitted from noise source (wind turbine) that emitted sound energy (see "emission").

"**Immission spectra imbalance**" The spectra are not in balance when the C-weighted sound level is more than 20 dB greater than the A-weighted sound level. For the purposes of this requirement, the A-weighted sound level is defined as the long-term background sound level (L_{A90}) +5 dBA. The C-weighted sound level is defined as the L_{Ceq} measured during the operation of the wind turbine operated so as to result in its highest sound output. A Complaint test provided later in this document is based on the immission spectra imbalance criteria.

"**Infra-Sound**" sound with energy in the frequency range of 0-20 Hz is considered to be infra-sound. It is normally considered to not be audible for most people unless in relatively high amplitude. However, there is a wide range between the most sensitive and least sensitive people to perception of sound and perception is not limited to stimulus of the auditory senses. The most significant exterior noise induced dwelling vibration occurs in the frequency range between 5 Hz and 50 Hz. Moreover, levels below the threshold of audibility can still cause measurable resonances inside dwelling interiors. Conditions that support or magnify resonance may also exist in human body cavities and organs under certain conditions. Although no specific test for infrasound is provided in this document, the test for immission spectra imbalance will limit low frequency sound and thus, indirectly limit infrasound. See low-frequency noise (LFN) for more information.

"**Low Frequency Noise (LFN)**" refers to sounds with energy in the lower frequency range of 20 to 200 Hz. LFN is deemed to be excessive when the difference between a C-weighted sound level and an A-weighted sound level is greater than 20 decibels at any measurement point outside a residence or

other occupied structure. The criteria for this condition is the "Immission Spectra Imbalance" entry in the **Table of Not-To-Exceed Property Line Sound Immission Limits.**"

"**Measurement Point (MP)**" means location where sound measurements are taken such that no significant obstruction blocks sound from the site. The Measurement Point should be located so as to not be near large objects such as buildings and in the line-of-sight to the nearest turbines. Proximity to large buildings or other structures should be twice the largest dimension of the structure, if possible. Measurement Points should be at quiet locations remote from street lights, transformers, street traffic, flowing water and other local noise sources.

"**Measurement Wind Speed**" For measurements conducted to establish the background noise levels ($L_{A90\ 10\ min}$, $L_{C90\ 10\ min}$, and etc.) the maximum wind speed, sampled within 5m of the microphone and at its height, shall be less than 2 m/s (4.5 mph) for valid background measurements. For valid wind farm noises measurements conducted to establish the post-construction sound level the maximum wind speed, sampled within 5m of the microphone and at its height, shall be less than 4m/s (9 mph). The wind speed at the WES blade height shall be at or above the nominal rated wind speed and operating in its highest sound output mode. For purposes of enforcement, the wind speed and direction at the WES blade height shall be selected to reproduce the conditions leading to the enforcement action while also restricting maximum wind speeds at the microphone to less than 4 m/s (9 mph).

For purposes of models used to predict the sound levels and sound pressure levels of the WES to be submitted with the Application, the wind speed shall be the speed that will result in the worst-case L_{Aeq} and L_{Ceq} sound levels at the nearest non-participating properties to the WES. If there may be more than one set of nearby sensitive receptors, models for each such condition shall be evaluated and the results shall be included in the Application.

"**Mechanical Noise**" means sound produced as a byproduct of the operation of the mechanical components of a WES(s) such as the gearbox, generator and transformers.

"**Noise**" means any unwanted sound. Not all noise needs to be excessively loud to represent an annoyance or interference.

"**Project Boundary**" means the external property boundaries of parcels owned by or leased by the WES developers. It is represented on a plot plan view by a continuous line encompassing all WES(s) and related equipment associated with the WES project.

"**Property Line**" means the recognized and mapped property parcel boundary line.

"**Qualified Independent Acoustical Consultant**" Qualifications for persons conducting baseline and other measurements and reviews related to the application for a WES or for enforcement actions against an operating WES include, at a minimum, demonstration of competence in the specialty of community noise testing. An example is a person with Full Membership in the Institute of Noise Control Engineers (INCE). There are scientists and engineers in other professional fields that have been called upon by their local community for help in the development of a WES Noise Ordinance. Many of these scientists and engineers have recently spent hundreds of hours learning many important aspects of noise related to the introduction of WES into their communities. Then with field measurement experience with background data and wind turbine noise emission, they have become qualified independent acoustical consultants for WES siting. Certifications such as Professional Engineer (P.E.) do not test for competence in acoustical principles and measurement and are thus not, without further qualification, appropriate for work under this document. The Independent Qualified Acoustical Consultant can have no financial or other connection to a WES developer or related company.

"**Sensitive Receptor**" means places or structures intended for human habitation, whether inhabited or not, public parks, state and federal wildlife areas, the manicured areas of recreational establishments designed for public use, including but not limited to golf courses, camp grounds and other nonagricultural state or federal licensed businesses. These areas are more likely to be sensitive to the exposure of the noise, shadow or flicker, etc. generated by a WES or WESF. These areas include, but are not limited to: schools, daycare centers, elder care facilities, hospitals, places of seated assemblage, non-agricultural businesses and residences.

"**Sound**" A fluctuation of air pressure which is propagated as a wave through air

"**Sound Power**" The total sound energy radiated by a source per unit time. The unit of measurement is the watt. Abbreviated as L_w. This information is determined for the WES manufacturer under laboratory conditions specified by IEC 61400-11 and provided to the local developer for use in computer model construction. There is known measurement error in this test procedure that must be disclosed and accounted for in the computer models. Even with the measurement error correction it cannot be assumed that the reported L_w values represent the highest sound output for all operating conditions. They reflect the operating conditions required to meet the IEC 61400-11 requirements. The lowest frequency is 50 Hz for acoustic power (L_w) requirement (at present) in IEC 61400-11. This Ordinance requires wind turbine certified acoustic power (L_w) levels at rated load for the total frequency range from 6.3 Hz to 10k Hz in one-third octave frequency bands tabulated to the nearest 1 dB. The frequency range of 6.3 Hz to 10k Hz shall be used throughout this Ordinance for all sound level modeling, measuring and reporting.

"**Sound Pressure**" The instantaneous difference between the actual pressure produced by a sound wave and the average or barometric pressure at a given point in space.

"**Sound Pressure Level (SPL)**" 20 times the logarithm, to the base 10, of the ratio of the pressure of the sound measured to the reference pressure, which is 20 micronewtons per square meter. In equation form, sound pressure level in units of decibels is expressed as SPL (dB) = 20 log p/pr.

"**Spectrum**" The description of a sound wave's resolution into its components of frequency and amplitude. The WES manufacturer is required to supply a one-third octave band frequency spectrum of the wind turbine sound emission at 90% of rated power. The published sound spectrum is often presented as A-weighted values but C-weighted values are preferred. This information is used to construct a model of the wind farm's sound immission levels at locations of interest in and around the WES. The frequency range of interest for wind turbine noise is approximately 6 Hz to 10k Hz.

"**Statistical Noise Levels**" Sounds that vary in level over time, such as road traffic noise and most community noise, are commonly described in terms of the statistical exceedance levels L_{NA}, where L_{NA} is the A-weighted sound level exceeded for N% of a given measurement period. For example, L_{10} is the noise level exceeded for 10% of the time. Of particular relevance, are: L_{A10} and L_{C10} the noise level exceed for 10% of the ten (10) minute interval. This is commonly referred to as the average maximum noise level. L_{A90} and L_{C90} are the A-weighted and C-weighted sound levels exceeded for 90% of the ten (10) minute sample period. The L_{90} noise level is defined by ANSI as the long-term background sound level (i.e. the sounds one hears in the absence of the noise source under consideration and without short term or near-by sounds from other sources), or simply the "background level." L_{eq} is the A or C-weighted equivalent noise level (the "average" noise level). It is defined as the steady sound level that contains the same amount of acoustical energy as the corresponding time-varying sound.

"**Tonal sound or tonality**" Tonal audibility. A sound for which the sound pressure is a simple sinusoidal function of the time, and characterized by its singleness of pitch. Tonal sound can be simple or complex.

"**Wind Energy Systems (WES)**" means equipment that converts and then transfers energy from the wind into usable forms of electrical energy.

"**Wind Turbine" or "Turbine" (WT)** means an industrial scale mechanical device which captures the kinetic energy of the wind and converts it into electricity. The primary components of a wind turbine are the blade assembly, electrical generator and tower.

III. APPLICATION PROCEDURE FOR WIND ENERGY SYSTEMS AND TECHNICAL REQUIREMENTS FOR LICENSING

This ordinance is intended to promote the safety and health of the community through criteria limiting sound emissions during operation of Wind Energy Systems. It is recognized that the requirements herein are neither exclusive, nor exhaustive. In instances where a health or safety concern is known to the wind project developer or identified by other means with regard to any application for a Wind Energy System, additional and/or more restrictive conditions may be included in the license to address such concerns. All rights are reserved to impose additional restrictions as circumstances warrant. Such additional or more restrictive conditions may include, without limitation (a) greater setbacks, (b) more restrictive noise limitations, or (c) limits restricting operation during night time periods or for any other conditions deemed reasonable to protect the community.

A. Application

Any Person desiring to secure a Wind Energy Systems license shall file an application form provided by the LGA Clerk, together with two additional copies of the application with the LGA Clerk.

B. Information to be submitted with Application

1. Information regarding the:

- Make and model of all turbines potentially used in this project,
- Sound Power Levels (L_w) for each 1/3 octave band from 6.3 Hz to 10,000 Hz, and
- A sound propagation model predicting the sound levels immitted into the community computed using at minimum 1/1 octave band sound power levels to compute the L_{Ceq} and L_{Aeq} levels to generate L_{Aeq} and L_{Ceq} contours in 5 dB increments overlaying an aerial view and property survey map from the WES property out to a distance to include all residential property within two (2) miles of the WES Property. Appropriate corrections for model algorithm error, IEC61400-11 test measurement accuracy, and directivity patterns of for each model of WT shall be disclosed and accounted for in the model(s). Predictions shall be made at all property lines within and outward for two (2) miles from the project boundary for the wind speed, direction and operating mode that would result in the worst case WT nighttime sound emissions.

The prediction model shall assume that the winds at hub height are sufficient for the highest sound emission operating mode. The projection shall include a description of all assumptions made in the model's construction and algorithms. If the model does not consider the effects of wind direction, geography of the terrain, and/or the effects of reinforcement from coherent sounds or tones from

the turbines all these items should be identified and all other means used to adjust the model's output to account for these factors. The results shall be displayed as a contour map of the predicted levels as over-all L_{Aeq} and L_{Ceq} contours out to 2 miles from the WES property, and shall also include a table showing the 1/3 or 1/1 octave band sound pressure as L_{Ceq} levels for the nearest property line(s) for sensitive receptor sites (including residences) within the model's boundaries. The predicted values must include the over-all sound levels and 1/1 or 1/3 octave band sound pressure levels from 6 Hz to 10k Hz in data tables that include the location of each receiving point by GPS location or other repeatable means.

C. Preconstruction Background Noise Survey

1. The Town reserves the right to require the preparation of (a) a preconstruction noise survey for each proposed Wind Turbine location conducted per procedures provided in the section on Measurement Procedures showing long-term background L_{A90} and L_{C90} sound levels. This must be completed and accepted prior to approval of the final layout and issuance of project permits.

    a. If any proposed wind farm project locates a WES within two miles of a sensitive receptor these studies are mandatory. The preconstruction baseline studies shall be conducted by an Independent Qualified Acoustical Consultant selected and hired by the LGA.

    b. The applicant shall be responsible for paying the consultant's fees and costs associated with conducting the study. These fees and cost shall be negotiated with the consultant and determined prior to any work being done on the study. The applicant shall be required to set aside 100% of these fees in an escrow account managed by the LGA, before the study is commenced by the consultant. Payment for this study does not require the WES developer's acceptance of the study's results.

    c. If the review shows that the predicted L_{Aeq} and L_{Ceq} sound levels exceed any of the criteria specified in the **Table of Not-To-Exceed Property Line Sound Immission Limits** then the application cannot be approved.

2. The LGA will refer the application to the LGA engineer (if qualified in acoustics) or an independent qualified acoustical consultant for further review and comparison of the long-term background sound levels against the predicted L_{Aeq} and L_{Ceq} sound levels reported for the model using the criteria in the **Table of Not-To-Exceed Property Line Sound Immission Limits**. The reasonably necessary costs associated with such a review shall be the responsibility of the applicant, in accord with the terms of this ordinance.

D. Post Construction Noise Measurement Requirements

1. **Sound Regulations Compliance**: A WES shall be considered in violation of the conditional use permit unless the applicant demonstrates that the project complies with all sound level limits using the procedures specified in this ordinance. Sound levels in excess of the limits established in this ordinance shall be grounds for the LGA to order immediate shut down of all non-compliant WT units.

2. **Post-Construction Sound Measurements**: Within twelve months of the date when the project is fully operational, and within four weeks of the anniversary date of the pre-construction background noise measurements, repeat the existing sound environment measurements taken before the project approval. Post-construction sound level measurements shall be taken both with all WES's running and with all WES's off. At the discretion of the Town, the Pre-construction background sound levels (L_{A90} and L_{C90}) can be substituted for the "all WES off' tests if a random sampling of 10% of the pre-construction study sites shows that background L_{90A} and L_{90C} conditions have increased less than 3 dB from those measured under the pre-

construction nighttime conditions. The post-construction measurements will be reported to the LGA (available for public review) using the same format as used for the preconstruction sound studies. Post-construction noise studies shall be conducted by a firm chosen and hired by the LGA. Costs of these studies are to be reimbursed by the Licensee in a similar manner to that described above. The wind farm developer's may ask to have its own consultant observe the publicly retained consultant at the convenience of the latter. The WES Licensee shall provide all technical information and wind farm data required by the qualified independent acoustical consultant before, during, and/or after any acoustical studies required by this document and for acoustical measurements.

3. Sound Limits

1. Establishing Long-Term Background Sound Level

a. Instrumentation: ANSI or IEC Type 1 Precision Integrating Sound Level Meter plus meteorological instruments to measure wind velocity, temperature and humidity near the sound measuring microphone. Measurement procedures must meet ANSI S12.9, Part 3 and Measurement Procedures Appendix to Ordinance following next Section.

b. Measurement location(s): Nearest property line(s) from proposed wind turbines representative of all non-participating residential property within 2.0 miles.

c. Time of measurements and prevailing weather: The atmosphere must be classified as stable with no vertical heat flow to cause air mixing. Stable conditions occur in the evening and middle of the night with a clear sky and very little wind near the surface. Sound measurements are only valid when the measured maximum wind speed at the microphone must be less than 2 m/s (4.5 mph).

d. Long-Term Background sound measurements: All data recording shall be a series of contiguous ten (10) minute measurements. The measurement objective is to determine the quietest ten minute period at each location of interest. Nighttime test periods are preferred unless daytime conditions are quieter. The following data shall be recorded simultaneously for each ten (10) minute measurement period: dBA data includes L_{A90}, L_{A10}, L_{Aeq} and dBC data includes L_{C90}, L_{C10}, and L_{Ceq}. The maximum wind speed at the microphone during the ten minutes, a single measurement of temperature and humidity at the microphone for each new location or each hour whichever is oftener shall also be recorded. A ten (10) minute measurement contains valid data provided: Both L_{A10} minus L_{A90} and L_{C10} minus L_{C90} are not greater than 10 dB and the maximum wind speed at the microphone is less than 2 m/s during the same ten (10) minute period as the acoustic data.

