

To: Mr David Wiesner (David.Wiesner@puc.nh.gov)  
From: Joe Wilkas, Bridgewater, NH  
March 23, 2015

New Hampshire Site Evaluation Committee  
c/o David K. Wiesner, Staff Attorney  
N.H. Public Utilities Commission  
21 South Fruit Street, Suite 10  
Concord, NH 03301

**Subject: New Hampshire Site Evaluation Committee Rulemaking, Docket No. 2014-04**

Dear Mr. Wiesner:

I participated in most of the NH OEP pre-rulemaking public participation meetings of the Health and Safety Workgroup last spring and am very disappointed by, after all the time, effort and research done by the group, many of whom were experts in the topics addressed, how little of our recommendations appeared in the published rulemaking document. And some things appeared that were never even discussed. After this experience, it's difficult not to be skeptical of government practices. So I will try once again to make this process what it should be and submit a few proposals to make the subject of sound limits agree with the intention of the public working group.

The sound limits proposed were intended to limit the intrusion of noise from power generation facilities from unduly interfering with the health and quality of life of those nearby. The proper measurement of sound has already been addressed by Mr Blair in his submission on March 3. I would like to propose two more enhancements to improve the evaluation process so the results protect the public interest while allowing for power generating facilities sited in appropriate areas. These enhancements address sound limits and who does the measurements. For a quick reference to the ambient sound level in NH rural communities, the Groton Wind project sound testing showed typical night ambient levels of 20-25dBA in quiet areas, those 'least influenced' by nearby traffic, running brooks, etc.

I'll identify the areas where improvements are needed in **red**, underlined, and *italicized*.

I'll then provide the improved version in green, underlined, and italicized, with short documentation of reasons for the changes with links to credible sources of this information.

From the Dec 14, 2014 draft rules:

<http://www.nhsec.nh.gov/projects/2014-04/documents/141216draft.pdf>

From PDF Page 40/43:

(2) For wind energy systems, apply the following standards:

a. Sound Standards: A-weighted equivalent sound levels produced by the applicant's energy facility during operations shall not exceed the ***greater of 45 dBA*** or 5 dBA above ambient levels between the hours of 8:00 a.m. and 8:00 p.m. each day, and the ***greater of 40 dBA*** or 5 dBA above ambient levels at all other times during each day, ***as measured at the exterior wall of any existing permanently occupied building on a non-participating landowner's property, or at the non-participating landowner's property line if it is less than 300 feet from an existing occupied building, and these sound levels shall not be exceeded for more than 3 minutes within any 60 minute period:***

Changing to 'shall not exceed the ***lesser of 40 dBA***' or 5dBA above ambient levels between 8AM and 8PM each day, and the ***lesser of 35dBA***' or 5dBA above ambient levels at all other times' would be more in line with information and recommendations from the World Health Organization, a recent Massachusetts Wind Turbine Impact Study (after numerous problems with noise issues from MA wind turbine installations), and references from acoustical studies. There is no reason to allow a 15dBA sound level increase from wind turbines anywhere, especially not in quiet rural areas.

And all these levels should be ***as measured at the boundaries of the wind project, not within non-participating adjacent property*** for obvious reasons of property rights.

And there is no reason to allow these limits, intended to eliminate annoyance, sleep deprivation, and other health issues, to be *exceeded for more than 3 minutes within any 60 minute period*. 3 minutes each hour totals 1 hour 12 minutes each day, 8 hours 24 minutes each week, etc., far too much. Wind Turbine operation is relatively continuous, and there should be no intermittent 'peaking' sound output from properly operating turbines.

So the rules should read:

From PDF Page 40/43:

(2) For wind energy systems, apply the following standards:  
a. Sound Standards: A-weighted equivalent sound levels produced by the applicant's energy facility during operations shall not exceed the *lower of 40 dBA* or 5 dBA above ambient levels between the hours of 8:00 a.m. and 8:00 p.m. each day, and the *lower of 35 dBA* or 5 dBA above ambient levels at all other times during each day, *measured at the boundaries of the wind project*.

Or perhaps a simpler version:

(2) For wind energy systems, apply the following standards:  
a. Sound Standards: A-weighted equivalent sound levels produced by the applicant's energy facility during operations shall not exceed the *lower of 37 dBA* or 5 dBA above ambient levels, *measured at the boundaries of the wind project*.

These limits can easily be met with appropriate project setbacks.

And here's another important recommendation that should be added:

There doesn't appear to be a requirement for post-installation sound testing to verify that the noise limits are actually being met, and if complaints arise. This testing requirement must be added, preferably at 1 month after operation begins and another at a 1 year. The sound testing company doing the post-construction testing should not be the one originally hired by the wind turbine company for the pre-construction assessment to eliminate the obvious conflict of interest. The post-installation testing company should be experienced with post-installation sound testing for wind projects, and be solicited, hired, and paid for by the SEC, with expenses reimbursed to the SEC by the wind company. This should at least minimize the tested site locations (see Groton Wind) too-often selected by the wind-hired sound testing companies that are tainted by sound from nearby running brooks, traffic, agricultural equipment, idling trucks, etc., and often with sound-impenetrable obstructions like hills and cliffs between the microphones and the Wind Turbines.

(See Groton Wind Appdx 35: <http://www.nhsec.nh.gov/projects/2010-01/documents/100326app35.pdf>)

See below for references supporting the above recommendations, many were posted on the NH OEP site during the public development portion of SB-99, and are still available there:

<http://www.nh.gov/oep/energy/programs/sb99pre-rulemaking.htm>

From World Health Organization (WHO) Guidelines for Community Noise, 1999:

<http://www.nh.gov/oep/energy/programs/documents/sb99-who-guidelines-community-noise.pdf>

PDF Page 50/153: If negative effects on sleep are to be avoided the equivalent sound pressure level should not exceed 30 dBA indoors for continuous noise. If the noise is not continuous, sleep disturbance correlates best with LAmax and effects have been observed at 45 dB or less. This is particularly true if the background level is low. Noise events exceeding 45 dBA should therefore be limited if possible. For sensitive people an even lower limit would be preferred.

