

Record Hill Wind, LLC // Natural Resources Protection Act  
Construction of 50.6 megawatt wind energy development - Roxbury

Excerpts from the Department's License Record – Noise

- Correspondence regarding noise
- Maine CDC Reply to public comment

From: Warren Brown [Warren\_Brown@umit.maine.edu]  
Sent: Monday, August 10, 2009 8:35 PM  
To: Callahan, Beth  
Subject: Record Hill Wind Project Supplemental Report -- Peer Review

Attachments: Record Hill Windfarm Application Review August 2009.pdf; MDEP Record 8.10.09 Invoice.pdf



Record Hill Windfarm Applicati...  
MDEP Record 8.10.09 Invoice.pd...

Hi Beth,

Please find these supplemental report review attached. Regarding the statement you requested on point source versus line source: Sound sources can vary widely in their arrangement, complexity and extend. Often times it is convenient and sufficiently accurate to approximate a multiple source arrangement into a single simplified configuration, e.g. point source, infinite line source or infinite plane source. Obviously, multiple sources could never be a single point, nor form an infinite line or plane, but as I mentioned, the model provides sufficient accuracy for the given situation, when used correctly. It is always more accurate, but often tenuous or next to impossible to base calculations on each individual source of a particular configuration or array. In the case of known sound sources in a linear array (wind turbines along a ridge) it is most accurate to base calculations on each turbine as a point source.

I have also attached my invoice for this supplement review. If you have any questions please don't hesitate to contact me.

Warren

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# Record Hill Wind Project Sound Level Assessment Supplement -- Peer Review

ROXBURY, MAINE

Warren L. Brown

August 10, 2009

Submitted by:

EnRad Consulting  
516 Main Street  
Old Town, Maine 04468

Submitted to:

Beth Callahan  
Maine Department of Environmental Protection.  
Statehouse Station 17  
Augusta ME 04433

## Review Basis

Record Hill Wind LLC (RHW) proposes to operate a 50.6 (formerly a 55) MW wind energy facility in the Town of Roxbury, Oxford County, Maine. At the request of the Maine Department of Environmental Protection (MDEP) a peer review is undertaken to determine if this supplement is reasonable and technically correct according to standard engineering practices and the Department Regulations on Control of Noise (06-096 CMR 375.10).

The proposed wind project noise assessment supplement will be generally critiqued unless detailed criticism is given.

### 1.0 Introduction

The stated objectives of the supplement were to determine the expected sound levels from routine operation and compare RHW sound levels with the relevant environmental noise standards.

The report describes replacement of the formerly proposed Clipper C96 turbines with the Siemens 2.3 MW Mk II and the resulting sound level/ MDEP sound level limit estimates at nearby protected locations.

### 5.0 Record Hill Wind Sound Levels

The supplement describes sound expected from operation of the Siemens wind turbines.

#### 5.2 Proposed Operation

Siemens wind turbine sound power levels are contrasted with and compared to Clipper turbines. The Siemens turbines have decreased sound power levels at frequencies above 400 Hz and conversely increased below 400 Hz resulting in a net decrease for the Siemens turbine of 3.5 dB(A) and conversely, an increase of 1.7 dB(L) over the Clipper.

Operation sound level estimates (based on CADNA/A software and standard assessment elements, including WINDTEST specifications, point source divergence, mixed ground cover, moderate downwind conditions, etc.) are contrasted with previously designated Clipper wind turbines.

Wind turbine operation and sound power output relative to wind speed are discussed and plotted. Sound level estimates are based on full turbine sound power output plus and an uncertainty factor of  $\pm 5$  dBA to allow for wind turbine sound power specification (IEC 61400-11) and outdoor propagation prediction (ISO 9613-2) margins of error. Selected sensitive receiver position sound level estimates from routine wind turbine operation range from 34 - 43 dBA, which are 5-20 dBA below MDEP limits for day/night requirements.

Wind speed generally varies with the elevation and may contain both horizontal and vertical components. Routine operating sound levels near maximum operating power will occur under a wide range of surface level conditions, characterized by times when wind turbines are completely inaudible due to high ambient noise and at times when surface level operation noise is more prominent.

