

Saddleback Ridge Wind, LLC // Natural Resource Protection Act (NRPA) and Site Location of Development Act applications

- *Exhibit 2: Report of Richard James dated October 4, 2011 (E-Coustic Solutions)*

E-Coustic Solution

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Oct. 4, 2011

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Subject: Comments on the Draft Saddleback Ridge Wind Order from Maine's Department of Environmental Protection L-25137-TG-B-N (Draft)

Dear Mr. Brown:

Thank you for the opportunity to provide my comments on the above referenced Draft Order of the Maine DEP regarding the Saddleback Ridge Wind Project. I have provided comments on this project earlier in the project's history. I will limit my current comments to the issues raised in the Draft Order that require an updated response.

BEP Hearing and Decision

Before going into details on the statements and conclusions of Section 5 NOISE it is important to note that since the initial round of comments and reports upon which the Draft Order is based were submitted the Board (BEP) has held a hearing (July 7, 2011) on the noise criteria used by the Department of Environmental Protection (DEP) and the need for noise criteria for wind turbines separate from the general industry rules of Chapter 375 based on testimony regarding the potential for adverse health effects from wind turbine sound emissions. Based on testimony regarding health concerns and property values at the hearings, the BEP has provisionally accepted the adoption of new rules specific to wind turbine projects. These new rules provide that the night time limits for protected locations be lowered to 42 dBA (Leq). They also provide new formulas for SDRS that are in line with the recent Hulme Decision in the U.K. on the same issue. The DEP's Draft Order addresses these health issues in a manner inconsistent with the BEP's understanding and decision. Based on the BEP's acceptance of this testimony and its vote to change Chapter 375 to address wind turbine noise under separate and more stringent criteria than used for general industry the DEP should use its authority to apply these more protective rules to the Saddleback Ridge Wind Project.

If the provisional rules were applied to this project there would be nine (9) residences that would be above the 42 dBA limit. This is based on a review of Table A4: Modeled Residences and 500 foot Buffer Locations from the revised Noise Study by RSG. The testimony on the World Health Organization's 2009 guidelines and Dr. Nissenbaum's on Mars Hill and Vinalhaven at the BEP proceedings demonstrated that the residents of all 33 non-participating homes at risk of adverse health effects. This is supported by two new papers. One is by Dr. Nissenbaum and colleagues that was presented at the 10th International Congress on Noise as a Public Health Problem (ICBEN) 2011, London, UK. This paper provides additional evidence to support his oral testimony at the BEP hearing which demonstrated that adverse health effects at Mars Hill and Vinalhaven Maine extend out to distances of 4000 feet from the turbines. The second recent paper is a peer reviewed report published in the September - October 2011 issue of Noise and Health. The report titled: "Evaluating the impact of wind turbine noise on health-related quality of life" by Dr. Daniel Shepherd et. al. finds that:

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"... we conclude that nighttime wind turbine noise limits should be set conservatively to minimize harm, and, on the basis of our data, suggest that setback distances need to be greater than 2 km in hilly terrain.

It should also be noted that the noise limits for wind turbine projects in the regions reviewed in the Shepherd study are 40 dBA (L_{A90}) which is a more stringent limit than the BEP has set in its wind turbine noise criteria.

Low Frequency Sound

The DEP Draft Order discounts concerns about the health impacts of infra and low frequency sound and accepts the RSG and Saddleback Ridge Wind Project position that the larger 2.75 MW wind turbines will be quieter than the ones previously considered and by implication also quieter than the 1.5 MW turbines sited at Mars Hill, Vinalhaven and Freedom. All of these were studied in a manner similar to Saddleback Ridge and accepted by the DEP and its consultant EnRad as being within the 45 dBA limits for protected locations under the original rules of Chapter 375. Yet, it is my experience with studies of the GE 2.5 MW turbines that the larger turbines have greater infra and low frequency noise emissions. This observation is supported in the peer reviewed 2010 paper by Henrik Moller and Christian Pedersen "*Low frequency noise from large turbines*" published in the Journal of the Acoustical Society of America. The paper looks at the potential for more problems in the future as wind turbines move from the under 2 MW size to the larger sizes.

