July 17, 2013

VIA E-MAIL

Massachusetts Department of
Environmental Protection
1 Winter Street
Boston, MA 02108

Attention: Martin Suuberg, Deputy Commissioner for Policy and Planning

Dear Mr. Suuberg:

Re: Regulations Impacting Industrial Wind Turbines

On behalf of Mr. Kelly and Mr. James, I would like to thank you for meeting with us on July 15, 2013 to discuss issues falling under the MassDEP’s purview as they relate to industrial wind turbines in the Commonwealth of Massachusetts, particularly issues specific to the MassDEP protocol for measuring, analyzing recording and reporting the acoustical impacts of industrial wind turbines.

The Alliance was created to protect the health and safety, as well as the private property rights, of Americans who have been negatively affected by alternative energy installations sited too close to their neighborhoods and shorelines.

The Alliance is a pro-alternative energy organization that supports all forms of alternative energy. The Alliance is committed to helping build consensus amongst stakeholders for the development and implementation of siting criteria for alternative energy installations and legislation in protection of the health, safety and property rights of the American people. I invite you to visit our webpage to learn more about our activities: www.AltEnergySiting.org.

It is our position that the noise that wind turbines create constitutes a form of air pollution regulated by your agency. Turbine noise is different from other sources of noise pollution and the MassDEP has admitted publicly that compliance testing, as presently performed, does not specifically address the unique noise characteristics of wind turbines. Through consultation with acousticians and engineers, it is our view that by utilizing existing MassDEP noise regulations and by amending existing testing protocols, the MassDEP can implement testing protocol regulations to accurately identify and assess the more audible aspects (e.g. dBA scale) of the unique noise
emanating from industrial wind turbines including infrasound, low frequency sound and aerodynamic amplitude modulation. To demonstrate how we believe small changes to the existing regulations might improve the validity, repeatability, and sufficiency of the measurements, we would suggest the following industrial wind turbine noise testing protocol:

**Noise Test Procedure for Industrial Wind Turbines**

1) **Intent:**

To accurately identify the actual acoustical noise levels emanating from the industrial wind turbine, including infrasound, low frequency sound and Aerodynamic Amplitude Modulation (“AAM”) levels. This acoustical analysis will be performed by an independent acoustical professional utilizing acceptable industry procedure especially ANSI S12.18 Procedures for Outdoor Measurement of SPL and ANSI S12.9 Part 3- Short Term Measurements with Observer Present.

2) **Purpose:**

To determine if the industrial wind turbine complies with the noise limits stipulated in the MaDEP, Section 310 CMR 7.10 Noise (which were adopted by Scituate). Noise compliance will be determined as follows:

a) Continuously measure the noise level time history of the wind turbine(s) operating at full-load (or greatest noise emissions if different from full load) for the wind speed and other meteorological condition(s) identified in any complaints (or during calm surface winds (<5mph) in the absence of a complaint) through the turbine shut down sequence to full stop. Continue the measurement during the full stop condition for at least 10 minutes to measure the background sound level. From this measurement determine the backround sound level (L$_{A90}$) for the wind turbine "off" condition and the average and maximum sound levels (L$_{Aeq}$ and L$_{Amax}$) for the wind turbine "on" condition. If necessary, the background sound level data shall be selected to be free of short duration sounds, wind induced noise, insect noise and other sounds that are not considered to be part of the long term background sound level as defined in ANSI S12.9 Part 3 5.4 long term background sound.

b) Inspect measurements for Pure tones by comparing the average of the adjacent octave band sound pressure levels, if the tone is steady over time, and the background sound pressure levels (assuming the sound in the adjacent octave bands is not fluctuating). If the tone or background sounds are fluctuating, more advanced tests for tones covered in ANSI standards should be applied.

3) **Criteria:**

A noise source will be considered to be violating the Department’s noise regulation (310 CMR 7.10) if the source:
a) Increases the broadband sound level by more than 10 dB(A) above ambient (e.g. the background sound level as $L_{A90}$), or

b) 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 the quietest time that occurs during normal equipment operating hours. “Ambient” may also be established by other means with consent of the Department.

4) Instruments:

Acoustic instruments shall comply with the American National Standards Institute (ANSI) or equivalent international standard. The sound level meter shall be capable of simultaneously measuring and storing un-weighted octave-bands (8 to 8kHz) and over-all sound levels in dBA, dBC and dBLin, (or dBZ) in intervals no longer than 0.100 to 0.125 seconds.

Sound level meters shall comply with the latest version of ANSI S1.4-1983 requirements for Class 1 (or Type 1) precision. Acoustic calibrators shall comply with ANSI S1.4-1984 for Class 1 (or Type 1) precision. Each microphone used for outdoor measurements shall be fitted with a windscreen appropriate for wind speeds at the microphone. Sound level meters used for pure tone analysis shall comply with ANSI (or equivalent) requirements for octave band center frequencies.