5.4 Tonal and Short Duration Repetitive Sound

Tonal sounds are not expected based on manufacturer provided specifications. Short duration repetitive sounds may occur as a result of amplitude modulation during some conditions and have the potential to exceed 6 dBA, but RSE does not expect them to cause exceedence of the applicable MDEP limit.

6.0 Conclusions and Recommendations

Maine DEP sound level limits based on land use and land owner agreements were conservatively set at "quiet limits -- 45 dBA nighttime./55 dBA daytime" (within 500 feet of residence).

The proposed sensitive receiver sites, PL1 through PL9, are reasonable in number and general location to assess wind turbine operation compliance for nearby protected locations. Operations of the substation and transmission lines generally do not generate significant sound levels.

Predicted sound levels in this estimate, including tonal and short duration repetitive sounds are below MDEP limits.

RSE's recommendations to measure routine operation sound levels at respective protected locations under a rigorous protocol and condition requirements is appropriate.

Conclusion - (Peer Review)

It's my opinion the Record Hill Wind Project noise assessment is reasonable and technically correct according to standard engineering practices and the Department Regulations on Control of Noise (06-096 CMR 375.10).

Routine operating sound levels should be measured within the first year of operation to demonstrate compliance using the following protocol, which includes specific meteorological conditions.

Compliance should be demonstrated, based on following outlined conditions for 12, 10-minute measurement intervals per monitoring location meeting 06-096 CMR 375.10 requirements.

The sound compliance assessment for the Record Hill Wind Project requires carefully specified measurement conditions, monitoring specifications and reporting requirements to characterize and consistently quantify wind turbine sound levels. Operations

compliance for the project should be demonstrated when the following outlined conditions have been met for 12, 10-minute measurement intervals per monitoring location meeting 06-096 CMR 375.10 requirements.

Some compliance test locations may exhibit unique characteristics requiring modification of its compliance assessment requirements. Assessment modifications may be necessitated by elevated ambient sound levels, availability of stable atmospheric conditions, less than maximum sound power output from turbines under possible measurement conditions, etc. Assessments requiring alternative methods should be thoroughly proposed including their basis in writing by the applicant as part of the pretest Compliance Assessment Plan and shall be reviewed and approved by the DEP in advance of performing the compliance assessment test.

Extraneous sounds could potentially or do complicate routine operation compliance assessment. In the case of RHW, the Swift River and various mountain streams contribute to ambient background sound levels depending on weather and flow conditions. If RHW must adjust for such sounds, background ambient sound level measurements will be necessary. If background ambient sound level measurements are proposed, locations, times and flow conditions will be determined with concurrence from the DEP and as further described below.

- a. Compliance should be demonstrated when the required operating/test conditions and sound level limits per 06-096 CMR Chapter 375.10 have been met for twelve 10-minute measurement intervals at each representative monitoring location.
- b. Compliance should also be demonstrated and analyses of either short duration repetitive or tonal sound should not be required when the total of all sound for each of the twelve, 10-minute measurement results are equal or greater than 5 dBA below the applicable DEP noise limit for each representative monitoring position even with wind speeds equal or less than 6 mph. When the total of all sound for each of the twelve, 10-minute measurement results are equal or greater than 10 dBA below the applicable DEP noise limit for any representative monitoring position, short duration repetitive and tonal sound analyses should not be required for that position. Compliance under this paragraph requires that the monitoring positions were downwind and the wind turbines were operating at full sound power.
- c. Measurements should be obtained during weather conditions when wind turbine sound is most clearly noticeable. To the extent reasonably possible, measurements should be conducted when the measurement location is downwind of the development and maximum surface (10 meter) wind speeds  $\leq 6$  mph with concurrent turbine hub-elevation wind speeds sufficient to generate the maximum continuous rated sound power from the five nearest wind turbines to the measurement location. These conditions generally occur during inversion periods usually between 11pm-5am and can also occur earlier in the evening around sunset. A downwind location is defined as within  $45^\circ$  of the direction between a