" As wind turbines get larger, worries have emerged that the turbine noise would move down in frequency and that the low-frequency noise would cause annoyance for the neighbors. The noise emission from 48 wind turbines with nominal electric power up to 3.6 MW is analyzed and discussed. The relative amount of low-frequency noise is higher for large turbines (2.3–3.6 MW) than for small turbines (< 2 MW), and the difference is statistically significant. The difference can also be expressed as a downward shift of the spectrum of approximately one-third of an octave."

This paper's findings are in opposition to the DEP's acceptance of promises from the developer and its consultants that the new turbines will be 'quieter.' It may be that the new turbines are quieter when using a dBA setting for measurement, but that is because that dBA excludes the low frequency sounds. The spectral data that is provided in the revised noise study is shown as dBA values and only provides the sound levels down to the 31.5 Hz octave band. The use of the dBA weighting masks the high levels that would be in the table if the data was presented un-weighted.

Table 4: GE 2.75-103 Spectral Sound Power Levels

10-m Height wind speed (m/s)	Nominal Sound Power (dBA)	Octave Band Center Frequency								
		31.5 Hz	63 Hz	125 Hz	250 Hz	500 Hz	1 kHz	2 kHz	4 kHz	8 kHz
7 to cut-out	105.0	82.6	92.2	96.1	97.9	98.4	99.0	96.0	87.5	71.7

For example the un-weighted sound pressure level in the 31.5 Hz octave band is 122 dB, which is much more meaningful in light of the Moller/Pedersen warning about higher low frequency sound from larger wind turbines. A recent paper by myself and Mr. Wade Bray of Head Acoustics demonstrated that the majority of the acoustic energy emitted by wind turbines of the 1.5 MW size are in the range below the 31.5 Hz octave band. Our paper: "*Dynamic measurements of wind turbine acoustic signals, employing sound quality engineering methods considering the time and frequency*

sensitivities of human perception" shows that not only is wind turbine noise predominantly in the lower frequency, the peak is in the infrasound range. We show that when properly analyzed wind turbine noise emissions contain sufficient infrasound to exceed the Threshold of Perception for audible steady tones but it also exceeds the threshold of vestibular response reported in the peer-reviewed works of Dr. Salt et. al. by 40 dB. It is a mistake for the DEP to ignore the importance of infra and low frequency sound emissions and their potential to cause adverse health effects and to propagate further than the more audible sounds that are contributors to the reported dBA sound levels.

Model

The DEP Draft Order also accepts without qualification that the models used to predict (or as should be said, estimate) the sound levels at receiving properties are inherently accurate. Yet, this is not what is being reported by others who have as much experience in wind turbine project models as any of the consultants or advisors to DEP or the Saddleback Ridge project. For example, in Ontario where 900 turbines are in operation of the size installed in Maine's existing projects or larger, the primary consultant to the Ontario Ministry of Environment who conducts complaint follow-ups noted in a paper presented in 2009 in Ottawa, that even after MOE has tightened its requirements for modeling a +/- 5 dBA difference between modeled estimates and field measurements exists:

" Ontario has been on the forefront of noise assessment for wind power projects in Canada, having produced guidelines for the methodology and criteria in 2004, and updating these in 2008. The guidelines rely on internationally recognized standards, and the updated version has now considered and clarified factors such as the wind profile, penalties for the quality of the sound, and ground attenuation factors. These improvements have increased the consistency between assessments, although there remains in practice variations of at least +/- 5 dB between the predicted impacts and sound levels measured in the field."

Brian Howe, "*Recent developments in assessment guidelines for sound from wind power projects in Ontario, Canada, with a comparison to acoustic audit results*"

How is it that the consultant to the Saddleback Ridge project can profess to have such high accuracy when others such as Mr. Howe find considerable variability? The DEP's acceptance of the RSG claims of accuracy appears to be based solely on the study of one project and a few locations under ideal conditions. What about other locations with different topography and weather conditions? The observations of Mr. Howe should be taken seriously by DEP and EnRad and a reasonable degree of uncertainty introduced as safety factors be used in the decisions for permits rather than accepting that a prediction of 44 dB means that the sounds at that location will never be 45 or higher. Yet, this draft decision accepts these non-peer reviewed and self reported studies as though they were independent validations of the models accuracy.