5) Calibration:

Acoustic instruments used for measurements shall have current calibration certificates from an independent laboratory, which are traceable to a measurement standard established by the National Institute of Standards and Technology (NIST). The sound level meter’s measurement accuracy shall be confirmed with an acoustic calibrator mounted over the microphone prior to commencement of the acoustical test.

6) Weather Conditions:

This test is required to have moderate to strong wind speeds at the hub (12 to 18 meters per second, 27 to 40 mph) and calm to light (0 to 2.2 m/s, 0 to 5 mph) at ground level with no precipitation.

7) Measurements:

The sound meter or microphone shall be mounted on a tripod approximately 5 feet above the ground. The tripod shall be positioned to avoid reflections; at least 25 feet away from all large vertical surfaces, (buildings, walls, and solid fences), 25 feet or more away from vegetation including trees that may produce leaf rustle, and at least 5 feet away from smaller surfaces (poles, posts and tree trunks) to comply with ANSI S12.9-1993/Part3).
8) Observations:

During measurement periods, acoustic observations are required to identify all audible noise sources with and without the noise source under test operating. Other required comments are; date & time, weather conditions; ground level wind speed & direction).

9) Wind Turbine Owner:

The wind turbine operator shall provide critical information about wind turbine operation during the testing period. The purpose of this requirement is to verify that the wind turbine controls are set for normal operating mode, and to document measurements of wind and operating conditions important to interpreting the sound measurements. This information may be obtained from the historical SCADA data in a resolution no greater than one minute increments showing wind speed at hub & direction, nacelle orientation, blade pitch setting(s), hub rpm, and generator output or load.

10) Instrument Setup:

Prior to the first measurement, the sound level meter shall be verified with the acoustic calibrator and at the completion of all sound measurements.

The sound level meters shall be configured to measure and store un-weighted octave bands sound pressure levels (8Hz to 8kHz minimum) plus over-all dBA, dBC and dBLin, (or dBZ if dBLin not available) sound levels at intervals no longer than 0.125 seconds (e.g "Fast" setting). Due to the potential for strong wind turbine generated aerodynamic amplitude modulation; the sound meter response shall be set to fast. The information collected during the measurements shall be reported in total along with the final values for the L_{AMax} and L_{A90} compliance metrics. This will provide for peer review and archival documentation should the need arise.

11) Test Locations;

Nearest three to five residences, with a clear line-of-sight view of the wind turbine, ranging from about 600 feet to 4,000 feet.

12) Test Procedure;

With the wind turbine operating start the sound meter measurements and continue for 10 minutes, then shut the turbine off and continue for 10 minutes. Repeat this procedure at each measurement location to determine the maximum sound level emanating from the industrial wind turbine.

Beyond Audible Sound

The pro-offered protocol Noise Test Procedure for Industrial Wind Turbines provides a means to protect public health and welfare for audible sounds (dBA criteria) but still does not address the infra and low frequency sound that is a characteristic of all modern, upwind, utility scale, wind turbines. To address sounds in the lower frequency range, where over 50% of the acoustic energy emitted from wind turbines is located, other metrics such as dBC, or dBLin are
needed. The current focus on only dBA weighting discounts sounds in that region and therefore is not sensitive to an important aspect of wind turbine sound emissions.

Rather than propose language to address this we offer an example of a complete set of criteria developed to address wind turbine noise across its entire frequency range from low frequency to audible sounds. We are not suggesting that it be adopted by MassDEP but offer it as an example of a complete set of criteria and test protocols that can be used to guide any future work on the Massachusetts's regulations. The example document is attached as: "Appendix A-Proposed Wind Turbine Siting Sound Limits." It is from the peer reviewed "Encyclopedia of Environmental Management," 2012 edition. It is titled: "Noise Criteria-WindFarms." This paper offers an overview of many of the issues related to interactions between people and wind turbines. The authors of "Noise Criteria-WindFarms," Robert Thorne, Daniel Shepherd, and Chris Hanning are experts in Low Frequency Sound, Psychoacoustics, and the effects of sleep disturbance on health, respectively.

Appendix A: is an update of the wind turbine siting criteria first proposed in the 2008 paper by George Kamperman and Rick James titled: "The 'How To' Guide to Siting Wind Turbines to Prevent Health Risks from Sound." The Kamperman/James wind siting criteria follow the same concept used in the MassDEP regulations of establishing a long term background sound level ($L_{90}$) and the sound level when the wind turbine(s) are operating ($L_{eq}$) and using the difference between these two conditions to determining acceptability or non-compliance.

Appendix A, from "Noise Criteria-Wind Farms" expands upon the protocol described above in "Noise Test Procedure for Industrial Wind Turbines" by considering low frequency sound using a dBC test and defining the conditions for a penalty for amplitude modulation (blade swish).