2. Wind Turbine Sound Immission Limits

No wind turbine or group of turbines shall be located so as to cause wind turbine sound immission at any location on non-participating property containing a residence in excess of the limits in the following table:

Table of Not-To-Exceed Property Line Sound Immission Limits [1]			
Criteria	**Condition**	**dBA**	**dBC**
A	Immission above pre-construction background:	$L_{Aeq} = L_{A90} + 5$	$L_{Ceq} = L_{C90} + 5$
B	Maximum immission:	35 L_{Aeq}	55 L_{Ceq} for quiet[2] rural environment 60 L_{Ceq} for rural-suburban environment
C	Immission spectra imbalance (C - A $\leq$ 20dB)	L_{Ceq} (immission) minus (L_{A90} (background) +5 dB) $\leq$ 20 dB	
D	Prominent tone penalty:	5 dB	5 dB
Notes			
1	Each Test is independent and exceedances of any test establishes non-compliance Sound "immission" is the wind turbine sound emission as received at a property.		
2	A "quiet rural environment" is a location 2 miles from a major transportation artery without high traffic volume during otherwise quiet periods of the day or night.		
3	Prominent tone as defined in IEC 61400-11. This Standard is not to be used for any other purpose.		
[1] Required Procedures provided in VIII Reference Standards including ANSI 12.9 Part 3 as Amended			

3. Wind Farm Noise Compliance Testing

All of the measurements outlined above in 1. Establishing Long Term Background Noise Level must be repeated to determine compliance with 2. Wind Turbine Sound Immission Limits. The compliance test location is to be the pre-turbine background noise measurement location nearest to the home of the complainant in line with the wind farm and nearer to the wind farm. The time of day for the testing and the wind farm operating conditions plus wind speed and direction must replicate the conditions that generated the complaint. Procedures of ANSI S12.9- Part 3 apply as amended in the Appendix to Ordinance. The effect of instrumentation limits for wind and other factors must be recognized and followed.

3. Operations

The WES/WT is non-compliant and must be shut down immediately if it exceeds any of the limits in the **Table of Not-To-Exceed Property Line Sound Immission Limits.**

4. Complaint Resolution

1. The owner/operator of the WES shall respond within five (5) business days after notified of a noise complaint by any property owner within the project boundary and a one-mile radius beyond the project boundary.
2. The tests shall be performed by a qualified independent acoustical consultant acceptable to the complainant and the local agency charged with enforcement of this ordinance.
3. Testing shall commence within ten (10) working days of the request. If testing cannot be initiated within ten (10) days, the WES(s) in question shall be shut down until the testing can be started.
4. A copy of the test results shall be sent to the property owner, and the LGA's Planning or Zoning department within thirty (30) days of test completion.
5. If a Complaint is made, the presumption shall be that it is reasonable. The LGA shall undertake an investigation of the alleged operational violation by a qualified individual mutually acceptable to the LGA.

a) The reasonable cost and fees incurred by the LGA in retaining said qualified individual shall be reimbursed by the owner of the WESF.

b) Funds for this assessment shall be paid or put into an escrow account prior to the study and payment shall be independent of the study findings.

6. After the investigation, if the LGA reasonably concludes that operational violations are shown to be caused by the WESF, the licensee/operator/owner shall use reasonable efforts to mitigate such problems on a case-by-case basis including such measures as not operating during the nighttime or other noise sensitive period if such operation was the cause of the complaints.

5. Reimbursement of Fees and Costs.

Licensee/operator/owner agrees to reimburse the LGA 's reasonable fees and costs incurred in the preparation, negotiation, administration and enforcement of this Ordinance, including, without limitation, the LGA 's attorneys' fees, engineering and/or consultant fees, LGA meeting and hearing fees and the costs of public notices. If requested by the LGA the funds shall be placed in an escrow account under the management of the LGA. The preceding fees are payable within thirty (30) days of invoice. Unpaid invoices shall bear interest at the rate of 1% per month until paid. The LGA may recover all reasonable costs of collection, including attorneys' fees.

VII. MEASUREMENT PROCEDURES

SUPPLEMENT TO WIND ENERGY SYSTEMS LICENSING ORDINANCE FOR SOUND

I. Introduction

The potential impact of sound and sound induced building vibration associated with the operation of wind powered electric generators is often a primary concern for citizens living near proposed wind energy systems (WES(s)). This is especially true of projects located near homes, residential neighborhoods, businesses, schools, and hospitals in quiet residential and rural communities. Determining the likely sound and vibration impacts is a highly technical undertaking and requires a serious effort in order to collect reliable and meaningful data for both the public and decision makers.

This protocol is based in part on criteria published in American National Standards S12.9 -Part 3 Quantities and Procedures for Description and Measurement of Environmental Sound, and S12.18 and for the measurement of sound pressure level outdoors.

The purpose is to first, establish a consistent and scientifically sound procedure for evaluating existing background levels of audible and low frequency sound in a WES project area, and second to use the information provided by the Applicant in its Application showing the predicted over-all sound levels in terms of L_{Aeq} and L_{Ceq} and 1/3 or 1/1 octave bands as part of the required information submitted with the application.

The over-all values shall be presented as overlays to the applicant's iso-level plot plan graphics and, for 1/1 or 1/3 octave data, in tabular form with location information sufficient to permit comparison of the baseline results to the predicted levels. This comparison will use the level limits of the ordinance to determine the likely impact operation of a new wind energy system project will have on the existing community soundscape. If the comparison demonstrates that the WES project will not exceed any of the level limits the project will be considered to be within allowable limits for safety and health. If the Applicant submits only partial information required for this comparison

the application cannot be approved. In all cases the burden to establish the operation as meeting safety and health limits will be on the Applicant.

Next, it covers requirements for the sound propagation model to be supplied with the application.

Finally, if the project is approved, this section covers the study needed to compare the post-build sound levels to the predictions and the baseline study. The level limits in the ordinance apply to the post-build study. In addition, if there have been any complaints about WES sound or low frequency noise emissions or wind turbine noise induced dwelling vibration by any resident of an occupied dwelling that property will be included in the post-build study for evaluation against the rules for sound level limits and compliance.

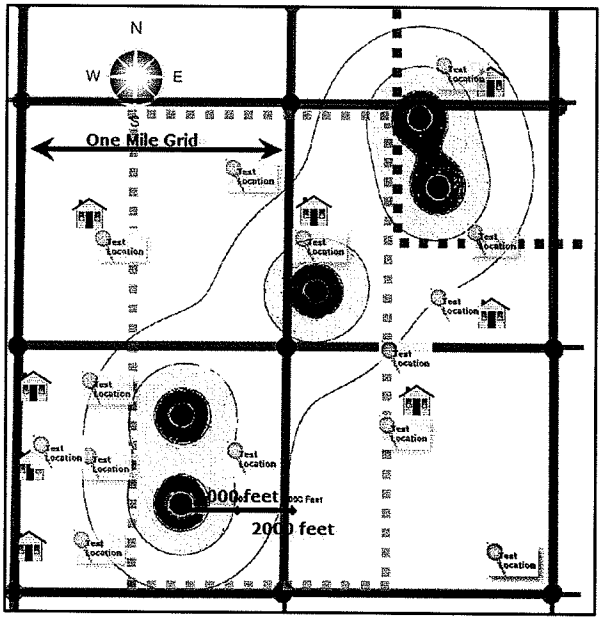
The characteristics of the proposed WES project and the features of the surrounding environment will influence the design of the sound and vibration study. Site layout, types of WES(s) selected and the existence of other significant local audible and low frequency sound sources and sensitive receptors should be taken into consideration when designing a sound study. The work will be performed by a qualified independent acoustical consultant for both the pre-construction background and post-construction sound studies as described in the body of the ordinance.

II. Instrumentation

All instruments and other tools used to measure audible, inaudible and low frequency sound shall meet the requirements for ANSI or IEC Type 1 Integrating Averaging Sound Level Meter Standards The principle standard reference for this document is ANSI 12.9/Part 3 with important additional specific requirements for the measuring instrumentation and measurement protocol.

III. Measurement of Pre-Construction Sound Environment (Base-line)

An assessment of the proposed WES project areas existing sound environment is necessary in order to predict the likely impact resulting from a proposed project. The following guidelines must be used in developing a reasonable estimate of an area's existing background sound environment. All testing is to be performed by an independent qualified acoustical consultant approved by the LGA as provided in the body of the ordinance. The WES applicant may file objections detailing any concerns it may have with the LGA's selection. These concerns will be addressed in the study. Objections must be filed prior to the start of the noise study. All measurements are to be conducted with ANSI or IEC Type 1 certified and calibrated test equipment per reference specification at the end of this section. Test results will be reported to the LGA or its appointed representative.



Sites with No Existing Wind Energy Systems (Base-line Sound Study)

Sound level measurements shall be taken as follows:

The results of the model showing the predicted worst case L_{Aeq} and L_{Ceq} sound emissions of the proposed WES project will be overlaid on a map (or separate L_{Aeq} and L_{Ceq} maps) of the project area. An example (right) shows an approximately two (2) mile square section with iso-level contour lines prepared by the

applicant, sensitive receptors (homes) and locations selected for the baseline sound tests whichever are the controlling metric. The test points shall be located at the property line bounding the property of the turbine's host closest to the wind turbine. Additional sites may be added if appropriate. A grid comprised of one (1) mile boundaries (each grid cell is one (1) square mile) should be used to assist in identifying between two (2) to ten (10) measurement points per cell. The grid shall extend to a minimum of two (2) miles beyond the perimeter of the project boundary. This may be extended to more than two (2) miles at the discretion of the LGA. The measurement points shall be selected to represent the noise sensitive receptor sites based on the anticipated sound propagation from the combined WT in the project. Usually, this will be the closest WT. If there is more than one WT near-by then more than one test site may be required.

The intent is to anticipate the locations along the bounding property line that will receive the highest sound immissions. The site that will most likely be negatively affected by the WES project's sound emissions should be given first priority in testing. These sites may include sites adjacent to occupied dwellings or other noise sensitive receptor sites. Sites shall be selected to represent the locations where the background soundscapes reflect the quietest locations of the sensitive receptor sites. Background sound levels (and 1/3 octave band sound pressure levels if required) shall be obtained according to the definitions and procedures provided in the ordinance and recognized acoustical testing practice and standards.

All properties within the proposed WES project boundaries will be considered for this study.

One test shall be conducted during the period defined by the months of April through November with the preferred time being the months of June through August. These months are normally associated with more contact with the outdoors and when homes may have open windows during the evening and night. Unless directed otherwise by the LGA the season chosen for testing will represent the background soundscape for other seasons. At the discretion of the LGA, tests may be scheduled for other seasons.

All measurement points (MPs) shall be located with assistance from the LGA staff and property owner(s) and positioned such that no significant obstruction (building, trees, etc.) blocks sound and vibration from the nearest proposed WES site.

Duration of measurements shall be a minimum of ten (10) continuous minutes for all criteria at each location. The duration must include at least six (6) minutes that are not affected by transient sounds from near-by and non-nature sources. Multiple ten (10) minute samples over longer periods such as 30 minutes or one (1) hour may be used to improve the reliability of the L_{A90} and L_{C90} values. The ten (10) minute sample with the lowest valid L_{90} values will be used to define the background sound.

The tests at each site selected for this study shall be taken during the expected 'quietest period of the day or night' as appropriate for the site. For the purpose of determining background sound characteristics the preferred testing time is from 10pm until 4 am. If circumstances indicated that a different time of the day should be sampled the test may be conducted at the alternate time if approved by the Town.

Sound level measurements shall be made on a weekday of a non-holiday week. Weekend measurements may also be taken at selected sites where there are weekend activities that may be affected by WT sound.

Measurements must be taken with the microphone at 1.2 to 1.5 meters above the ground and at least 15 feet from any reflective surface following ANSI 12.9 Part 3 protocol including selected options and other requirements outlined later in this Section.

Reporting

1. For each Measurement Point and for each qualified measurement period, provide each of the following measurements:

a. L_{Aeq}, L_{A10}, and L_{A90}, and

b. L_{Ceq} , L_{C10}, and L_{C90}

2. A narrative description of any intermittent sounds registered during each measurement. This may be augmented with video and audio recordings.

3. A narrative description of the steady sounds that form the background soundscape. This may be augmented with video and audio recordings.

4. Wind speed and direction at the microphone (Measurement Point), humidity and temperature at time of measurement will be included in the documentation. Corresponding information from the nearest 10 meter weather reporting station shall also be obtained.

Measurements taken only when wind speeds are less than 2m/s (4.5 mph) at the microphone location will be considered valid for this study. A windscreen of the type recommended by the monitoring instrument's manufacturer must be used for all data collection.

5. Provide a map and/or diagram clearly showing (Using plot plan provided by LGA or Applicant):

- The layout of the project area, including topography, the project boundary lines, and property lines.
- The locations of the Measurement Points.
- The distance between any Measurement Points and the nearest WT(s).
- The location of significant local non-WES sound and vibration sources.
- The distance between all MPs and significant local sound sources. And,
- The location of all sensitive receptors including but not limited to: schools, day-care centers, hospitals, residences, residential neighborhoods, places of worship, and elderly care facilities.

Sites with Existing Wind Energy Systems

Two complete sets of sound level measurements must be taken as defined below:

1. One set of measurements with the wind generator(s) off unless the LGA elects to substitute the sound data collected for the background sound study. Wind speeds must be suitable for background sound tests as specified elsewhere in this ordinance.

2. One set of measurements with the wind generator(s) running with wind speed at hub height sufficient to meet nominal rated power output or higher and less than 2 m/s below at the microphone location. Conditions should reflect the worst case sound emissions from the WES project. This will normally involve tests taken during the evening or night when winds are calm (less than 2m/sec) at the ground surface yet, at hub height, sufficient to power the turbines.

Sound level measurements and meteorological conditions at the microphone shall be taken and documented as discussed above.

Sound level Estimate for Proposed Wind Energy Systems (when adding more WT to existing project)

In order to estimate the sound impact of the proposed WES project on the existing environment an estimate of the sound produced by the proposed WES(s) under worst-case conditions for

producing sound emissions must be provided. This study may be conducted by a firm chosen by the WES operator with oversight provided by the LGA.

The qualifications of the firm should be presented along with details of the procedure that will be used, software applications, and any limitations to the software or prediction methods as required elsewhere in this ordinance for models.

Provide the manufacturer's sound power level (L_{Aw}) and (L_{Cw}) characteristics for the proposed WES(s) operating at full load utilizing the methodology in IEC 61400-11 Wind Turbine Noise Standard. Provide one-third octave band sound power level information from 6.3 Hz to 10k Hz. Furnish the data using no frequency weighting. A-weighted data is optional. Provide sound pressure levels predicted for the WES(s) in combination and at full operation and at maximum sound power output for all areas where the predictions indicate L_{Aeq} levels of 30 dBA and above. The same area shall be used for reporting the predicted L_{Ceq} levels. Contour lines shall be in increments of 5 dB.

Present tables with the predicted sound levels for the proposed WES(s) as L_{Aeq} and L_{Ceq} and at all octave band centers (8 Hz to 10k Hz) for distances of 500, 1000, 1500, 2000, 2500 and 5000 feet from the center of the area with the highest density of WES(s). For projects with multiple WES(s), the combined sound level impact for all WES(s) operating at full load must be estimated.

The above tables must include the impact (increased dBA and dBC (L_{eq}) above baseline L_{90} background sound levels) of the WES operations on all residential and other noise sensitive receiving locations within the project boundary. To the extent possible, the tables should include the sites tested (or likely to be tested) in the background study.

Provide a contour map of the expected sound level from the new WES(s), using 5dB L_{Aeq} and L_{Ceq} increments created by the proposed WES(s) extending out to a distance of two (2) miles from the project boundary, or other distance necessary, to show the 25 L_{Aeq} and 50 L_{Ceq} boundaries.