It is important to understand that when Mr. Howe says "...the updated version has now considered and clarified factors such as the wind profile, penalties for the quality of the sound and ground attenuation factors." he is referring to the MOE's requirement that the model represent the "predictable worst case" conditions for noise emissions. This requirement is also part of the BEP's revised noise regulations for wind turbines in part 7(c). This requires that the model represent the "predictable worst case" and that it should represent high wind shear conditions and other conditions that may affect in-flow airstream turbulence (7(c)(1)). These requirements should be part of the DEP decision making process and not ignored because an acoustics expert asserts that such conditions do not exist at the top of a ridge.

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NRO

The DEP engages in some type of suspension-of-disbelief by accepting that the use of NRO modes will make a significant difference in how wind turbine sounds affect the residential properties where the turbines are too close to run in full operating mode. First, it must be understood that the NRO modes (generally there are three or four settings, NRO1, NRO2, etc) only reduce emissions by 1 dB per mode. Thus, if the NRO mode 1 or 2 is used one can expect that under weather conditions that do not induce blade swish/thump sounds (SDRS) a decrease of 1 or 2 dB will be achieved. Yet, it is generally accepted that a 3 dB change in a noise source is barely perceptible. How will a barely perceptible reduction mitigate the noise for those residents near the closest turbines? Second, use of NRO modes on Vinalhaven Island did not prevent exceedances of the 45 dBA nighttime limits. It is unproven as to whether NRO modes affect noise emissions during periods of in-flow turbulence which is the condition most likely to produce high noise emissions.

Finally, NRO modes are the only post-construction mitigation method available. To allow that mitigation tool to be used as a method of obtaining a permit instead of requiring Saddleback Ridge Wind to relocate those turbines means that if there is a need for further reduction found after operation commences the available mitigation method will not be available because it was already applied. This seems to be a poor decision and one that is not based on precaution and concern for the residents.

SDRS

The DEP Draft Order accepts the promises of RSG and Saddleback Ridge Wind that there is no reason to apply a penalty for short duration repetitive sounds. This is based on application of the formula used for general industry which in the BEP decision was found to be inappropriate for the type of SDRS produced by wind turbines. Further, RSG claims that its review of meteorological tower data from met towers on the ridge shows that wind shear will be infrequent for turbines along the ridge. This assertion is not based on any review by a qualified meteorologist nor does it address all of the wind and weather conditions that lead to blade swish and the need for the SDRS penalty.

There are many other causes of blade swish and thump that are from in-flow turbulence not related to wind shear. Ridge tops are subject to strong updrafts and micro-turbulence from the mixing of air as lower air streams have to rise to pass the ridge top. Locating turbines along a ridge puts them at the locus of these mixing air streams. That mixing will cause in-flow turbulence and the result will be higher noise emissions than the model used in its calculations and also more swish and thump as blades are buffeted by the micro-turbulence.

Meteorological

In spite of RSG's unqualified assertions that the meteorological conditions at the ridge have low wind shear and not likely to affect turbine noise emissions there are many others who are more qualified to make these assessments and they do not agree. They advise pilots of small aircraft about the dangers of flying too close to ridges. Even larger commercial size jets at higher elevations are affected by the turbulence over ridges. When an expert in acoustics makes an assertion about ridge meteorology without the advice of a qualified expert it should be rejected by the DEP. However, in this case we find the DEP is accepting of these assertions and bases its decision that a penalty is not required on it.

Tones

The DEP also accepts RSG's assertion that tones will not be part of the noise emissions for the project turbines. But, as shown in the paper by Mr. Bray and myself, tones are prevalent in the lowest frequencies and those are not considered by either RSG or the DEP and EnRad.

Public Comment

In the final part of section 5 NOISE, D. Public Comment, the DEP reviews literature provided to them by Friends of Maine's Mountains such as the reports of Dr. Eja Pedersen and her colleagues. These are apparently given little weight in the Draft Order as they all demonstrate that the current 45 dBA criteria will lead to annoyance and complaints. In a recent paper by Dr. Pedersen and her colleagues titled: "Response to noise from modern wind farms in The Netherlands" published in 2009 in the peer reviewed Journal of the Acoustical Society of America a graph showing annoyance from wind turbines compared to annoyance from other common community noise sources. It is reproduced below. This shows that wind turbines are more annoying (Dr. Pedersen uses annoyance an adverse health effect in the context of this paper) than aircraft, industry, road traffic and railways. Only shunting yards have a higher potential to cause annoyance at the same sound levels as wind turbines. It is wrong for the DEP to ignore the work of the researchers as they do in the Draft Order. This cherry picking of what to use as support for their Draft Order continues with the DEP references to the Maine Center for Disease Control decision that wind turbines pose no risks of health effects. This decision is not in line with the research of qualified medical and acoustical experts and has been shown to have been a reaction to questions without significant research by the MCDC.