- d. Measurement intervals affected by increased biological activities, leaf rustling, traffic, high water flow or other extraneous ambient noise sources that affect the ability to demonstrate compliance should be excluded from reported data. The intent is to obtain measurements that meet the specified criteria for the entire 10-minute interval.
- e. Selection of monitoring locations should require concurrence from Maine DEP. Sound monitoring locations will be positioned to most closely reflect the representative protected locations for purposes of demonstrating compliance with applicable sound level limits, subject to permission from the respective property owner(s).
- f. Maine DEP concurrence on meteorological site selection is required. To the extent reasonably possible, meteorological measurements of wind speed and direction should be collected using anemometers at a 10-meter height above ground and at the center of large unobstructed areas that are generally correlated with sound level measurement locations. Locations that cannot meet these criteria due to the lack of large unobstructed areas in the general vicinity of the compliance monitoring positions can be utilized with DEP concurrence and could require adjustments to reflect the actual conditions found at the protected locations selected for measurements. Results should be reported, based on 1-second integration intervals, and be reported synchronously with hub level and sound level measurements at 10 minute intervals. The wind speed average and maximum will be reported from surface stations. Individual 1-second wind gusts greater than 6 mph during any 10-minute measurement interval do not necessarily prevent the use of sound measurements taken during those intervals from being used to demonstrate compliance with the DEP noise limits.
- g. Sound level parameters reported for each 10-minute measurement period should include A-weighted equivalent sound level, 10/90% exceedance levels and ten 1-minute 1/3 octave band linear equivalent sound levels (dB). Short duration repetitive events should be characterized by event duration and amplitude. Event frequency is defined as the average event frequency +/- 1 standard deviation and amplitude is defined as the peak event amplitude minus the average minima sound levels immediately before and after the event, as measured at an interval of 50 ms or less, A-weighted and fast time response (i.e. 125 milliseconds). For each 10-minute measurement period short duration repetitive sound events should be reported by percentage of 50 ms or less intervals for each observed amplitude integer above 4 dBA. To the extent possible, reported measurement results should have minimal extraneous noise in the respective measurement intervals in accordance with (c.). Evaluation of tonal or short duration repetitive sounds are not required where measured sound levels are 5 dBA or more below the applicable limits.

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From: Mills, Dora A.

Sent: Sunday, August 09, 2009 11:55 AM

To: 'Kelly Sastamoine'

Cc: Callahan, Beth; thurston.steve@gmail.com; sherlots2@wildblue.net

Subject: RE: Help

I hope you are doing well, and glad you attended and enjoyed the Autism Conference.

I did do some research this winter and spring on wind turbines and noise. The results of this research I posted on our website (<http://www.maine.gov/dhhs/boh/wind-turbines.shtml>), which includes a fact sheet as well as an opinion piece that I've pasted in below. I hope you find them useful.

Thank you again for your inquiry and your work on public health issues. Dora

## Are wind turbines health hazards?

(This article was originally in the *Portland Press Herald's Maine Voices*)

DORA ANNE MILLS June 21, 2009

Recently, questions have been raised about possible health effects from the noise produced by wind turbines.

After reviewing the medical and public health literature and conducting interviews with experts, I have developed some conclusions to these questions.

- Are there health effects from noise generated by wind turbines?

Noise generated by wind turbines can produce a low-frequency repetitive swishing sound that by some reports can be very annoying.

There are claims that turbines also generate very low-frequency noise outside the range of hearing that is alleged to cause health effects.

In my reading of peer-reviewed medical and public health literature, mostly from Europe and Canada, I found no evidence of adverse health effects from the noise generated by wind turbines except for those associated with annoyances from the audible noises.

These effects, however, are mitigated or disappear with proper placement of the turbines from nearby residences.

So, although the noise qualities are different, it seems as though what was found to be true of airports and highways is true of wind turbines: It is primarily a matter of distance.

However, there is no one proper distance for all wind turbines.

Research indicates that a number of factors determine proper placement, including the height of the wind turbine, the surrounding topography, wind conditions, and wind direction.