PDF Page 55/163: For each of the three types of traffic noise, the percentage of highly annoyed persons in a population started to increase at an Ldn value of 42 dBA, and the percentage of moderately annoyed persons at an Ldn value of 37 dBA (Miedema & Vos 1998).

PDF Page 62/163: Where noise is continuous, the equivalent sound pressure level should not exceed 30 dBA indoors, if negative effects on sleep are to be avoided. When the noise is composed of a large proportion of low-frequency sounds a still lower guideline value is recommended, because low frequency noise (e.g. from ventilation systems) can disturb rest and sleep even at low sound pressure levels.

PDF Page 69/163: 30dBAeq guideline for sleep disturbance

Massachusetts Wind Turbine Impact Study

<http://www.mass.gov/eea/docs/dep/energy/wind/turbine-impact-study.pdf>

PDF Page 37/164: In the lowest two sound categories (<32.5 dB(A)) nobody reported being more than slightly annoyed, whereas in the highest two categories 28% (37.5–40 dB(A)) and 44% (>40 dB(A)) reported being more than slightly annoyed.

Renewable Energy World article 'Looking for leadership in reducing noise impacts', with references to many sound studies and recommended limits, levels of annoyance and complaints, etc.

<http://www.renewableenergyworld.com/rea/news/article/2011/02/looking-for-wind-industry-leadership-in-reducing-noise-impacts>

Chris Bajdek, [in a 2007 paper](#) aimed at helping the industry alleviate noise fears, suggests that 44% of those within about 1900 feet of a typical wind farm would be “highly annoyed,” and that only as sound drops below 40db (at around a half mile), will annoyance drop substantially. He cites a survey from Wisconsin that found similar results, with about 50% of respondents living within a half mile saying noise is a problem; over a third of those between a quarter and half mile had been awakened by turbines.

While community noise standards never aim to eliminate negative impacts, few would suggest that disrupting a third to half of the nearby population is an acceptable goal. It's become clear, in both experience and the literature, that modern turbines trigger adverse reactions at lower sound levels than other community noise sources.

A growing number of acoustics professionals have been proactively seeking answers to why this may be, some looking at characteristics of turbine noise for clues, and others at psychoacoustics and rural “place identity.” These researchers appear to be coalescing around recommended wind farm noise standards of 30-35dB, which do in fact come closer to the familiar goal of keeping new noise intrusions to within 5-10dB of existing ambient conditions (rural night ambient is often around 25dB, even when winds aloft trigger turbines into action).

Unfortunately, this work has been relentlessly attacked by many in the industry, despite the fact that these more cautionary acousticians aren't activist yahoos, but longtime industrial and military consultants with decades in the field of noise control. It's time to step back from stubborn “lines in the sand” and really assess what they're finding.

Massachusetts Wind Turbine Impact Study

<http://www.mass.gov/eea/docs/dep/energy/wind/turbine-impact-study.pdf>

PDF Page 37/164: In the lowest two sound categories (<32.5 dB(A)) nobody reported being more than slightly annoyed, whereas in the highest two categories 28% (37.5–40 dB(A)) and 44% (>40 dB(A)) reported being more than slightly annoyed (unadjusted percentages).

<http://journals.plos.org/plosone/article?id=10.1371/journal.pone.0114183>

Health Effects Related to Wind Turbine Noise Exposure: A Systematic Review (of 116 studies), December 2014.

Conclusion: At present it seems reasonable to conclude that noise from wind turbines increases the risk of annoyance and disturbed sleep in exposed subjects in a dose-response relationship. There seems to

be a tolerable limit of around  $L_{Aeq}$  of 35 dB. Logically, accepting higher limits in legislations may lead to increased numbers of annoyed subjects. It therefore seems reasonable to conclude that a cautious approach is needed when planning future wind farms. Furthermore, there is an indication that noise annoyance and sleep disturbance are related and that disturbed sleep potentially can lead to adverse health effects.

MA Sound Limits:

<http://www.mass.gov/eea/docs/dep/air/community/noiseefs.pdf>

A noise source will be considered to be violating the Department's noise regulation (310 CMR 7.10) if the source:

1. Increases the broadband sound level by more than 10 dB(A) above ambient, or
2. Produce a "pure tone" condition – when any octave band center frequency sound pressure level exceeds the two adjacent center frequency sound pressure levels by 3 decibels or more.

These criteria are measured both at the property line and at the nearest inhabited residence. "Ambient" is defined as the background A-weighted sound level that is exceeded 90% of the time, measured during equipment operating hours. "Ambient" may also be established by other means with consent of the Department.

A Minnesota report on international wind energy policies of 24 countries, including setback distances and sound limits from 2011, with many references:

[http://mn.gov/commerce/energyfacilities/documents/International\\_Review\\_of\\_Wind\\_Policies\\_and\\_Recommendations.pdf](http://mn.gov/commerce/energyfacilities/documents/International_Review_of_Wind_Policies_and_Recommendations.pdf)

Conclusions begin on PDF page 24/63, and include a table summarizing all the data.

Noise: The average lower noise limit is approximately 35 dB(A), and the average upper noise limit is 45 dB(A). This is demonstrated in Figure 3, with most noise limits between 30 and 50 dB(A), and all noise limits between 25 and 65 dB(A). A major outlier is the French noise limit of 25 dB(A), but this is for inside residences rather for outside them like the rest of the noise limits.