Provide a description of the impact of the proposed sound from the WES project on the existing environment. The results should anticipate the receptor sites that will be most negatively impacted by the WES project and to the extent possible provide data for each MP that are likely to be selected in the background sound study (note the sensitive receptor MPs):

1. Report expected changes to existing sound levels for L_{Aeq} and L_{A90}
2. Report expected changes to existing sound levels for L_{Ceq} and L_{C90}
3. Report the expected changes to existing sound pressure levels for each of the 1/1 or 1/3 octave bands in tabular form from 8 Hz to 10k Hz.
4. Report all assumptions made in arriving at the estimate of impact, any limitations that might cause the sound levels to exceed the values of the estimate, and any conclusions reached regarding the potential effects on people living near the project area. If the effects of coherence, worst case weather, or operating conditions are not reflected in the model a discussion of how these factors could increase the predicted values is required.
5. Include an estimate of the number of hours of operation expected from the proposed WES(s) and under what conditions the WES(s) would be expected to run. Any differences from the information filed with the Application should be addressed.

IV. Post-Construction Measurements

Post Construction Measurements should be conducted by a qualified noise consultant selected by and under the direction of the LGA. The requirements of this Appendix for Sites with Existing Wind Energy Systems shall apply

1. Within twelve months of the date when the project is fully operational, preferably within two weeks of the anniversary date of the pre-construction background sound measurements, repeat the measurements. Post-construction sound level measurements shall be taken both with all WES(s) running and with all WES(s) off except as provided in this ordinance.

2. Report post-construction measurements to the LGA using the same format as used for the background sound study.

VIII. REFERENCE Standards and ANSI S12.9 Part 3 with Required Amendments

ANSI/ASA S12.9-1993/Part 3 (R2008) - American National Standard Quantities and Procedures for Description and Measurement of Environmental Sound, Part 3: Short-Term Measurements with an Observer Present.

This standard is the second in a series of parts concerning description and measurement of outdoor environmental sound. The standard describes recommended procedures for measurement of short-term, time-average environmental sound outdoors at one or more locations in a community for environmental assessment or planning for compatible land uses and for other purposes such as demonstrating compliance with a regulation. These measurements are distinguished by the requirement to have an observer present. Sound may be produced by one or more separate, distributed sources of sound such as a highway, factory, or airport. Methods are given to correct the measured levels for the influence of background sound.

Wind Turbine Siting Acoustical Measurements
ANSI S12.9 Part 3 Selected Options and Requirement Amendments

For the purposes of this ordinance specific options provided in ANSI S12.9-Part 3 (2008) shall apply with the additional following requirements to Sections in ANSI S12.9/Part 3:

5.2 background sound: Use definition (1) 'long-term'
5.2 long-term background sound: The L_{90} excludes short term background sounds
5.3 basic measurement period: Ten (10) minutes $L_{90(10\ min)}$
5.6 Sound Measuring Instrument: Type 1 Integrating Meter meeting ANSI S1.43 or IEC 61672-1. The sound level meter shall cover the frequency range from 6.3 Hz to 20k Hz and simultaneously measure dBA L_N and dBC L_N. The instrument must also be capable of accurately measuring low-level background sounds down to 20 dBA.
6.5 Windscreen: Required
6.6(a) An anemometer accurate to ± 10% at 2m/s. to full scale accuracy. The anemometer shall be located 1.5 to 2m above the ground and orientated to record maximum wind velocity. The maximum wind velocity, wind direction, temperature and humidity shall be recorded for each ten (10) minute sound measurement period observed within 5 m. of the measuring microphone..
7.1 Long-term background sound
7.2 Data collection Methods: Second method with observed samples to avoid contamination by short term sounds (purpose: to avoid loss of statistical data)
8 Source(s) Data Collection: All requirements in ANSI S12.18 Method #2 precision to the extent possible while still permitting testing of the conditions that lead to complaints. The

meteorological requirements in ANSI S12.18 may not be applicable for some complaints. For sound measurements in response to a complaint, the compliance sound measurements should be made under conditions that replicate the conditions that caused the complaint without exceeding instrument and windscreen limits and tolerances.

8.1(b) Measuring microphone with windscreen shall be located 1.2m to 1.8m (1.5m preferred) above the ground and greater than 8m from large sound reflecting surface.

8.3(a) All meteorological observations required at both (not either) microphone and nearest 10m weather reporting station.

8.3(b) For a 10 minute background sound measurement to be valid the wind velocity shall be less then 2m/s (4.5 mph) measured less than 5m from the microphone. Compliance sound measurements shall be taken when winds shall be less than 4m/s at the microphone.

8.3(c) In addition to the required acoustic calibration checks, the sound measuring instrument internal noise floor, including microphone, must also be checked at the end of each series of ten minute measurements and no less frequently than once per day. Insert the microphone into the acoustic calibrator with the calibrator signal off. Record the observed dBA and dBC reading on the sound level meter to determine an approximation of the instrument self noise. Perform this test before leaving the background measurement location. This calibrator-covered microphone must demonstrate the results of this test are at least 5 dB below the immediately previous ten-minute acoustic test results, for the acoustic background data to be valid. This test is necessary to detect undesired increase in the microphone and sound level meter internal self-noise. As a precaution sound measuring instrumentation should be removed from any air-conditioned space at least an hour before use. Nighttime measurements are often performed very near the meteorological dew point. Minor moisture condensation inside a microphone or sound level meter can increase the instrument self noise and void the measured background data.

8.4 The remaining sections starting at 8.4 in ANSI S12.9 Part 3 Standard do not apply.

ANSI S12.18-1994 (R2004) American National Standard Procedures for Outdoor Measurement of Sound Pressure Level

This American National Standard describes procedures for the measurement of sound pressure levels in the outdoor environment, considering the effects of the ground, the effects of refraction due to wind and temperature gradients, and the effects due to turbulence. This standard is focused on measurement of sound pressure levels produced by specific sources outdoors. The measured sound pressure levels can be used to calculate sound pressure levels at other distances from the source or to extrapolate to other environmental conditions or to assess compliance with regulation. This standard describes two methods to measure sound pressure levels outdoors. METHOD No. 1: general method; outlines conditions for routine measurements. METHOD No. 2: precision method; describes strict conditions for more accurate measurements. This standard assumes the measurement of A-weighted sound pressure level or time-averaged sound pressure level or octave, 1/3-octave or narrow-band sound pressure level, but does not preclude determination of other sound descriptors.

ANSI S1.43-1997(R2007) American National Standard Specifications for Integrating Averaging Sound Level Meters

This Standard describes instruments for the measurement of frequency-weighted and time-average sound pressure levels. Optionally, sound exposure levels may be measured. This standard is consistent with the relevant requirements of ANSI S1.4-1983(R 1997) American National Standard Specification for Sound Level Meters, but specifies additional characteristics that are necessary to

measure the time-average sound pressure level of steady, intermittent, fluctuating, and impulsive sounds.

ANSI S1.11-2004 American National Standard 'Specification for Octave-Band and Fractional-Octave-Band Analog and Digital Filters'

This standard provides performance requirements for analog, sampled-data, and digital implementations of band-pass filters that comprise a filter set or spectrum analyzer for acoustical measurements. It supersedes ANSI S1.11-1986 (R1998) American National Standard Specification for Octave-Band and Fractional-Octave-Band Analog and Digital Filters, and is a counterpart to International Standard IEC 61260:1995 Electroacoustics - Octave-Band and Fractional-Octave-Band Filters. Significant changes from ANSI S1.11-1986 have been adopted in order to conform to most of the specifications of IEC 61260:1995. This standard differs from IEC 61260:1995 in three ways: (1) the test methods of IEC 61260 clauses 5 is moved to an informative annex, (2) the term 'band number,' not present in IEC 61260, is used as in ANSI S1.11-1986, (3) references to American National Standards are incorporated, and (4) minor editorial and style differences are incorporated.

ANSI S1.40-2006 American National Standard Specifications and Verification Procedures for Sound Calibrators

IEC 61400-11

Second edition 2002-12, Amendment 1 2006-05

IEC 61400-11

Second edition 2002-12, Amendment 1 2006-0

Wind turbine generator systems –Part 11: Acoustic noise measurement techniques

The purpose of this part of IEC 61400 is to provide a uniform methodology that will ensure consistency and accuracy in the measurement and analysis of acoustical emissions by wind turbine generator systems. The standard has been prepared with the anticipation that it would be applied by:

- the wind turbine manufacturer striving to meet well defined acoustic emission performance requirements and/or a possible declaration system;
- the wind turbine purchaser in specifying such performance requirements;
- the wind turbine operator who may be required to verify that stated, or required, acoustic performance specifications are met for new or refurbished units;
- the wind turbine planner or regulator who must be able to accurately and fairly define acoustical emission characteristics of a wind turbine in response to environmental regulations or permit requirements for new or modified installations.

This standard provides guidance in the measurement, analysis and reporting of complex acoustic emissions from wind turbine generator systems. The standard will benefit those parties involved in the manufacture, installation, planning and permitting, operation, utilization, and regulation of wind turbines. The measurement and analysis techniques recommended in this document should be applied by all parties to insure that continuing development and operation of wind turbines is carried out in an atmosphere of consistent and accurate communication relative to environmental concerns. This standard presents measurement and reporting procedures expected to provide accurate results that can be replicated by others.

End of Measurement Procedure

VIII. Noise-Con 2008 Paper

Dearborn, Michigan

NOISE-CON 2008

2008 July 28-31

Simple guidelines for siting wind turbines to prevent health risks[30]

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Revision: 2.1[31]

Industrial scale wind turbines are a familiar part of the landscape in Europe, U.K. and other parts of the world. In the U.S., however, similar industrial scale wind energy developments are just beginning operation. The presence of industrial wind projects will increase dramatically over the next few years given the push by the Federal and state governments to promote renewable energy sources through tax incentives and other forms of economic and political support. States and local governments in the U.S. are promoting what appear to be lenient rules for how industrial wind farms can be located in communities, which are predominantly rural and often very quiet. Studies already completed and currently in progress describe significant health effects associated with living in the vicinity of industrial grade wind turbines. This paper reviews sound studies conducted by consultants for governments, the wind turbine owner, or the local residents for a number of sites with known health or annoyance problems. The purpose is to determine if a set of simple guidelines using dBA and dBC sound levels can serve as the 'safe' siting guidelines. Findings of the review and recommendations for sound limits will be presented. A discussion of how the proposed limits would have affected the existing sites where people have demonstrated pathologies apparently related to wind turbine sound will also be presented.

Background

A relatively new source of community noise is spreading rapidly across the rural U.S. countryside. Industrial grade wind turbines, a common sight in many European countries, are now being promoted by Federal and state governments as the way to minimize coal powered electrical energy and its effects on global warming. But, the initial developments using the newer 1.5 to 3 MWatt wind turbines here in the U.S. has also led to numerous complaints from

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[30]

[31] The criteria table at the end of this paper and portions of the narrative have been revised to reflect our current understanding of how to specify the sound limits with less ambiguity and to use the new format for presenting them.

residents who find themselves no longer in the quiet rural communities they were living in before the wind turbine developments went on-line. Questions have been raised about whether the current siting guidelines being used in the U.S. are sufficiently protective for the people living closest to the developments. Research being conducted into the health issues using data from established wind turbine developments is beginning to appear that supports the possibility there is a basis for the health concerns. Other research into the computer modeling and other methods used for determining the layout of the industrial wind turbine developments and the distances from residents in the adjacent communities are showing that the output of the models should not be considered accurate enough to be used as the sole basis for making the siting decisions.

The authors have reviewed a number of noise studies conducted in response to community complaints for wind energy systems sited in Europe, Canada, and the U.S. to determine if additional criteria are needed for establishing safe limits for industrial wind turbine sound immissions in rural communities. In several cases, the residents who filed the complaints have been included in studies by medical researchers who are investigating the potential health risks associated with living near industrial grade wind turbines 365 days a year. These studies were also reviewed by the authors to help in identifying what factors need to be considered in setting criteria for 'safe' sound limits at receiving properties. Due to concerns about medical privacy, details of these studies are not discussed in this paper. Current standards used in the U.S. and in most other parts of the world rely on not-to-exceed dBA sound levels, such as 50 dBA, or on not-to-exceed limits based on the pre-construction background sound level plus an adder (e.g. L_{90A} + 5 dBA).

Our review covered the community noise studies performed in response to complaints, research on health issues related to wind turbine noise, critiques of noise studies performed by consultants working for the wind developer, and research/technical papers on wind turbine sound immissions and related topics. The papers are listed in Tables 1-4.

Table 1-List of Studies Related to Complaints

Resource Systems Engineering, Sound Level Study - Ambient & Operations Sound Level Monitoring, Maine Department of Environmental Protection Order No. L-21635-26-A-N, June 2007
ESS Group, Inc., Draft Environmental Impact Statement For The Dutch Hill Wind Power Project - Town of Cohocton, NY, November 2006
David M. Hessler, Environmental Sound Survey and Noise Impact Assessment - Noble Wethersfield Wind park - Towns of Wethersfield and Eagle NY For: Noble Environmental Power, LLC January 2007
George Hessler, "Report Number 101006-1, Noise Assessment Jordanville Wind Power Project," October 2006
HGC Engineering, "Environmental Noise Assessment Pubnico Point Wind Farm, Nova Scotia, Natural Resources Canada Contract NRCAN-06-0046," August 23, 2006
John I. Walker, Sound Quality Monitoring, East Point, Prince Edward Island" by Jacques Whitford, Consultants for Prince Edward Island Energy Corporation, May 28, 2007

Table 2- List of Studies related to Health

Nina Pierpont, "Wind Turbine Syndrome – Abstract" from draft article and personal conversations. www.ninapierpont.com
Nina Pierpont, "Letter from Dr. Pierpont to a resident of Ontario, Canada, re: Wind Turbine Syndrome," Autumn 2007
Amanda Harry, "Wind Turbine Noise and Health" (2007)
Barbara J. Frey and Peter J. Hadden, "Noise Radiation from Wind Turbines Installed Near Homes, Effects on Health" (2007)
Eja Pedersen, "Human response to wind turbine noise – Perception, annoyance and moderating factors, Occupational and Environmental Medicine," The Sahlgrenska Academy, Gotenborg 2007
Robin Phipps, "In the Matter of Moturimu Wind Farm Application, Palmerston North, Australia," March 2007
WHO European Centre for Environment and Health, Bonn Office, "Report on the third meeting on night noise guidelines," April 2005

Table 3-List of Studies that review Siting Impact Statements

Richard H. Bolton, "Evaluation of Environmental Noise Analysis for 'Jordanville Wind Power Project,'" December 14, 2006 Rev 3.
Clifford P. Schneider, "Accuracy of Model Predictions and the Effects of Atmospheric Stability on Wind Turbine Noise at the Maple Ridge Wind Power Facility," Lowville, NY – 2007

Table 4-List of Research and Technical papers included in review process

Anthony L. Rogers, James F. Manwell, Sally Wright, "Wind Turbine Acoustic Noise," Renewable Energy Research Laboratory, Dept. of ME and IE, U of Mass, Amherst, amended June 2006
ISO. 1996. Acoustics - Attenuation of sound during propagation outdoors - Part 2: General method of calculation. International Organization of Standardization. ISO 9613-2. p. 18.
G.P. van den Berg, "The Sounds of High Winds – the effect of atmospheric stability on wind turbine sound and microphone noise," Ph.D. thesis, 2006
Fritz van den Berg, "Wind Profiles over Complex Terrain," Proceedings of Second International Meeting on Wind Turbine Noise, Lyons, France, Sept. 2007
William K. G. Palmer, "Uncloaking the Nature of Wind Turbines-Using the Science of Meteorology," Proceedings of Second International Meeting on Wind Turbine Noise, Lyons, France, Sept. 2007
Soren Vase Legarth, "Auralization and Assessment of Annoyance from Wind Turbines," Proceedings of Second International Meeting on Wind Turbine Noise, Lyons, France, Sept. 2007
Julian T. and Jane Davis, "Living with aerodynamic modulation, low frequency vibration

and sleep deprivation - how wind turbines inappropriately placed can act collectively and destroy rural quietitude," Proceedings of Second International Meeting on Wind Turbine Noise, Lyons, France, Sept. 2007
James D. Barnes, "A Variety of Wind Turbine Noise Regulations in the United States - 2007," Proceedings of Second International Meeting on Wind Turbine Noise, Lyons, France, Sept. 2007
M. Schwartz and D. Elliott, Wind Shear Characteristics at Central Plains Tall Towers, NREL 2006
IEC 61400 "Wind turbine generator systems, Part 11: Acoustic noise measurement techniques,".rev:2002

Discussion

After reviewing the materials in the tables; we have arrived at our current understanding of wind turbine noise and its impact on the host community and its residents. The review showed that some residents living as far as 3 km (two (2) miles) from a wind farm complain of sleep disturbance from the noise. Many residents living one-tenth this distance (300 m. or 1000 feet) from a wind farm are experiencing major sleep disruption and other serious medical problems from nighttime wind turbine noise. The peculiar acoustic characteristics of wind turbine noise immissions cause the sounds heard at the receiving properties to be more annoying and troublesome than the more familiar noise from traffic and industrial factories. Limits used for these other community noise sources do not appear to be appropriate for siting industrial wind turbines. The residents who are annoyed by wind turbine noise complain of the approximately one (1) second repetitive swoosh-boom-swoosh-boom sound of the turbine blades and "low frequency" noise. It is not apparent to these authors whether the complaints that refer to "low frequency" noise are about the audible low frequency part of the swoosh-boom sound, the one hertz amplitude modulation of the swoosh-boom sound, or some combination of both acoustic phenomena.