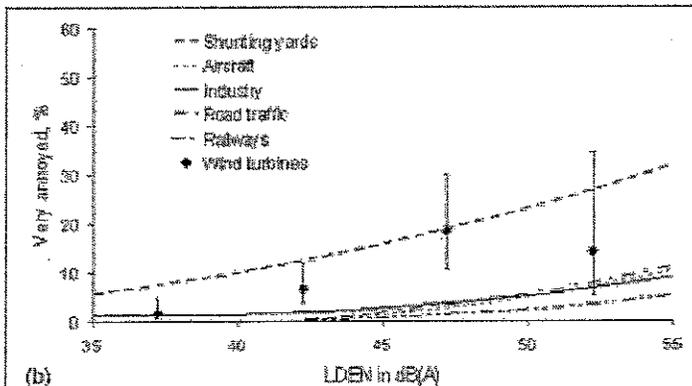
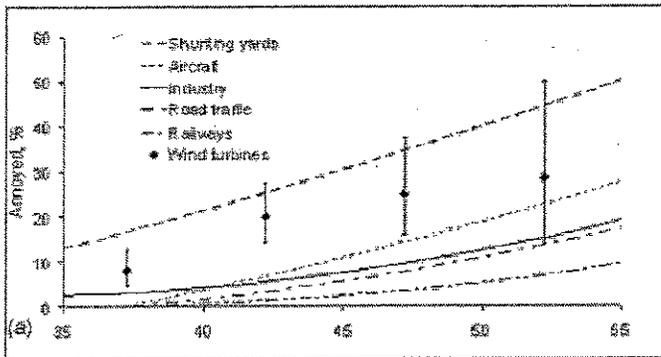


FIG. 3. (Color online) Proportion of respondents annoyed (a) and very annoyed (b) by wind turbine noise outside their dwellings (only respondents who did not benefit economically, n=586) compared to the modeled response [(A) percentage annoyed and (B) percentage highly annoyed] to noise from road traffic, aircraft, and railways (Miedema and Oudshoorn, 2001) and from industry and shunting yards (Miedema and Vos, 2004). For wind turbine noise the median of sound immission levels in each 5-dB interval is at the abscissa.



The DEP Draft Order then proceeds to ignore the works of the presenters at the October 30, 2009 Symposium held in Picton Ontario. This includes works by Dr. Salt and Dr. Pierpont among others. The DEP does not mention that these presentations have been reformatted for publication in a peer reviewed journal, the Bulletin of Science Technology and Society in the August 2011 issue. I have attached those papers and additional papers not mentioned by the DEP so that the peer reviewed work is part of this record.

The section continues with acceptance of the Maine Center for Disease Control assessment that wind turbines pose no

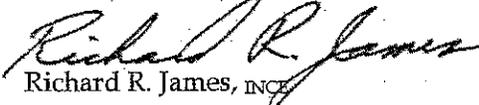
risk for adverse health effects. It ignores the storm of protests by members of the Maine medical community about the apparent bias in the assessment. Further the DEP then uses a non-peer reviewed whitepaper, funded and promoted by the wind industry trade association AWEA, that claims wind turbines are not a health risk. Both of these works appear to have the same source for information and do not even include any evidence that the

authors have ever talked to a person who is experiencing the adverse health effects that Drs. Nissenbaum and Shepherd have so well documented. Further, the AWEA document has been "peer

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reviewed" after it was issued by medical professionals with experience working with people exhibiting adverse health effects and who are members of the Society for Wind Vigilance. That review found that the AWEA whitepaper's conclusion of no adverse health effects is not even supported by the body of the document. A recent review of the medical evidence for adverse health effects is attached which covers the research on this topic up to the recent papers by Nissenbaum and Shepherd. This review provides considerable evidence that the MCDC and AWEA papers are not comprehensive and only report the literature that supports the decision that wind turbines are not a health risk.

Sincerely,
E-Coustic Solutions


Richard R. James, INC