By embracing the pro-offered test protocol for enforcement of 310 CMR 7.10, the MassDEP can be confident that an appropriate industrial wind turbine testing protocol is being utilized and that the results of same will accurately reflect the noise emanating from industrial wind turbines at the time complaints have been filed or are most likely to occur.

This will also help to eliminate the appearance of the sort of noise testing manipulation in evidence in Scituate, Massachusetts. This case study follows.

Update - Wind Study Dialogue between the Community and Scituate Wind LLC:

Since its approval in March 2013, the noise compliance testing of Scituate Wind LLC has not commenced. The Scituate community adversely affected by the operation of the industrial wind turbine has attempted to stay in close contact with Palmer Capital, its acoustical consultant Tech Environmental and members of the Scituate Board of Health to encourage a testing date and reasonable notice of same, to provide the neighbors’ consultant, E-Coustics, with sufficient time to mobilize and test simultaneously with Tech Environmental.

On or about May 28th we were advised that Tech Environmental was considering Thursday night / Friday morning (May 30th and 31st) for testing. However, on the morning of May 30th we were advised that this test schedule was scrubbed because the forecast had been changed to light
southwest winds of less than seven miles per hour. We were surprised at this last minute change because our own experiences, documented and presented as evidence to the Scituate Board of Health, has consistently demonstrated that these would have been optimal conditions for acoustical testing for elevated disturbances of industrial wind turbine noise output. We asked for E-Coustics opinion and here is what we believe to be true.

Many of us in the neighborhood have found that the most disruptive evenings are when there is almost a dead calm outside our windows, but the turbine still turns and we hear it distinctly while we are attempting to sleep. In fact, I am aware of a number of folks who had a very disruptive night on May 30th with these exact conditions, some of whom have already written to Mr. Deane of Palmer Capital and Scituate Board of Health Director, Jennifer Sullivan, to advise accordingly. These nighttime conditions are defined as temperature inversion, otherwise known as a stable atmosphere. The temperature inversion boundary layer disconnects the upper level winds from the surface level winds resulting in calm or very low winds at the surface and high winds at the hub (the reason the blades can still spin). From our documented experiences over the past 16 months, this would appear to be the optimum test conditions for the sort of acoustical test to be conducted by Tech Environmental and E-Coustics to determine whether or not the Scituate industrial wind turbine was in compliance.

Neighbors in this community have been very transparent in describing and documenting the conditions that have caused them noise and strobe related health problems. Tech Environmental was clearly able to predict wind speeds of seven miles per hour with winds coming from the southwest, which we can now confirm, based on our experience on those evenings, were optimum acoustical testing conditions to capture elevated noise output and perhaps demonstrate that the Scituate industrial wind turbine does not comply with MassDEP noise guidelines. Yet certain stakeholders would make it appear that predicting ‘optimum’ test conditions is a difficult procedure and have made no effort to organize a subsequent test date, certainly not between May 31st and June 24th when on that date the turbine was struck by lightning and has been inoperable ever since.

Conclusion

We understand that the first meeting of the MassDEP Wind and Noise Technical Advisory Group (“WNTAG”) is to be convened on Thursday July 18, 2013. The Alliance’s proposed acoustical testing will ensure the highest level of accuracy and integrity apropos of industrial wind turbine acoustical testing in the Commonwealth of Massachusetts. This testing protocol ensures that the noise emanating from industrial wind turbines is accurately recorded and analysed, including infrasound, low frequency sound and aerodynamic amplitude modulation. To exclude any one of these three categories from a stringent industrial wind turbine noise testing protocol would be a disservice to the MassDEP and the constituency that it is mandated to protect.

By embracing the type of stringent industrial wind turbine noise testing protocols proposed by the Alliance, the MassDEP can play a leading role in ensuring that pre-approval and permitting
criteria is employed to accurately model potential noise impacts from to be constructed industrial wind turbines and to accurately identify noise emanating from existing industrial wind turbines to ensure compliance or identify non-compliance. As importantly, the MassDEP will put in motion a process focused on rebuilding the public’s trust in this administrative and regulatory body.

On Tuesday July 9\textsuperscript{th}, over forty folks testified at the Joint Committee on Public Health on the issue of industrial wind turbines in the Commonwealth of Massachusetts. In addition to the writer, one of those delivering testimony was Roxanne Zak, energy committee chair of the Sierra Club, who said “it is critical for the public to acknowledge “wind turbine syndrome” is real, and that sound and pressure differences can create health problems for some people. “We can’t dismiss the evidence that people are having problems.”

We as a community and a Commonwealth need to get this industrial wind turbine testing protocol right. We as an organization strongly encourage adoption of the the Alliance’s proposed testing protocol and we will be closely monitoring developments in this regard.

Your kind consideration is appreciated.

Regards,

T.S. (Tom) Thompson
Executive Director