To assist in understanding the issues at hand, the authors developed the 'conceptual' graph for industrial wind turbine sound shown in Figure 1. This graph shows the data from one of the complaint sites plotted against the sound immission spectra for a modern 2.5 MWatt wind turbine; Young's threshold of perception for the 10% most sensitive population (ISO 0266); and a spectrum obtained for a rural community during a three hour, 20 minute test from 11:45 pm until 3:05 am on a windless June evening in near Ubly, Michigan a quiet rural community located in central Huron County. (Also called: Michigan's "Thumb.") It is worth noting that this rural community demonstrates how quiet a rural community can be when located at a distance from industry, highways, and airport related noise emitters.

During our review we posed a number of questions to ourselves related to what we were learning. The questions (italics) and our answers are:

Do National or International or local community Noise Standards for siting wind turbines near dwellings address the low frequency portion of the wind turbine's sound immissions?[32] No! State and Local governments are in the process of establishing wind farm noise limits and/or wind turbine

[32] Emissions refer to acoustic energy from the 'viewpoint' of the sound emitter, while immissions refer to acoustic energy from the viewpoint of the receiver.

setbacks from nearby residents, but the standards incorrectly presume that limits based on dBA levels are sufficient to protect the residents.

Do wind farm developers have noise limit criteria and/or wind turbine setback criteria that apply to nearby residents? Yes! But the Wind Industry recommended residential wind turbine noise levels (typically 50-55 dBA) are too high for the quiet nature of the rural communities and may be unsafe for the nearest residents. An additional concern is that some of the methods for implementing pre-construction computer models may predict sound levels that are too low. These two factors combined can lead to post-construction complaints and health risks.

Are all residents living near wind farms equally affected by wind turbine noise? No, children, people with pre-existing medical conditions, especially sleep disorders, and the elderly are generally the most susceptible. Some people are unaffected while some nearby neighbors develop serious health effects caused by exposure to the same wind turbine noise.

How does wind turbine noise impact nearby residents? Initially, the most common problem is chronic sleep deprivation during nighttime. According to the medical research documents, this may develop into far more serious physical and psychological problems

What are the technical options for reducing wind turbine noise immission at residences? There are only two options: 1) increase the distance between source and receiver, and/or 2) reduce the source sound power immission. Either solution is incompatible with the objective of the wind farm developer to maximize the wind power electrical generation within the land available.

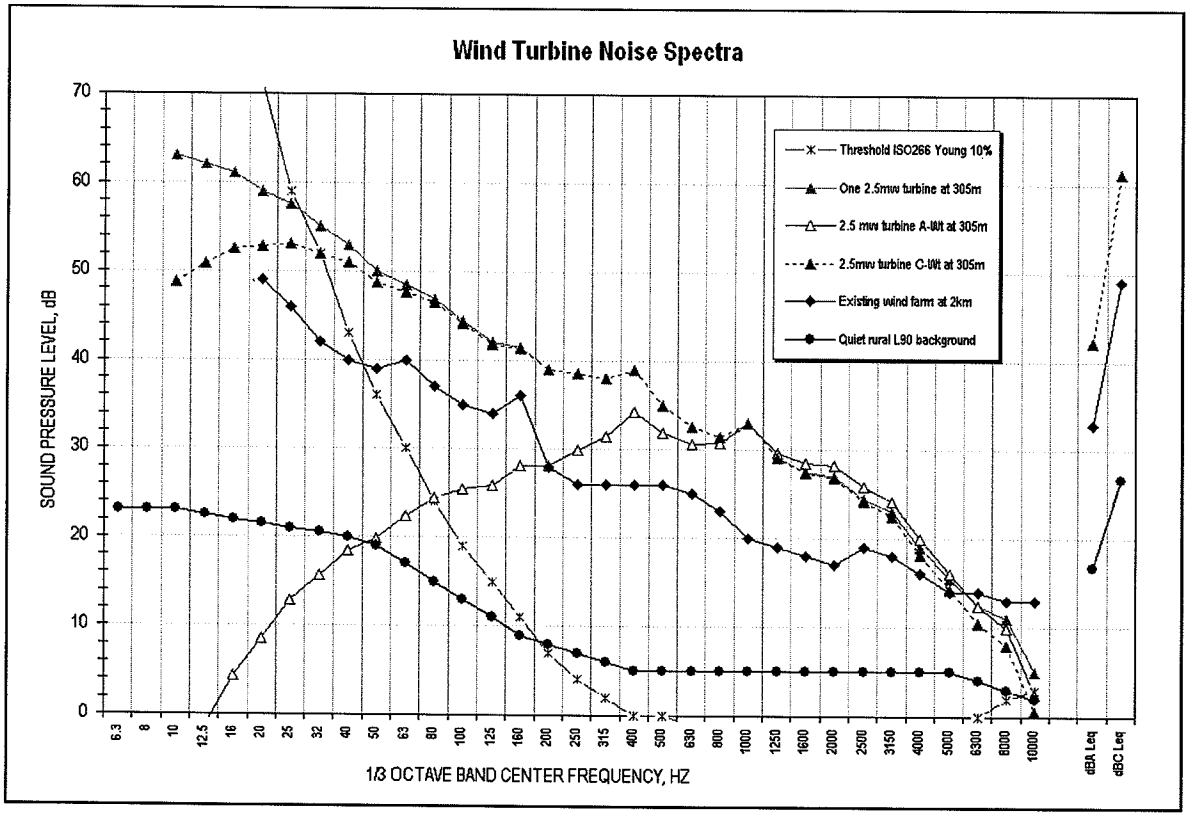

Figure 1-Generalized Sound Spectra vs. perception and rural community L_{90A} background 1/3 octave SPL

Is wind turbine noise at a residence much more annoying than traffic noise? Yes, researchers have found that "Wind turbine noise was perceived by about 85% of the respondents even when the calculated A-weighted SPL were as low as 35.0–37.5 dB. This could be due to the presence of

amplitude modulation in the noise, making it easy to detect and difficult to mask by ambient noise." [JASA 116(6), December 2004, pgs 3460-3470, "Perception and annoyance due to wind turbine noise-a dose-relationship" Eja Pedersen and Kerstin Persson Waye, Dept of Environmental Medicine, Goteborg University, Sweden]

Why do wind turbine noise immissions of only 35 dBA disturb sleep at night? This issue is now being studied by the medical profession. The affected residents complain of the middle to high frequency swooshing sounds of the rotating turbine blades at a constant repetitive rate of about 1 hertz plus low frequency noise. The amplitude modulation of the swooshing sound changes continuously. The short time interval between the blade's swooshing sounds described by residents as sometimes having a thump or low frequency banging sound that varies in amplitude up to 10 dBA. This may be a result of phase changes between turbine emissions, turbulence, or an operational mode.. The assumptions about wall and window attenuation being 15 dBA or more may not be sufficiently protective considering the relatively high amplitude of the wind turbine's low frequency immission spectra.

What are the typical wind farm noise immission criteria or standards? Limits are not consistent and may vary even within a particular country. Example criteria include: Australia-the lower of 35 dBA or L_{90} + 5 dBA, Denmark-40 dBA, France L_{90} + 3 (night) and L_{90} + 5 (day), Germany-40 dBA, Holland-40 dBA, United Kingdom-40 dBA (day) and 43 dBA (night) or L_{90} + 5 dBA, Illinois-55 dBA (day) and 51 dBA (night), Wisconsin-50 dBA and Michigan-55 dBA. Note: Illinois statewide limits are expressed only in nine contiguous octave frequency bands and no mention of A-weighting for the hourly l_{eq} limits. Typically, wind turbine noise just meeting the octave band limits would read 5 dB below the energy sum of the nine octave bands after applying A-weighting. So the Illinois limits are approximately 50 dBA (daytime 7 AM to 10 PM) and 46 dBA at night, assuming a wind farm is a Class C Property Line Noise Source.

What is a reasonable wind farm sound immission limit to protect the health of residences? We are proposing an immission limit of 35 dBA or L_{90A} + 5 dBA whichever is lower and also a C-weighted criteria to address the impacted resident's complaints of wind turbine low frequency noise: For the proposed criteria the dBC sound level at a receiving property shall not exceed L_{90A} + 20dB. In other words, the dBC operating immission limit shall not be more than 20 dB above the measured dBA (L_{90A}) pre-construction nighttime background sound level. A maximum not-to-exceed limit of 50 dBC is also proposed.

Why should the dBC immission limit not be permitted to be more than 20 dB above the background measured L_{90A}? The World Health Organization and others have determined a sound emitter's noise that results in a difference between the dBC and dBA value greater than 20 dB will be an annoying low frequency issue.

Is not L_{90A} the minimum dBA background noise level? This is not exactly correct. The L_{90} is the statistical descriptor representing the quietest 10% of the time. It may be understood as the sounds one hears when there are no nearby or short-term sounds from man-made or natural sources. It excludes sounds that are not part of the soundscape during all seasons. It is very important to establish the statistical average background noise environment outside a potentially impacted residence during the quietest (10 pm to 4 am) sleeping hours of the night. This nighttime sleep disturbance has generated the majority of the wind farm noise complaints throughout the world. The basis for a community's wind turbine sound immission limits would be the minimum 10 minute nighttime L_{90A} plus 5 dB for the time period of 10 pm to 7 am. This would become the Nighttime Immission Limits for the proposed wind farm. This can be accomplished with one or several ten (10) minute measurements during any night when the

atmosphere is classified stable with a light wind from the area of the proposed wind farm. The Daytime Limits (7 am to 7 pm) could be set 10 dB above the minimum nighttime L_{90A} measured noise, but the nighttime criteria will always be the limiting sound levels.

A nearby wind farm meeting these noise immission criteria will be clearly audible to the residents occasionally during nighttime and daytime. Compliance with this noise standard would be determined by repeating the initial nighttime minimum nighttime L_{90A} tests and adding the dBC (L_{eqC}) noise measurement with the turbines on and off. If the nighttime background noise level (turbines off) was found to be slightly higher than the measured background prior to the wind farm installation, then the results with the turbines on must be corrected to determine compliance with the pre-turbine established sound limits.

The common method used for establishing the background sound level at a proposed wind farm used in many of the studies in Table 1 was to use unattended noise monitors to record hundreds of ten (10) minute measurements to obtain a statistically significant sample over varying wind conditions or a period of weeks. The measured results for daytime and nighttime are combined to determine the statically average wind noise as a function of wind velocity measured at a height of ten (10) meters. This provides an enormous amount of data but the results have little relationship to the wind turbine sound immission or turbine noise impact in nearby residents. The purpose of this exhaustive exercise often only demonstrates how much noise is generated by the wind. In some cases it appears that the data is used to 'prove' that the wind noise masks the turbine's sound immissions.

The most glaring failure of this argument occurs during the frequent nighttime condition of a stable atmosphere. Then, the wind turbines operate at full or near full power and noise output while the wind at ground level is calm and the background noise level is low. This is the condition of maximum turbine noise impact on nearby residents. It is the condition which most directly causes chronic sleep disruption. Furthermore, the measurement methodology is usually faulty, as much of the wind noise measured by unattended sound monitors is the pseudo-wind noise generated by failure of the microphone's windscreen. This results in totally erroneous background sound levels being used for permitting and siting decisions. (See studies in Table 3, esp. Van den Berg)

Are there additional noise data to be recorded for a pre-wind turbine noise survey near selected dwellings? Yes, The measuring sound level meter(s) need document the L_{Aeq} , L_{A10}, L_{A90} and L_{Ceq} , L_{C10}, L_{C90} sound levels plus start time & date for each 10 minute sample. The L_{10} results will be utilized to help validate that conditions were appropriate for measuring the L_{90} long term background sound levels. For example, on a quiet night one would expect L_{A10} to be less than 10 dB higher than the L_{A90} long-term background sound level. On a windy night or day the difference may be more than 20 dB. There is a requirement for measurement of the wind velocity near the sound measurement microphone continuously throughout each ten (10) minute recorded noise sample. The ten (10) minute average of the wind speed near the microphone shall not exceed 2 m/s (4.5 mph) and the maximum wind speed for operational tests shall not exceed 4 m/s (9 mph). It is strongly recommended that observed samples be used for these tests.

Is there a need to record weather data during the background noise recording survey? One weather monitor is required at the proposed wind farm on the side nearest the residents. The weather station sensors are at standard ten (10) meter height above ground. It is critical the weather be recorded every ten (10) minutes synchronized with the clocks in the sound level recorders without ambiguity in the start and end time of each ten (10) minute period. The weather station should record wind speed and direction, temperature, humidity and rain.

Why do Canada and some other countries base the permitted wind turbine noise immission limits on the operational wind velocity at the 10m height wind speed instead of a maximum dBA or L_{A90} + 5 dBA immission level? First, it appears that the wind turbine industry will take advantage of every opportunity to elevate the maximum permitted noise immission level to reduce the setback distance from the nearby dwellings. Including wind as a masking source in the criteria is one method for elevating the permissible limits. Indeed the background noise level does increase with surface wind speed. When it does occur, it can be argued that the increased wind noise provides some masking of the wind farm turbine noise emission. However, in the middle of the night when the atmosphere is defined as stable (no vertical flow from surface heat radiation) the layers of the lower atmosphere can separate and permit wind velocities at the turbine hubs to be 2 to 4 times the wind velocity at the 10m high wind monitor but remain near calm at ground level. The result is the wind turbines can be operating at or close to full capacity while it is very quiet outside the nearby dwellings.

This is the heart of the wind turbine noise "problem" for residents within 3 km (approx. two miles) of a wind farm. When the turbines are producing the sound from operation it is quietest outside the surrounding homes. The PhD thesis of P.G. van den Berg "The Sounds of High Winds" is very enlightening on this issue. See also the letter by John Harrison in Ontario "On Wind Turbine Guidelines."

What sound monitor measurements would be needed for enforcement of the wind turbine sound ordinance? A similar sound and wind 10 minute series of measurements would be repeated at the pre-wind farm location nearest the resident registering the wind turbine noise complaint, with and without the operation of the wind turbines. An independent acoustics expert should be retained who reports to the County Board or other responsible governing body. This independent acoustics expert shall be responsible for all the acoustic measurements including instrumentation setup, calibration and interpretation of recorded results. An independent acoustical consultant shall also perform all pre-turbine background noise measurements and interpretation of results to establish the Nighttime (and Daytime if applicable) industrial wind turbine sound immission limits. At present the acoustical consultants are retained by, and work directly for, the wind farm developer.