As with airports, annoyance levels are difficult to assess and vary from person to person.

Careful measurements of different noise frequencies in a variety of weather conditions should assure proper placement of wind turbines that protect against annoyances and resulting effects.

- Does Maine law assure proper placement of wind turbines from residences?

Maine Department of Environmental Protection rules recognize that excessive noise can degrade the health and welfare of nearby neighbors. The rules set noise limits based on the type of development in the area and as measured at the boundary of the property owned by the developer. These rules serve to ensure that a turbine is located at a sufficient distance from homes so there are not annoying levels of noise.

Maine DEP, using professional noise experts, evaluates proposed wind turbine developments using measurements of high and low frequency noise and requires wind farms to demonstrate compliance with enforceable noise limits.

A number of states and countries have no such noise regulations, and of those that have them, Maine's compare very favorably in the protections they offer.

- What are the health benefits from wind turbines?

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Generating energy from wind turbines means less energy generated from foreign oil and coal, both being major contributors to global warming, pollution, and resulting diseases and deaths due to heart disease, cancer, asthma, and other lung diseases.

Maine's highest-in-the-nation rates of asthma and cancer are thought to be at least partially due to pollution from our dependence on fossil fuels.

According to the Maine DEP, if Maine generated 5 percent of its electricity from wind power, there would be significant pollution cuts, including annual amounts of almost a half-million tons of carbon dioxide, about 250 tons of sulfur dioxide, and about 150 tons of nitrogen oxide.

- What about a moratorium on wind turbine projects?

In researching and reading several dozen papers and other sources of information I do not find evidence to support a moratorium on wind turbine projects.

The articles cited by those who are in favor of a moratorium are primarily either from non-peer-reviewed journals (though some are labeled as "peer-reviewed") or are misinterpreted analyses from peer-reviewed journals.

If there is any evidence for a moratorium, it is most likely on the further use of fossil fuels, given their known and common ill effects on the health of our population.

Wind turbines play an important role in a vision of Maine generating energy that harnesses our own clean resources and improves the overall health of Maine. However, like any source of noise, proper placement away from residences is important.

Maine DEP regulations and current testing protocols serve to properly place turbines, and when combined with community input, can help us achieve the vision of a healthier Maine.

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**From:** Kelly Sastamoine [mailto:ksastamoine@jfmhomes.org]  
**Sent:** Wednesday, May 13, 2009 9:32 AM  
**To:** Mills, Dora A.  
**Cc:** Callahan, Beth; thurston.steve@gmail.com; sherlots2@wildblue.net  
**Subject:** Help

Dora, I had the great pleasure of attending the "Bridging the Gap between Knowledge and Physicians" conference yesterday in Augusta. What a break through day that was for Maine.

I was impressed with so much talk about data! Data is so very important when determining the safety level of things we humans are exposed to. Particularly Dr. Poling's point on vaccines.... "How do we know it IS NOT, if we don't know what it IS?"

I am the parent who posed the question to Dr. Herbert and Dr. Poling in regards to audible noise, light flicker, and acoustical vibrations; in regards to wind turbines. I didn't expect to leave Dr. Herbert speechless, but was impressed that the question did. I was unimpressed however, to hear that this question has not crossed her path given her expertise in the field. We have "report" of many problems with the effects of industrial turbines, we do not have "data", as Dr. Buie pointed out there is a distinct difference, neither should be ignored.

With that being said, I encourage you to support the moratorium that is being let by doctors Rumford and Mars Hill. We humans living in the area deserve time collect data, and better understand what we are exposing our future generations to.

I am sure you know how to reach the DEP, but just in case please contact Beth Callahan. [beth.callahan@maine.gov](mailto:beth.callahan@maine.gov)!

I would appreciate a response to this message.

Thank you again,

Kelly Sastamoine  
357-0118

Dr. Martha Herbert contact information: [mherbert1@partners.org](mailto:mherbert1@partners.org) 617-724-5920

Dr. Jon Poling contact information: 800-929-9502 (Athens GA office)

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