This presents a serious problem with conflict of interest on the part of the consultant. The wind farm developer would like to show the significant amount of wind noise that is present to mask the sounds of the wind turbine immissions. The wind farm impacted community would like to know that wind turbine noise will be only barely perceptible and then only occasionally during the night or daytime.

Is frequency analysis required either during pre-wind farm background survey or for compliance measurements? Normally one-third octave or narrower band analysis would only be required if there is a complaint of tones immission from the wind farm.

Proposed Sound Limits

The simple fact that so many residents complain of low frequency noise from wind turbines is clear evidence that the single A-weighted (dBA) noise descriptor used in most jurisdictions for siting turbines is not adequate. The only other simple audio frequency weighting that is standardized and available on all sound level meters is C-weighting or dBC. A standard sound level meter set to measure dBA is increasingly less sensitive to low frequency below 500 Hz (one octave above middle-C). The same sound level meter set to measure dBC is equally sensitive to all frequencies above 32 Hz (lowest note on grand piano). It is well accepted that dBC readings

are more predictive of perceptual loudness than dBA readings if low frequency sounds are significant.

We are proposing to use the commonly accepted dBA criteria that is based on the pre-existing background sound levels plus a 5 dB allowance for the wind turbine's immissions (e.g. L_{90A} +5) for the audible sounds from wind turbines. In addition, to address the lower frequencies that are not considered in A-weighted measurements we are proposing to add limits based on dBC. The Proposed Sound Limits are presented in the text box at the end of this paper.

For the current industrial grade wind turbines in the 1.5 to 3 MWatt range, the addition of the dBC requirement will result in an increased distance between wind turbines and the nearby residents. For the generalized graphs shown in Figure 1, the distances would need to be approximately double the current distance. This will result in setbacks in the range of 1 km or greater for the current generation of wind turbines if they are to be located in rural areas where the L_{90A} background sound levels are 30 dBA or lower. When no man-made sounds are audible they can even be under 20 dBA. In areas with higher background sound levels, turbines could be located somewhat closer, but still at a distance greater than the 305 m (1000 ft.) or less setbacks commonly seen in U.S. based wind turbine standards set by many states and used for wind turbine developments.

1. Establishing Long-Term Background Noise Level

a. Instrumentation: ANSI or IEC Type 1 Precision Integrating Sound Level Meter plus meteorological instruments to measure wind velocity, temperature and humidity near the sound measuring microphone. Measurement procedures must meet ANSI S12.9, Part 3.

b. Measurement location(s): Nearest property line(s) from proposed wind turbines representative of all non-participating residential property within 2.0 miles.

c. Time of measurements and prevailing weather: The atmosphere must be classified as stable with no vertical heat flow to cause air mixing. Stable conditions occur in the evening and middle of the night with a clear sky and very little wind near the surface. Sound measurements are only valid when the measured wind speed at the microphone does not exceed 2 m/s (4.5 mph).

d. Long-Term Background sound measurements: All data recording shall be a series of contiguous ten (10) minute measurements. The measurement objective is to determine the quietest ten minute period at each location of interest. Nighttime test periods are preferred unless daytime conditions are quieter. The following data shall be recorded simultaneously for each ten (10) minute measurement period: dBA data includes L_{A90}, L_{A10}, L_{Aeq} and dBC data includes L_{C90}, L_{C10}, and L_{Ceq}. The maximum wind speed at the microphone during the ten minutes, a single measurement of temperature and humidity at the microphone for each new location or each hour whichever is oftener shall also be recorded. A ten (10) minute measurement contains valid data provided: Both L_{A10} minus L_{A90} and L_{C10} minus L_{C90} are not greater than 10 dB and the maximum wind speed at the microphone did not exceed 2 m/s during the same ten (10) minute period as the acoustic data.

2. Wind Turbine Sound Immission Limits

No wind turbine or group of turbines shall be located so as to cause wind turbine sound immission at any location on non-participating property containing a residence in excess of the limits in the following table:

Table of Not-To-Exceed Property Line Sound Immission Limits [1]

Criteria	Condition	dBA	dBC
A	Immission above pre-construction background:	$L_{Aeq} = L_{A90} + 5$	$L_{Ceq} = L_{C90} + 5$
B	Maximum immission:	35 L_{Aeq}	55 L_{Ceq} for quiet[2] rural environment 60 L_{Ceq} for rural-suburban environment
C	Immission spectra imbalance	L_{Ceq} (immission) minus (L_{A90} (background)+5) $\leq$ 20 dB	
D	Prominent tone penalty:	5 dB	5 dB

Notes	
1	Each Test is independent and exceedances of any test establishes non-compliance Sound "immission" is the wind turbine noise emission as received at a property
2	A "Quiet rural environment" is a location 2 miles from a state road or other major transportation artery without high traffic volume during otherwise quiet periods of the day or night.
3	Prominent tone as defined in IEC 61400-11. This Standard is not to be used for any other purpose.

[1] Procedures provided in Section 7. Measurement Procedures (Appendix to Ordinance) of the most recent version of "**The How To Guide To Siting Wind Turbines To Prevent Health Risks From Sound**" by Kamperman and James apply to this table.

3. Wind Farm Noise Compliance Testing

All of the measurements outlined above in 1. Establishing the Long-Term Background Noise Level must be repeated to determine compliance with 2. Wind Turbine Sound Immission Limits. The compliance test location is to be the pre-turbine background noise measurement location nearest to the home of the complainant in line with the wind farm and nearer to the wind farm. The time of day for the testing and the wind farm operating conditions plus wind speed and direction must replicate the conditions that generated the complaint. Procedures of ANSI S12.9-Part 3 apply as amended. Instrumentation limits for wind and other factors must be recognized and followed.

Scoping Comment
234

Talburt, Tammy (CTED)

From: elizabeth gardner [redacted]@aol.com]
Sent: Friday, May 15, 2009 6:58 PM
To: CTED EFSEC
Subject: Concern about Whistling Ridge

Allen Fiksdal
Manager, Energy Facility Site Evaluation Council PO Box 43172
905 Plum Street SE
Olympia , 98504-3172

Dear Mr. Fiksdal, ,

I am writing to comment on the proposed Whistling Ridge Energy Project in Skamania County, Washington.

The proposed project would cause significant negative impacts to sensitive wildlife and plant habitat and would degrade the outstanding scenic beauty of the Columbia River Gorge National Scenic Area.

The Whistling Ridge proposal includes more than 80 wind turbines in two counties, yet the application filed with EFSEC discusses only 50 turbines in Skamania County. The EIS must review the cumulative environmental impacts of all portions of the project, including both the Skamania Co. and Klickitat Co. portions.

This proposal is likely to have different and greater wildlife impacts than any other wind energy facility proposed in the State of Washington, because this project is proposed at a heavily forested site. The project would permanently disturb large areas of forested habitat and result in direct and indirect impacts to multiple wildlife species through habitat loss and displacement, direct collisions with turbine blades, and other factors. The potentially affected species include northern spotted owl, western gray squirrel, northern goshawk and other raptors, several species of bats, multiple migratory bird species, mule deer, black-tailed deer, and elk. Several of these species are listed as sensitive or threatened in Washington State.

Locating 426-foot-tall turbines on the ridgeline of the Columbia River Gorge would also degrade the scenic values of the Gorge. The turbines would be highly visible from several designated key viewing areas within the National Scenic Area, including Interstate 84, the Historic Columbia River Highway, Cook-Underwood Road, and Panorama Point. The project would introduce highly visible industrial facilities into the natural, forested landscape, protruding above ridgelines and detracting from the natural scenic beauty of the Gorge. The wind towers would have daytime and nighttime warning lights, which would worsen the aggravate scenic impacts.

Finally, the proposed project would be located partially within the Columbia River Gorge National Scenic Area. Specifically, the applicant proposes to construct, expand, and improve more than two miles of roads within the National Scenic Area in order to haul industrial materials with gross vehicle weights of up to 53 tons. This proposal to construct and use Scenic Area lands for industrial purposes is prohibited by the National Scenic Area Act and Management Plan, and must be denied.

I support renewable energy, but I am opposed to industrial-scale wind energy development within or adjacent to the Columbia River Gorge National Scenic Area, a designated national scenic treasure.

elizabeth gardner
[redacted]
gresham, OR 97080

Scoping Comment # 235

Talburt, Tammy (CTED)

From: Ann Lemon [redacted]@msn.com]
Sent: Friday, May 15, 2009 7:19 PM
To: CTED EFSEC
Subject: Concern about Whistling Ridge

Allen Fiksdal
Manager, Energy Facility Site Evaluation Council PO Box 43172
905 Plum Street SE
Olympia , 98504-3172

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I support renewable energy, but I am opposed to industrial-scale wind energy development within or adjacent to the Columbia River Gorge National Scenic Area, a designated national scenic treasure.

Ann Lemon
[redacted]
Lake Oswego, OR 97035

Scoping Comment
236

Talburt, Tammy (CTED)

From: scott hulbert [redacted]@yahoo.com]
Sent: Friday, May 15, 2009 7:26 PM
To: CTED EFSEC
Subject: Concern about Whistling Ridge

Allen Fiksdal
Manager, Energy Facility Site Evaluation Council PO Box 43172
905 Plum Street SE
Olympia , 98504-3172

Dear Mr. Fiksdal, ,

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I support renewable energy, but I am opposed to industrial-scale wind energy development within or adjacent to the Columbia River Gorge National Scenic Area, a designated national scenic treasure.

scott hulbert
[redacted]
white salmon, WA 98672

Scoping Comment
237

Talburt, Tammy (CTED)

From: Jane Garbisch [redacted]@yahoo.com]
Sent: Friday, May 15, 2009 7:58 PM
To: CTED EFSEC
Subject: Concern about Whistling Ridge

Allen Fiksdal
Manager, Energy Facility Site Evaluation Council PO Box 43172
905 Plum Street SE
Olympia , 98504-3172

Dear Mr. Fiksdal, ,

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I support renewable energy, but I am opposed to industrial-scale wind energy development within or adjacent to the Columbia River Gorge National Scenic Area, a designated national scenic treasure.

Jane Garbisch
[redacted]
Portland, OR 97214

503-314-[redacted]

Scoping Comment
238

Talburt, Tammy (CTED)

From: Peder Bisbjerg [redacted]@attglobal.net]
Sent: Friday, May 15, 2009 7:59 PM
To: CTED EFSEC
Subject: Concern about Whistling Ridge

Allen Fiksdal
Manager, Energy Facility Site Evaluation Council PO Box 43172
905 Plum Street SE
Olympia , 98504-3172

Dear Mr. Fiksdal, ,

I am writing to comment on the proposed Whistling Ridge Energy Project in Skamania County, Washington.

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I support renewable energy, but I am opposed to industrial-scale wind energy development within or adjacent to the Columbia River Gorge National Scenic Area, a designated national scenic treasure.

Peder Bisbjerg
[redacted]
Lake Oswego, OR 97034

Scoping Comment
239

Talburt, Tammy (CTED)

From: [redacted]@lylefire.com
Sent: Friday, May 15, 2009 8:05 PM
To: CTED EFSEC
Subject: Whistling Ridge Energy Project

Mr. Fiksdal:

This message is to register my opposition to the location of the highly visible WREP towers within view from the Gorge National Scenic Area.

As a Gorge resident who invested heavily in order to live in the NSA and within its restrictions, the bases of my objection are among those already articulated by others. Primarily, when the Act was formulated (pre-wind turbine era) the predominant types of view-spoiling structures that were envisioned were homes and conventional buildings. The arrays of large wind turbine towers are NOT structures which are "visually subordiante from key viewing areas."

Such an extensive landscape and habitat incursion should not be made hastily. Already, renewable energy analysts are beginning to conclude from scientific and economic data that wind power will likely go the way of the recent ethanol "wave of the future" craze.
Once these wind installations are in place the damage will be done and not be inexpensively remediated.

Thank you for your consideration.

Regards,
Jim Newell

[redacted]
Bingen, WA 98605

Scoping Comment
240

Talburt, Tammy (CTED)

From: Patricia Bitner [redacted]@q.com]
Sent: Friday, May 15, 2009 8:48 PM
To: CTED EFSEC
Subject: Concern about Whistling Ridge

Allen Fiksdal
Manager, Energy Facility Site Evaluation Council PO Box 43172
905 Plum Street SE
Olympia , 98504-3172

Dear Mr. Fiksdal, ,

I am writing to comment on the proposed Whistling Ridge Energy Project in Skamania County, Washington.

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I support renewable energy, but I am opposed to industrial-scale wind energy development within or adjacent to the Columbia River Gorge National Scenic Area, a designated national scenic treasure.

Patricia Bitner
[redacted]
Eugene, OR 97403

Scoping Comment
241

Talburt, Tammy (CTED)

From: Gene Johnson [redacted]@gmail.com]
Sent: Friday, May 15, 2009 8:52 PM
To: CTED EFSEC
Subject: Concern about Whistling Ridge

Allen Fiksdal
Manager, Energy Facility Site Evaluation Council PO Box 43172
905 Plum Street SE
Olympia , 98504-3172

Dear Mr. Fiksdal, ,

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I support renewable energy, but I am opposed to industrial-scale wind energy development within or adjacent to the Columbia River Gorge National Scenic Area, a designated national scenic treasure.

Gene Johnson
[redacted]
Portland, OR 97209

Scoping Comment
242

Talburt, Tammy (CTED)

From: catherine dorner [redacted]@msn.com]
Sent: Friday, May 15, 2009 9:07 PM
To: CTED EFSEC
Subject: Concern about Whistling Ridge

Allen Fiksdal
Manager, Energy Facility Site Evaluation Council PO Box 43172
905 Plum Street SE
Olympia , 98504-3172

Dear Mr. Fiksdal, ,

I am writing to comment on the proposed Whistling Ridge Energy Project in Skamania County, Washington.

The proposed project would cause significant negative impacts to sensitive wildlife and plant habitat and would degrade the outstanding scenic beauty of the Columbia River Gorge National Scenic Area.

The Whistling Ridge proposal includes more than 80 wind turbines in two counties, yet the application filed with EFSEC discusses only 50 turbines in Skamania County. The EIS must review the cumulative environmental impacts of all portions of the project, including both the Skamania Co. and Klickitat Co. portions.

This proposal is likely to have different and greater wildlife impacts than any other wind energy facility proposed in the State of Washington, because this project is proposed at a heavily forested site. The project would permanently disturb large areas of forested habitat and result in direct and indirect impacts to multiple wildlife species through habitat loss and displacement, direct collisions with turbine blades, and other factors. The potentially affected species include northern spotted owl, western gray squirrel, northern goshawk and other raptors, several species of bats, multiple migratory bird species, mule deer, black-tailed deer, and elk. Several of these species are listed as sensitive or threatened in Washington State.

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I support renewable energy, but I am opposed to industrial-scale wind energy development within or adjacent to the Columbia River Gorge National Scenic Area, a designated national scenic treasure.

catherine dorner
[redacted]
Portland, OR 97236

Scoping Comment
243

Talburt, Tammy (CTED)

From: Paul Torrence [redacted]@nau.edu]
Sent: Friday, May 15, 2009 9:12 PM
To: CTED EFSEC
Subject: Concern about Whistling Ridge

Allen Fiksdal
Manager, Energy Facility Site Evaluation Council PO Box 43172
905 Plum Street SE
Olympia , 98504-3172

Dear Mr. Fiksdal, ,

I am writing to comment on the proposed Whistling Ridge Energy Project in Skamania County, Washington.

The proposed project would cause significant negative impacts to sensitive wildlife and plant habitat and would degrade the outstanding scenic beauty of the Columbia River Gorge National Scenic Area.

The Whistling Ridge proposal includes more than 80 wind turbines in two counties, yet the application filed with EFSEC discusses only 50 turbines in Skamania County. The EIS must review the cumulative environmental impacts of all portions of the project, including both the Skamania Co. and Klickitat Co. portions.

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I support renewable energy, but I am opposed to industrial-scale wind energy development within or adjacent to the Columbia River Gorge National Scenic Area, a designated national scenic treasure.

Paul Torrence
[redacted]
Williams, OR 97544

Scoping Comment
244

Talburt, Tammy (CTED)

From: Earl Switzer [redacted]@aol.com]
Sent: Friday, May 15, 2009 9:27 PM
To: CTED EFSEC
Subject: Concern about Whistling Ridge

Allen Fiksdal
Manager, Energy Facility Site Evaluation Council PO Box 43172
905 Plum Street SE
Olympia , 98504-3172

Dear Mr. Fiksdal, ,

I am writing to comment on the proposed Whistling Ridge Energy Project in Skamania County, Washington.

The proposed project would cause significant negative impacts to sensitive wildlife and plant habitat and would degrade the outstanding scenic beauty of the Columbia River Gorge National Scenic Area.

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I support renewable energy, but I am opposed to industrial-scale wind energy development within or adjacent to the Columbia River Gorge National Scenic Area, a designated national scenic treasure.

Earl Switzer
[redacted]
Portland, OR, OR 97233

503 206 [redacted]

Scoping Comment
245

Talburt, Tammy (CTED)

From: Frank Mele [redacted]@yahoo.com]
Sent: Friday, May 15, 2009 10:27 PM
To: CTED EFSEC
Subject: Concern about Whistling Ridge

Allen Fiksdal
Manager, Energy Facility Site Evaluation Council PO Box 43172
905 Plum Street SE
Olympia , 98504-3172

Dear Mr. Fiksdal, ,

I am writing to comment on the proposed Whistling Ridge Energy Project in Skamania County, Washington.

The proposed project would cause significant negative impacts to sensitive wildlife and plant habitat and would degrade the outstanding scenic beauty of the Columbia River Gorge National Scenic Area.

The Whistling Ridge proposal includes more than 80 wind turbines in two counties, yet the application filed with EFSEC discusses only 50 turbines in Skamania County. The EIS must review the cumulative environmental impacts of all portions of the project, including both the Skamania Co. and Klickitat Co. portions.

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I support renewable energy, but I am opposed to industrial-scale wind energy development within or adjacent to the Columbia River Gorge National Scenic Area, a designated national scenic treasure.

Frank Mele
[redacted]
Silverton, OR 97381

Scoping Comment
246

Talburt, Tammy (CTED)

From: Kathleen Fitzpatrick[redacted]@gmail.com]
Sent: Friday, May 15, 2009 10:53 PM
To: CTED EFSEC
Subject: Whistling Ridge Energy Project

Allen Fiksdal
Manager, Energy Facility Site Evaluation Council PO Box 43172
905 Plum Street SE
Olympia , 98504-3172

Dear Mr. Fiksdal, ,

I am writing to comment on the proposed Whistling Ridge Energy Project in Skamania County, Washington.

Large scale, industrial development does not belong in National Scenic Areas. Scenic Areas are federal treasures and these treasures belong to the American People.

Your job is to protect the public trust. Filling the scenic views of the Columbia Gorge with large scale industrial equipment would betray the public trust.

Would you put a wind farm in the Grand Canyon? Yosemite? How about up the face of Mt. St. Helens or Mt. Rainier? The answer to these questions are obvious.

What is more important to the American people--SDS corporate profits or the preservation of one of the most beautiful areas in the world?

Thank you,

Kathy Fitzpatrick

Kathleen Fitzpatrick
[redacted]
Mosier, OR 97040

(541) 400-[redacted]

Scoping Comment # 247

Talburt, Tammy (CTED)

From: Marianne Platt [redacted]@msn.com]
Sent: Friday, May 15, 2009 10:59 PM
To: CTED EFSEC
Subject: Concern about Whistling Ridge

Allen Fiksdal
Manager, Energy Facility Site Evaluation Council PO Box 43172
905 Plum Street SE
Olympia , 98504-3172

Dear Mr. Fiksdal, ,

I am writing to comment on the proposed Whistling Ridge Energy Project in Skamania County, Washington.

The proposed project would cause significant negative impacts to sensitive wildlife and plant habitat and would degrade the outstanding scenic beauty of the Columbia River Gorge National Scenic Area.

The Whistling Ridge proposal includes more than 80 wind turbines in two counties, yet the application filed with EFSEC discusses only 50 turbines in Skamania County. The EIS must review the cumulative environmental impacts of all portions of the project, including both the Skamania Co. and Klickitat Co. portions.

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Locating 426-foot-tall turbines on the ridgeline of the Columbia River Gorge would also degrade the scenic values of the Gorge. The turbines would be highly visible from several designated key viewing areas within the National Scenic Area, including Interstate 84, the Historic Columbia River Highway, Cook-Underwood Road, and Panorama Point. The project would introduce highly visible industrial facilities into the natural, forested landscape, protruding above ridgelines and detracting from the natural scenic beauty of the Gorge. The wind towers would have daytime and nighttime warning lights, which would worsen the aggravate scenic impacts.

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I support renewable energy, but I am opposed to industrial-scale wind energy development within or adjacent to the Columbia River Gorge National Scenic Area, a designated national scenic treasure.

Marianne Platt
[redacted]
Bend, OR 97701

Scoping Comment
248

Talburt, Tammy (CTED)

From: Dustin Micheletti [redacted]@yahoo.com]
Sent: Friday, May 15, 2009 11:13 PM
To: CTED EFSEC
Subject: Concern about Whistling Ridge

Allen Fiksdal
Manager, Energy Facility Site Evaluation Council PO Box 43172
905 Plum Street SE
Olympia , 98504-3172

Dear Mr. Fiksdal, ,

I am writing to comment on the proposed Whistling Ridge Energy Project in Skamania County, Washington.

The proposed project would cause significant negative impacts to sensitive wildlife and plant habitat and would degrade the outstanding scenic beauty of the Columbia River Gorge National Scenic Area.

The Whistling Ridge proposal includes more than 80 wind turbines in two counties, yet the application filed with EFSEC discusses only 50 turbines in Skamania County. The EIS must review the cumulative environmental impacts of all portions of the project, including both the Skamania Co. and Klickitat Co. portions.

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Locating 426-foot-tall turbines on the ridgeline of the Columbia River Gorge would also degrade the scenic values of the Gorge. The turbines would be highly visible from several designated key viewing areas within the National Scenic Area, including Interstate 84, the Historic Columbia River Highway, Cook-Underwood Road, and Panorama Point. The project would introduce highly visible industrial facilities into the natural, forested landscape, protruding above ridgelines and detracting from the natural scenic beauty of the Gorge. The wind towers would have daytime and nighttime warning lights, which would worsen the aggravate scenic impacts.

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I support renewable energy, but I am opposed to industrial-scale wind energy development within or adjacent to the Columbia River Gorge National Scenic Area, a designated national scenic treasure.

Dustin Micheletti
[redacted]
Portland, OR 97218

Scoping Comment
249

Talburt, Tammy (CTED)

From: Paula Kuttner [[redacted]@hotmail.com]
Sent: Saturday, May 16, 2009 12:28 AM
To: CTED EFSEC
Subject: Concern about Whistling Ridge

Allen Fiksdal
Manager, Energy Facility Site Evaluation Council PO Box 43172
905 Plum Street SE
Olympia , 98504-3172

Dear Mr. Fiksdal, ,

I am writing to comment on the proposed Whistling Ridge Energy Project in Skamania County, Washington.

I support more wind power, but this huge project is totally at odds with the Scenic Area, the homes and small towns, and the forest habitat and endangered species therein.

I knew a man who traveled all over the world; he often referred to the drive through the Columbia Gorge as the most beautiful in the world... it simply isn't the place for a huge intrusive development like this.

The proposed project would cause significant negative impacts to sensitive wildlife and plant habitat and would degrade the outstanding scenic beauty of the Columbia River Gorge National Scenic Area.

The Whistling Ridge proposal includes more than 80 wind turbines in two counties, yet the application filed with EFSEC discusses only 50 turbines in Skamania County. The EIS must review the cumulative environmental impacts of all portions of the project, including both the Skamania Co. and Klickitat Co. portions.

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I support renewable energy, but I am opposed to industrial-scale wind energy development within or adjacent to the Columbia River Gorge National Scenic Area, a designated national scenic treasure.

Paula Kuttner
[redacted]
The Dalles, OR 97058

Talburt, Tammy (CTED)

Scoping Comment # 250

From: James Nielson [redacted]@yahoo.com]
Sent: Saturday, May 16, 2009 1:54 AM
To: CTED EFSEC
Subject: Wind Farm Raincheck

Allen Fiksdal
Manager, Energy Facility Site Evaluation Council PO Box 43172
905 Plum Street SE
Olympia , 98504-3172

Dear Mr. Fiksdal, ,

I am writing to comment on the proposed Whistling Ridge Energy Project in Skamania County, Washington. Below is the pre-written letter that I endorse, but first I'd like to throw in my own 2 bits. I was amazed when I first went to San Francisco as a teenager and saw the wind farms there. It can be a beautiful sight, and an inspiring sign of progress. When I saw that some turbines had gone up near my grandmother's place over in Eastern Oregon, I was pleased and proud at our areas forward-thinking people. And then night fell. The stars that once shone over a black horizon are now accompanied by a flashing string of red lights that can be seen for miles. All night, every night, for the foreseeable future. Let's not forget to take these sorts of things into consideration. Thanks for your time.

Sincerely,
James Nielson
Portland, OR

Now, here's the "form letter", which i endorse:

The proposed project would cause significant negative impacts to sensitive wildlife and plant habitat and would degrade the outstanding scenic beauty of the Columbia River Gorge National Scenic Area.

The Whistling Ridge proposal includes more than 80 wind turbines in two counties, yet the application filed with EFSEC discusses only 50 turbines in Skamania County. The EIS must review the cumulative environmental impacts of all portions of the project, including both the Skamania Co. and Klickitat Co. portions.

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Locating 426-foot-tall turbines on the ridgeline of the Columbia River Gorge would also degrade the scenic values of the Gorge. The turbines would be highly visible from several designated key viewing areas within the National Scenic Area, including Interstate 84, the Historic Columbia River Highway,

Cook-Underwood Road, and Panorama Point. The project would introduce highly visible industrial facilities into the natural, forested landscape, protruding above ridgelines and detracting from the natural scenic beauty of the Gorge. The wind towers would have daytime and nighttime warning lights, which would worsen the aggravate scenic impacts.

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I support renewable energy, but I am opposed to industrial-scale wind energy development within or adjacent to the Columbia River Gorge National Scenic Area, a designated national scenic treasure.

James Nielson
[redacted]
Portland, OR 97215

Scoping Comment
251

Talburt, Tammy (CTED)

From: Karen Kantor [redacted]@yahoo.com]
Sent: Saturday, May 16, 2009 4:44 AM
To: CTED EFSEC
Subject: Concern about Whistling Ridge

Allen Fiksdal
Manager, Energy Facility Site Evaluation Council PO Box 43172
905 Plum Street SE
Olympia , 98504-3172

Dear Mr. Fiksdal, ,

I am writing to comment on the proposed Whistling Ridge Energy Project in Skamania County, Washington.

The proposed project would cause significant negative impacts to sensitive wildlife and plant habitat and would degrade the outstanding scenic beauty of the Columbia River Gorge National Scenic Area.

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I support renewable energy, but I am opposed to industrial-scale wind energy development within or adjacent to the Columbia River Gorge National Scenic Area, a designated national scenic treasure.

Karen Kantor
[redacted]
Chicago, IL 60640

Scoping Comment
#252

Talburt, Tammy (CTED)

From: Margo Dameier [[redacted]@gorge.net]
Sent: Saturday, May 16, 2009 6:36 AM
To: CTED EFSEC
Subject: Concern about Whistling Ridge

Allen Fiksdal
Manager, Energy Facility Site Evaluation Council PO Box 43172
905 Plum Street SE
Olympia , 98504-3172

Dear Mr. Fiksdal, ,

I am writing to comment on the proposed Whistling Ridge Energy Project in Skamania County, Washington.

The proposed project would cause significant negative impacts to sensitive wildlife and plant habitat and would degrade the outstanding scenic beauty of the Columbia River Gorge National Scenic Area.

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I support renewable energy, but I am opposed to industrial-scale wind energy development within or adjacent to the Columbia River Gorge National Scenic Area, a designated national scenic treasure.

Margo Dameier
[redacted]
Hood River, OR 97031

Scoping Comment
253

Talburt, Tammy (CTED)

From: Jerry Rosenkoetter [redacted]@gmail.com]
Sent: Saturday, May 16, 2009 6:50 AM
To: CTED EFSEC
Subject: Concern about Whistling Ridge

Allen Fiksdal
Manager, Energy Facility Site Evaluation Council PO Box 43172
905 Plum Street SE
Olympia , 98504-3172

Dear Mr. Fiksdal, ,

Please site wind farm projects on land that's already managed for productivity, not on the last few acres that are preserved for scenic and conservation values.

I am writing to comment on the proposed Whistling Ridge Energy Project in Skamania County, Washington.

The proposed project would cause significant negative impacts to sensitive wildlife and plant habitat and would degrade the outstanding scenic beauty of the Columbia River Gorge National Scenic Area.

The Whistling Ridge proposal includes more than 80 wind turbines in two counties, yet the application filed with EFSEC discusses only 50 turbines in Skamania County. The EIS must review the cumulative environmental impacts of all portions of the project, including both the Skamania Co. and Klickitat Co. portions.

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I support renewable energy, but I am opposed to industrial-scale wind energy development within or adjacent to the Columbia River Gorge National Scenic Area, a designated national scenic treasure.

Jerry Rosenkoetter
[redacted]
SALEM, OR 97317

Scoping Comment
254

Talburt, Tammy (CTED)

From: Kathleen Archer [[redacted]@aol.com]
Sent: Saturday, May 16, 2009 7:03 AM
To: CTED EFSEC
Subject: Concern about Whistling Ridge

Allen Fiksdal
Manager, Energy Facility Site Evaluation Council PO Box 43172
905 Plum Street SE
Olympia , 98504-3172

Dear Mr. Fiksdal, ,

I am writing to comment on the proposed Whistling Ridge Energy Project in Skamania County, Washington.

The proposed project would cause significant negative impacts to sensitive wildlife and plant habitat and would degrade the outstanding scenic beauty of the Columbia River Gorge National Scenic Area.

The Whistling Ridge proposal includes more than 80 wind turbines in two counties, yet the application filed with EFSEC discusses only 50 turbines in Skamania County. The EIS must review the cumulative environmental impacts of all portions of the project, including both the Skamania Co. and Klickitat Co. portions.

This proposal is likely to have different and greater wildlife impacts than any other wind energy facility proposed in the State of Washington, because this project is proposed at a heavily forested site. The project would permanently disturb large areas of forested habitat and result in direct and indirect impacts to multiple wildlife species through habitat loss and displacement, direct collisions with turbine blades, and other factors. The potentially affected species include northern spotted owl, western gray squirrel, northern goshawk and other raptors, several species of bats, multiple migratory bird species, mule deer, black-tailed deer, and elk. Several of these species are listed as sensitive or threatened in Washington State.

Locating 426-foot-tall turbines on the ridgeline of the Columbia River Gorge would also degrade the scenic values of the Gorge. The turbines would be highly visible from several designated key viewing areas within the National Scenic Area, including Interstate 84, the Historic Columbia River Highway, Cook-Underwood Road, and Panorama Point. The project would introduce highly visible industrial facilities into the natural, forested landscape, protruding above ridgelines and detracting from the natural scenic beauty of the Gorge. The wind towers would have daytime and nighttime warning lights, which would worsen the aggravate scenic impacts.

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I support renewable energy, but I am opposed to industrial-scale wind energy development within or adjacent to the Columbia River Gorge National Scenic Area, a designated national scenic treasure.

Kathleen Archer
[redacted]
Portland, OR 97214

Scoping Comment
255

Talburt, Tammy (CTED)

From: Ann Waugh [redacted]@thewaughs.net]
Sent: Saturday, May 16, 2009 7:48 AM
To: CTED EFSEC
Subject: Concern about Whistling Ridge

Allen Fiksdal
Manager, Energy Facility Site Evaluation Council PO Box 43172
905 Plum Street SE
Olympia , 98504-3172

Dear Mr. Fiksdal, ,

I am writing to comment on the proposed Whistling Ridge Energy Project in Skamania County, Washington.

The proposed project would cause significant negative impacts to sensitive wildlife and plant habitat and would degrade the outstanding scenic beauty of the Columbia River Gorge National Scenic Area.

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I support renewable energy, but I am opposed to industrial-scale wind energy development within or adjacent to the Columbia River Gorge National Scenic Area, a designated national scenic treasure.

Ann Waugh
[redacted]
Boring, OR 97009

503.663.[redacted]

Scoping Comment
256

Talburt, Tammy (CTED)

From: Brian Harris [redacted]@hotmail.com]
Sent: Saturday, May 16, 2009 7:50 AM
To: CTED EFSEC
Subject: Concern about Whistling Ridge

Allen Fiksdal
Manager, Energy Facility Site Evaluation Council PO Box 43172
905 Plum Street SE
Olympia , 98504-3172

Dear Mr. Fiksdal, ,

I am writing to comment on the proposed Whistling Ridge Energy Project in Skamania County, Washington.

The proposed project would cause significant negative impacts to sensitive wildlife and plant habitat and would degrade the outstanding scenic beauty of the Columbia River Gorge National Scenic Area.

The Whistling Ridge proposal includes more than 80 wind turbines in two counties, yet the application filed with EFSEC discusses only 50 turbines in Skamania County. The EIS must review the cumulative environmental impacts of all portions of the project, including both the Skamania Co. and Klickitat Co. portions.

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I support renewable energy, but I am opposed to industrial-scale wind energy development within or adjacent to the Columbia River Gorge National Scenic Area, a designated national scenic treasure.

Brian Harris
[redacted]
Hood River, OR 97031

Scoping Comment
257

Talburt, Tammy (CTED)

From: Katie Pearmine [redacted]@gmail.com]
Sent: Saturday, May 16, 2009 8:15 AM
To: CTED EFSEC
Subject: Concern about Whistling Ridge

Allen Fiksdal
Manager, Energy Facility Site Evaluation Council PO Box 43172
905 Plum Street SE
Olympia , 98504-3172

Dear Mr. Fiksdal, ,

I am writing to comment on the proposed Whistling Ridge Energy Project in Skamania County, Washington.

The proposed project would cause significant negative impacts to sensitive wildlife and plant habitat and would degrade the outstanding scenic beauty of the Columbia River Gorge National Scenic Area.

The Whistling Ridge proposal includes more than 80 wind turbines in two counties, yet the application filed with EFSEC discusses only 50 turbines in Skamania County. The EIS must review the cumulative environmental impacts of all portions of the project, including both the Skamania Co. and Klickitat Co. portions.

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I support renewable energy, but I am opposed to industrial-scale wind energy development within or adjacent to the Columbia River Gorge National Scenic Area, a designated national scenic treasure.

Katie Pearmine
[redacted]
Portland, OR 97206

Scoping Comment # 258

Talburt, Tammy (CTED)

From: Jim & Dee Hulbert [redacted]@gorge.net]
Sent: Saturday, May 16, 2009 8:36 AM
To: CTED EFSEC
Subject: Whisting Ridge Energy Project

Mr. Allen Fiksdal:

I have lived in White Salmon for more than 20 years and I am strongly opposed to the location of the Whistling Ridge Energy Project being proposed by the SDS Timber Company. While I support renewable energy projects in general, the Columbia River Gorge is not the place to locate this kind of project. The Gorge is recognized as one of our most outstanding natural areas by the establishment of the Columbia River Gorge National Scenic Area. While the project is not technically within the CRGNSA, it will have serious impacts on the values for which it was established. Not only will outstanding scenic values be compromised, but important wildlife habitat will be lost.

Certainly, there must be better places in Washington to locate the wind farm. Placing wind turbines next to the NSA is comparable to placing them along the top of Grand Canyon National Park. It would be easier to accept the proposed location if it had really good wind conditions. However, it is my understanding that the area has only marginal conditions for a wind farm.

I am especially offended that the SDS Company has been able to influence the DNR and include some of our public lands in the proposal. These lands, now available for all to recreate in, would be forever changed and public access to them compromised. These state lands are important timber producing areas and are used by me for hunting and mushroom picking. They should not even be considered for this poorly conceived project.

Thank you for considering my comments about the proposed project.

Jim Hulbert

Scoping Comment
259

Talburt, Tammy (CTED)

From: Julie Steiner [redacted]@aol.com]
Sent: Saturday, May 16, 2009 8:56 AM
To: CTED EFSEC
Subject: Concern about Whistling Ridge

Allen Fiksdal
Manager, Energy Facility Site Evaluation Council PO Box 43172
905 Plum Street SE
Olympia , 98504-3172

Dear Mr. Fiksdal, ,

I am writing to comment on the proposed Whistling Ridge Energy Project in Skamania County, Washington.

The proposed project would cause significant negative impacts to sensitive wildlife and plant habitat and would degrade the outstanding scenic beauty of the Columbia River Gorge National Scenic Area.

The Whistling Ridge proposal includes more than 80 wind turbines in two counties, yet the application filed with EFSEC discusses only 50 turbines in Skamania County. The EIS must review the cumulative environmental impacts of all portions of the project, including both the Skamania Co. and Klickitat Co. portions.

This proposal is likely to have different and greater wildlife impacts than any other wind energy facility proposed in the State of Washington, because this project is proposed at a heavily forested site. The project would permanently disturb large areas of forested habitat and result in direct and indirect impacts to multiple wildlife species through habitat loss and displacement, direct collisions with turbine blades, and other factors. The potentially affected species include northern spotted owl, western gray squirrel, northern goshawk and other raptors, several species of bats, multiple migratory bird species, mule deer, black-tailed deer, and elk. Several of these species are listed as sensitive or threatened in Washington State.

Locating 426-foot-tall turbines on the ridgeline of the Columbia River Gorge would also degrade the scenic values of the Gorge. The turbines would be highly visible from several designated key viewing areas within the National Scenic Area, including Interstate 84, the Historic Columbia River Highway, Cook-Underwood Road, and Panorama Point. The project would introduce highly visible industrial facilities into the natural, forested landscape, protruding above ridgelines and detracting from the natural scenic beauty of the Gorge. The wind towers would have daytime and nighttime warning lights, which would worsen the aggravate scenic impacts.

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I support renewable energy, but I am opposed to industrial-scale wind energy development within or adjacent to the Columbia River Gorge National Scenic Area, a designated national scenic treasure.

Julie Steiner
[redacted]
Portland, OR 97225

503292[redacted]

Scoping Comment
260

Talburt, Tammy (CTED)

From: Marnie McPhee [redacted]@aol.com]
Sent: Saturday, May 16, 2009 10:46 AM
To: CTED EFSEC
Subject: Concern about Whistling Ridge

Allen Fiksdal
Manager, Energy Facility Site Evaluation Council PO Box 43172
905 Plum Street SE
Olympia , 98504-3172

Dear Mr. Fiksdal, ,

I am writing to comment on the proposed Whistling Ridge Energy Project in Skamania County, Washington.

The proposed project would cause significant negative impacts to sensitive wildlife and plant habitat and would degrade the outstanding scenic beauty of the Columbia River Gorge National Scenic Area.

The Whistling Ridge proposal includes more than 80 wind turbines in two counties, yet the application filed with EFSEC discusses only 50 turbines in Skamania County. The EIS must review the cumulative environmental impacts of all portions of the project, including both the Skamania Co. and Klickitat Co. portions.

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I support renewable energy, but I am opposed to industrial-scale wind energy development within or adjacent to the Columbia River Gorge National Scenic Area, a designated national scenic treasure.

Marnie McPhee
[redacted]
Portland, OR 97206

Scoping Comment #261

Talburt, Tammy (CTED)

From: John Laptad [redacted]@gorge.net]
Sent: Saturday, May 16, 2009 11:06 AM
To: CTED EFSEC
Subject: Concern about Whistling Ridge

Allen Fiksdal
Manager, Energy Facility Site Evaluation Council PO Box 43172
905 Plum Street SE
Olympia , 98504-3172

Dear Mr. Fiksdal, ,

I am writing to comment on the proposed Whistling Ridge Energy Project in Skamania County, Washington.

The proposed project would cause significant negative impacts to sensitive wildlife and plant habitat and would degrade the outstanding scenic beauty of the Columbia River Gorge National Scenic Area.

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I support renewable energy, but I am opposed to industrial-scale wind energy development within or adjacent to the Columbia River Gorge National Scenic Area, a designated national scenic treasure.

John Laptad
[redacted]
Hood River, OR 97031

Scoping Comment
#262

Talburt, Tammy (CTED)

From: Jeffrey Block [redacted]@yahoo.com]
Sent: Saturday, May 16, 2009 11:26 AM
To: CTED EFSEC
Subject: Concern about Whistling Ridge

Allen Fiksdal
Manager, Energy Facility Site Evaluation Council PO Box 43172
905 Plum Street SE
Olympia , 98504-3172

Dear Mr. Fiksdal, ,

I am writing to comment on the proposed Whistling Ridge Energy Project in Skamania County, Washington.

The proposed project would cause significant negative impacts to sensitive wildlife and plant habitat and would degrade the outstanding scenic beauty of the Columbia River Gorge National Scenic Area.

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I support renewable energy, but I am opposed to industrial-scale wind energy development within or adjacent to the Columbia River Gorge National Scenic Area, a designated national scenic treasure.

Jeffrey Block
[redacted]
PORTLAND, OR 97220

Scoping Comment #263

Talburt, Tammy (CTED)

From: Will McKamey [redacted]@gmail.com]
Sent: Saturday, May 16, 2009 11:50 AM
To: CTED EFSEC
Subject: Concern about Whistling Ridge

Allen Fiksdal
Manager, Energy Facility Site Evaluation Council PO Box 43172
905 Plum Street SE
Olympia , 98504-3172

Dear Mr. Fiksdal, ,

I am writing to comment on the proposed Whistling Ridge Energy Project in Skamania County, Washington.

The proposed project would cause significant negative impacts to sensitive wildlife and plant habitat and would degrade the outstanding scenic beauty of the Columbia River Gorge National Scenic Area.

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I support renewable energy, but I am opposed to industrial-scale wind energy development within or adjacent to the Columbia River Gorge National Scenic Area, a designated national scenic treasure.

Will McKamey
[redacted]
Portland, OR 97209

503-224-[redacted]

Scoping Comment #264

Talburt, Tammy (CTED)

From: [redacted]@isp.com
Sent: Saturday, May 16, 2009 11:52 AM
To: CTED EFSEC
Subject: Concern about Whistling Ridge

Allen Fiksdal
Manager, Energy Facility Site Evaluation Council PO Box 43172
905 Plum Street SE
Olympia , 98504-3172

Dear Mr. Fiksdal, ,

I am writing to comment on the proposed Whistling Ridge Energy Project in Skamania County, Washington.

The proposed project would cause significant negative impacts to sensitive wildlife and plant habitat and would degrade the outstanding scenic beauty of the Columbia River Gorge National Scenic Area.

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I support renewable energy, but I am opposed to industrial-scale wind energy development within or adjacent to the Columbia River Gorge National Scenic Area, a designated national scenic treasure.

[redacted]
Portland, OR 97204

Scoping Comment #265

Talburt, Tammy (CTED)

From: cass estes [redacted]@waveriders.org]
Sent: Saturday, May 16, 2009 1:43 PM
To: CTED EFSEC
Subject: Concern about Whistling Ridge

Allen Fiksdal
Manager, Energy Facility Site Evaluation Council PO Box 43172
905 Plum Street SE
Olympia , 98504-3172

Dear Mr. Fiksdal, ,

I am writing to comment on the proposed Whistling Ridge Energy Project in Skamania County, Washington.

The proposed project would cause significant negative impacts to sensitive wildlife and plant habitat and would degrade the outstanding scenic beauty of the Columbia River Gorge National Scenic Area.

The Whistling Ridge proposal includes more than 80 wind turbines in two counties, yet the application filed with EFSEC discusses only 50 turbines in Skamania County. The EIS must review the cumulative environmental impacts of all portions of the project, including both the Skamania Co. and Klickitat Co. portions.

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I support renewable energy, but I am opposed to industrial-scale wind energy development within or adjacent to the Columbia River Gorge National Scenic Area, a designated national scenic treasure.

cass estes
[redacted]
hood river, OR 97031

Scoping Comment #266

Talburt, Tammy (CTED)

From: Ellynne Kutschera [redacted]@pdx.edu]
Sent: Saturday, May 16, 2009 2:27 PM
To: CTED EFSEC
Subject: Concern about Whistling Ridge

Allen Fiksdal
Manager, Energy Facility Site Evaluation Council PO Box 43172
905 Plum Street SE
Olympia , 98504-3172

Dear Mr. Fiksdal, ,

I have some concerns about the Whistling Ridge Energy Project in Skamania County, Washington.

Certainly the Columbia River Gorge offers a great potential for wind energy; also, in a time of needed energy alternatives, it may seem somewhat trivial to argue for keeping the "great views". However, we are also in a time when those natural things we still have are increasingly precious; degrading them, picking piece by piece at what we have left that is still magnificent, is just not right. Also, if the proposed project would cause significant negative impacts to sensitive wildlife and plant habitat in the Columbia River Gorge National Scenic Area, the trade-off is simply not worth it.

I am also supporting the following comments:

The Whistling Ridge proposal includes more than 80 wind turbines in two counties, yet the application filed with EFSEC discusses only 50 turbines in Skamania County. The EIS must review the cumulative environmental impacts of all portions of the project, including both the Skamania Co. and Klickitat Co. portions.

This proposal is likely to have different and greater wildlife impacts than any other wind energy facility proposed in the State of Washington, because this project is proposed at a heavily forested site. The project would permanently disturb large areas of forested habitat and result in direct and indirect impacts to multiple wildlife species through habitat loss and displacement, direct collisions with turbine blades, and other factors. The potentially affected species include northern spotted owl, western gray squirrel, northern goshawk and other raptors, several species of bats, multiple migratory bird species, mule deer, black-tailed deer, and elk. Several of these species are listed as sensitive or threatened in Washington State.

Locating 426-foot-tall turbines on the ridgeline of the Columbia River Gorge would also degrade the scenic values of the Gorge. The turbines would be highly visible from several designated key viewing areas within the National Scenic Area, including Interstate 84, the Historic Columbia River Highway, Cook-Underwood Road, and Panorama Point. The project would introduce highly visible industrial facilities into the natural, forested landscape, protruding above ridgelines and detracting from the natural scenic beauty of the Gorge. The wind towers would have daytime and nighttime warning lights, which would worsen the aggravate scenic impacts.

Finally, the proposed project would be located partially within the Columbia River Gorge National Scenic Area. Specifically, the applicant proposes to construct, expand, and improve more than two miles of roads within the National Scenic Area in order to haul industrial materials with gross vehicle weights of up to 53 tons. This proposal to construct and use Scenic Area lands for industrial

purposes is prohibited by the National Scenic Area Act and Management Plan, and must be denied.

I support renewable energy, but I am opposed to industrial-scale wind energy development within or adjacent to the Columbia River Gorge National Scenic Area, a designated national scenic treasure.

Ellynne Kutschera
[redacted]
Gresham, OR
Gresham, OR 97030

Scoping Comment #267

Talburt, Tammy (CTED)

From: [redacted]@yahoo.com
Sent: Saturday, May 16, 2009 2:46 PM
To: CTED EFSEC
Subject: Whistling Ridge Energy Project
Attachments: KAS scoping letter on Whistling Ridge Windpower Project -2.doc

Please accept these comments from Kittitas Audubon. Thanks

Scoping Comment
#268

Kittitas Audubon
P.O. Box 1443
Ellensburg, Washington 98926
May 14, 2009

Allen Fiksdahl, Manager
Energy Facilities Evaluation Council
P.O. Box 43172
905 Plum St. SE
Olympia, WA 98504-3172

RE: Whistling Ridge Energy Project scoping document.

Dear Mr. Fiksdahl,

This project represents the first wind farm proposed for construction on forested lands in the State of Washington and the northwest.
As such, there are what we consider to be two major wildlife concerns associated with Whistling Ridge Energy Project: The Northern Spotted Owl and Migratory Bats and Birds.

1. Northern Spotted Owl.
   The Northern Spotted Owl is listed federally as a Threatened species under the Endangered Species Act. It is listed as Endangered in the State of Washington. This project is located within a Northern Spotted Owl Special Emphasis Area (SOSEA).

   This wind farm should not be approved just based on its proximity to Northern Spotted Owl Special Emphasis Areas (SOSEA).

   While there are multiple threats to the recovery of Northern Spotted Owl (NSO), habitat is the one aspect over which we have the most control. Failure to maintain future habitat for a species already in precipitous decline will lead to the failure of the NSO Recovery Plan currently in its beginning stages before it has a chance to get started.

   With NSO at or near genetic bottleneck we should strive to maintain ALL available habitat. Even "incidental take" could lead to its extinction. Since there is no data about how NSO will interact with turbines this wind farm adds to the risk of their extinction.

   Across its US range the NSO is in greatest jeopardy in Washington State. The Washington Forest Practices Board currently has an NSO Working Group seeking ways for private lands to contribute to the recovery of the species. EFSEC should look closely at that work since the proposed wind farm falls within lands under that jurisdiction.

2. Migratory Birds and Bats.
   Large bird and bat kills have been experienced on wind farms on the east coast situated in migratory areas located in forests.
   Little is known about the migration of either birds or bats in Washington.
   Virtually nothing is known about bat migration or how bats interact with wind turbines.

   It is possible that large bat kills might occur here since the wind farm would be in a forested area. The reason for previous large bat kills has not as yet been determined, nor *ways to prevent, or mitigate for, large losses.*

   On this project no nighttime surveys have been done for birds to rule out a potential negative impact to migratory birds. *The wind farms already built in Washington are in areas of open habitat, none within forests.*

Again:
This wind farm should not be approved just based on its proximity to Northern Spotted Owl Emphasis Areas (SOSEA).

Sincerely,

Tom Gauron,
President

Beth Rogers
Conservation Committee

Scoping Comment
#269

Talburt, Tammy (CTED)

From: Gail Streicker [redacted]@hotmail.com]
Sent: Saturday, May 16, 2009 2:58 PM
To: CTED EFSEC
Subject: Concern about Whistling Ridge

Allen Fiksdal
Manager, Energy Facility Site Evaluation Council PO Box 43172
905 Plum Street SE
Olympia , 98504-3172

Dear Mr. Fiksdal, ,

I am writing to comment on the proposed Whistling Ridge Energy Project in Skamania County, Washington.

The proposed project would cause significant negative impacts to sensitive wildlife and plant habitat and would degrade the outstanding scenic beauty of the Columbia River Gorge National Scenic Area.

The Whistling Ridge proposal includes more than 80 wind turbines in two counties, yet the application filed with EFSEC discusses only 50 turbines in Skamania County. The EIS must review the cumulative environmental impacts of all portions of the project, including both the Skamania Co. and Klickitat Co. portions.

This proposal is likely to have different and greater wildlife impacts than any other wind energy facility proposed in the State of Washington, because this project is proposed at a heavily forested site. The project would permanently disturb large areas of forested habitat and result in direct and indirect impacts to multiple wildlife species through habitat loss and displacement, direct collisions with turbine blades, and other factors. The potentially affected species include northern spotted owl, western gray squirrel, northern goshawk and other raptors, several species of bats, multiple migratory bird species, mule deer, black-tailed deer, and elk. Several of these species are listed as sensitive or threatened in Washington State.

Locating 426-foot-tall turbines on the ridgeline of the Columbia River Gorge would also degrade the scenic values of the Gorge. The turbines would be highly visible from several designated key viewing areas within the National Scenic Area, including Interstate 84, the Historic Columbia River Highway, Cook-Underwood Road, and Panorama Point. The project would introduce highly visible industrial facilities into the natural, forested landscape, protruding above ridgelines and detracting from the natural scenic beauty of the Gorge. The wind towers would have daytime and nighttime warning lights, which would worsen the aggravate scenic impacts.

Finally, the proposed project would be located partially within the Columbia River Gorge National Scenic Area. Specifically, the applicant proposes to construct, expand, and improve more than two miles of roads within the National Scenic Area in order to haul industrial materials with gross vehicle weights of up to 53 tons. This proposal to construct and use Scenic Area lands for industrial purposes is prohibited by the National Scenic Area Act and Management Plan, and must be denied.

I support renewable energy, but I am opposed to industrial-scale wind energy development within or adjacent to the Columbia River Gorge National Scenic Area, a designated national scenic treasure.

Gail Streicker
[redacted]
Portland, OR 97212

Scoping Comment
#270

Talburt, Tammy (CTED)

From: Joseph Witt [redacted]@hotmail.com]
Sent: Saturday, May 16, 2009 3:32 PM
To: CTED EFSEC
Subject: Whistling Ridge

Allen Fiksdal
Manager, Energy Facility Site Evaluation Council PO Box 43172
905 Plum Street SE
Olympia , 98504-3172

Dear Mr. Fiksdal, ,

I am writing to comment on the proposed Whistling Ridge Energy Project in Skamania County, Washington.

The proposed project would set a bad precedent for Gorge development. The Gorge is already over-developed as it is. Future developments will use the wind development as an excuse to build in the Gorge. Further building in the Gorge will cause significant negative impacts to sensitive wildlife and plant habitat and would degrade the outstanding scenic beauty of the Columbia River Gorge National Scenic Area.

The Whistling Ridge proposal includes more than 80 wind turbines in two counties, yet the application filed with EFSEC discusses only 50 turbines in Skamania County. The EIS must review the cumulative environmental impacts of all portions of the project, including both the Skamania Co. and Klickitat Co. portions.

This proposal is likely to have different and greater wildlife impacts than any other wind energy facility proposed in the State of Washington, because this project is proposed at a heavily forested site. The project would permanently disturb large areas of forested habitat and result in direct and indirect impacts to multiple wildlife species through habitat loss and displacement, direct collisions with turbine blades, and other factors. The potentially affected species include northern spotted owl, western gray squirrel, northern goshawk and other raptors, several species of bats, multiple migratory bird species, mule deer, black-tailed deer, and elk. Several of these species are listed as sensitive or threatened in Washington State.

Locating 426-foot-tall turbines on the ridgeline of the Columbia River Gorge would also degrade the scenic values of the Gorge. The turbines would be highly visible from several designated key viewing areas within the National Scenic Area, including Interstate 84, the Historic Columbia River Highway, Cook-Underwood Road, and Panorama Point. The project would introduce highly visible industrial facilities into the natural, forested landscape, protruding above ridgelines and detracting from the natural scenic beauty of the Gorge. The wind towers would have daytime and nighttime warning lights, which would worsen the aggravate scenic impacts.

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I support renewable energy, but I am opposed to development within or adjacent to the Columbia River Gorge National Scenic Area.

Joseph Witt
[redacted]
Portland, OR 97214

Scoping Comment
#271

Talburt, Tammy (CTED)

From: Sandra Siegner [redacted]@att.net]
Sent: Saturday, May 16, 2009 3:39 PM
To: CTED EFSEC
Subject: Concern about Whistling Ridge

Allen Fiksdal
Manager, Energy Facility Site Evaluation Council PO Box 43172
905 Plum Street SE
Olympia , 98504-3172

Dear Mr. Fiksdal, ,

I am writing to comment on the proposed Whistling Ridge Energy Project in Skamania County, Washington.

The proposed project would cause significant negative impacts to sensitive wildlife and plant habitat and would degrade the outstanding scenic beauty of the Columbia River Gorge National Scenic Area.

The Whistling Ridge proposal includes more than 80 wind turbines in two counties, yet the application filed with EFSEC discusses only 50 turbines in Skamania County. The EIS must review the cumulative environmental impacts of all portions of the project, including both the Skamania Co. and Klickitat Co. portions.

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Locating 426-foot-tall turbines on the ridgeline of the Columbia River Gorge would also degrade the scenic values of the Gorge. The turbines would be highly visible from several designated key viewing areas within the National Scenic Area, including Interstate 84, the Historic Columbia River Highway, Cook-Underwood Road, and Panorama Point. The project would introduce highly visible industrial facilities into the natural, forested landscape, protruding above ridgelines and detracting from the natural scenic beauty of the Gorge. The wind towers would have daytime and nighttime warning lights, which would worsen the aggravate scenic impacts.

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I support renewable energy, but I am opposed to industrial-scale wind energy development within or adjacent to the Columbia River Gorge National Scenic Area, a designated national scenic treasure.

Sandra Siegner
[redacted]
Portland, OR 97219-6349

Scoping Comment
#272

Talburt, Tammy (CTED)

From: ellen maddex [redacted]@msn.com]
Sent: Saturday, May 16, 2009 4:28 PM
To: CTED EFSEC
Subject: Concern about Whistling Ridge

Allen Fiksdal
Manager, Energy Facility Site Evaluation Council PO Box 43172
905 Plum Street SE
Olympia , 98504-3172

Dear Mr. Fiksdal, ,

I am writing to comment on the proposed Whistling Ridge Energy Project in Skamania County, Washington.

The proposed project would cause significant negative impacts to sensitive wildlife and plant habitat and would degrade the outstanding scenic beauty of the Columbia River Gorge National Scenic Area.

The Whistling Ridge proposal includes more than 80 wind turbines in two counties, yet the application filed with EFSEC discusses only 50 turbines in Skamania County. The EIS must review the cumulative environmental impacts of all portions of the project, including both the Skamania Co. and Klickitat Co. portions.

This proposal is likely to have different and greater wildlife impacts than any other wind energy facility proposed in the State of Washington, because this project is proposed at a heavily forested site. The project would permanently disturb large areas of forested habitat and result in direct and indirect impacts to multiple wildlife species through habitat loss and displacement, direct collisions with turbine blades, and other factors. The potentially affected species include northern spotted owl, western gray squirrel, northern goshawk and other raptors, several species of bats, multiple migratory bird species, mule deer, black-tailed deer, and elk. Several of these species are listed as sensitive or threatened in Washington State.

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I support renewable energy, but I am opposed to industrial-scale wind energy development within or adjacent to the Columbia River Gorge National Scenic Area, a designated national scenic treasure.

ellen maddex
[redacted]
eugene, OR 97403

Scoping Comment #273

Talburt, Tammy (CTED)

From: J.G. Zettergren [redacted]@comcast.net]
Sent: Saturday, May 16, 2009 4:29 PM
To: CTED EFSEC
Subject: Concern about Whistling Ridge

Allen Fiksdal
Manager, Energy Facility Site Evaluation Council PO Box 43172
905 Plum Street SE
Olympia , 98504-3172

Dear Mr. Fiksdal, ,

I am writing to comment on the proposed Whistling Ridge Energy Project in Skamania County, Washington.

The proposed project would cause significant negative impacts to sensitive wildlife and plant habitat and would degrade the outstanding scenic beauty of the Columbia River Gorge National Scenic Area.

The Whistling Ridge proposal includes more than 80 wind turbines in two counties, yet the application filed with EFSEC discusses only 50 turbines in Skamania County. The EIS must review the cumulative environmental impacts of all portions of the project, including both the Skamania Co. and Klickitat Co. portions.

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Giving the backers of Whistling Wind a variance inside the National scenic are is is a slippery slope that will be used by developers and land owners as a precedent to develop elsewhere inside the

National Scenic Area. Do not allow this to go forward in this location. There are plenty of sites with good wind generating capacity without invading the National Scenic area visually or physically.

I support renewable energy, but I am opposed to industrial-scale wind energy development within or adjacent to the Columbia River Gorge National Scenic Area, a designated national scenic treasure.

J.G. Zettergren
[redacted]
McMinnville, OR 97128

Scoping Comment #274

Talburt, Tammy (CTED)

From: Robert and Dolores Scheelen [redacted]@earthlink.net]
Sent: Saturday, May 16, 2009 4:31 PM
To: CTED EFSEC
Subject: Concern about Whistling Ridge

Allen Fiksdal
Manager, Energy Facility Site Evaluation Council PO Box 43172
905 Plum Street SE
Olympia , 98504-3172

Dear Mr. Fiksdal, ,

I am writing to comment on the proposed Whistling Ridge Energy Project in Skamania County, Washington.

The proposed project would cause significant negative impacts to sensitive wildlife and plant habitat and would degrade the outstanding scenic beauty of the Columbia River Gorge National Scenic Area.

The Whistling Ridge proposal includes more than 80 wind turbines in two counties, yet the application filed with EFSEC discusses only 50 turbines in Skamania County. The EIS must review the cumulative environmental impacts of all portions of the project, including both the Skamania Co. and Klickitat Co. portions.

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I support renewable energy, but I am opposed to industrial-scale wind energy development within or adjacent to the Columbia River Gorge National Scenic Area, a designated national scenic treasure.

Robert and Dolores Scheelen
[redacted]
Medford, OR 97504

Scoping Comment #275

Talburt, Tammy (CTED)

From: James Tedford [redacted]@gorge.net]
Sent: Saturday, May 16, 2009 5:52 PM
To: CTED EFSEC
Subject: Columbia River Gorge wind turbine project

Dear Mr. Fiksdal,
Over twenty years ago, we bought a wonderful piece of property in Hood River, Oregon, while we still lived and worked in Juneau, Alaska. We knew we wanted to relocate at retirement, and we looked far and wide to find the perfect spot. What drew us to the Columbia River Gorge was its beauty. The National Scenic Area designation was important to us, not only as validation of what we already knew the Gorge to be, but as a protective umbrella, under which future development of the area would be filtered.

We worked and saved for years to finally build our dream home on that property in 1997. Our project was carefully scrutinized by the Columbia River Gorge Commission, and we had to make many adjustments as we attempted to comply with the requirements and restrictions of living within the view area. Though the Commission rules seemed difficult to work within at times, we understood that those rules were created for the greater good, and that we were contributing to the value of the Gorge by complying.

In order to sustain our way of life and our planet, we are very careful with all the products we use, the goods we consume, and the foods we eat. We support all attempts to grow alternative energy projects that are clean and renewable such as hydro power and wind power. However, it is critical that these types of projects be developed responsibly. It is not responsible in any way to place a wind turbine farm in the key viewing area within a National Scenic Area.

Private citizens must comply with Commission rules to safeguard the greater good. Do not allow a corporation to so totally disregard the intent of the National Scenic Area provisions and to act so irresponsibly with this turbine project. The livelihoods of thousands of families in the Gorge are tied to the tourist industry, which is tied inextricably to our beautiful scenery and breathtaking views. These turbines would forever mar the landscape, views, and quality of life in the Gorge. Please say "NO" to the Whistling Ridge Energy Project if it remains visible from locations within the Columbia Gorge National Scenic Area.

Thank you.
Laila and Jim Tedford
[redacted]
Hood River, OR 97031

[redacted]@gorge.net)