TAB 1

STATE OF CONNECTICUT
CONNECTICUT SITING COUNCIL

Petition of BNE Energy Inc. for a Declaratory Ruling for the Location, Construction and Operation of a 3.2 MW Wind Renewable Generating Project on New Haven Road in Prospect, Connecticut

Docket/Petition No. 980

February 15, 2011

PREFILED TESTIMONY OF NOISE CONTROL ENGINEERING, INC,
BY MICHAEL BAHTIARIAN, INCE Bd. Cert.

I. Introduction

1. Please state your name, position and business address.

I am Michael Bahtiarian, Vice President at Noise Control Engineering, Inc. (NCE). My business address is 799 Middlesex Turnpike, Billerica, Massachusetts 01821.

2. Please state your educational background and work experience?

As outlined in my professional biography attached as NCE Exhibit 1, I have a Masters of Science in Mechanical Engineering from Rensselaer Polytechnic Institute and a Bachelor of Science in Mechanical Engineering from the Pennsylvania State University. All of my work experience has been in the field of sound and vibration starting at General Dynamics Electric Boat Division in Groton Connecticut where I was employed as a sound and vibration engineer and worked on the *SEAWOLF* submarine program.

Noise Control Engineering, Inc. (NCE) is a private engineering consulting company which provides expertise in the areas of noise and vibration control. I joined NCE in 1994 and was the third employee of what is now a twelve person consulting firm. In the past sixteen years I have carried out numerous acoustical evaluations for clients in "heavy" and bio/high-tech industries, marine/shipbuilding, commercial/retail, site development and construction. Most

recently and under my management, NCE has reviewed wind turbine noise studies in the towns of Falmouth, Wareham, Bourne and Brewster, Massachusetts.

3. Have you previously testified before the Connecticut Siting Council?

No. I have not testified before this Council. However, I have been an expert witness in four other cases in New Hampshire, Vermont and Massachusetts. These cases are listed in NCE Exhibit 1.

4. Do you have any other qualifications or certifications that make you suited for testimony in this case?

Yes, I am a Board Certified member of the Institute of Noise Control Engineering (INCE Bd. Cert.). This certification is equivalent to a Professional Engineer (PE) license for the field of noise and vibration. The requirements for receiving the certification are similar to PE; greater than 4 years experience, recommendations from colleagues, and passing a rigorous 8 hour written exam.

II. Summary of Testimony

5. What is the purpose of your testimony in this proceeding?

The purpose of my testimony is to report on what is effectively my own peer review of the noise evaluation performed by VHB/Vanasse Hagen Brustlin, Inc. (VHB) of the "Wind Prospect" wind turbine project located at 178 New Haven Road in Prospect, Connecticut. The subject evaluation was performed for BNE Energy Inc. and dated October 2010. This study is provided in NCE Exhibit 2.

6. Please summarize your testimony.

My review of the subject VHB report found unsubstantiated claims, incorrect use of noise regulations, questionable computation methods and only a token study of existing conditions.

Based on my own computations of expected noise levels from the project, I have computed sound levels that will exceed the State of Connecticut Department of Environmental Protection (CTDEP) noise regulations. I conclude that the subject report is not adequate and sufficient and misrepresents the future project generated sound pressure level.

III. Detail Peer Review Issues

7. What were you asked to do in this proceeding?

I have been retained by Save Prospect Corp to perform a technical peer review of the Wind Prospect noise evaluation.

8. What material did you review?

I have reviewed the VHB/Vanasse Hagen Brustlin, Inc. (VHB) noise evaluation of the "Wind Prospect" wind turbine project located at 178 New Haven Road in Prospect, Connecticut. The subject evaluation was performed for BNE Energy Inc. and dated October 2010 (NCE Exhibit 2) and the Town of Prospect Zoning Map (NCE Exhibit 3), as well as the relevant Connecticut state noise regulations. The evaluation includes an appendix with noise monitoring summary, sound level calculations and wind assessment. My review includes all of the above materials.

9. Did you reach any conclusions after reviewing the Wind Prospect Noise Evaluation?

Yes, I have reached a few conclusions.

10. If so, what are your conclusions?

As a peer reviewer I conclude that the subject report is not adequate and sufficient for a project of this scale. Further, from my own estimates, I conclude that the subject report is incorrect to state that the operation of two 1.6 MegaWatt wind turbines will meet the State of Connecticut noise regulations.

11. Do you have any other more specific conclusions?

Yes, I have five more specific conclusions regarding details presented in the subject VHB report.

12. Can you tell us the first of the five specific conclusions?

Yes, the first conclusion is that the subject VHB report has made the unsubstantiated statement that it has evaluated ALL CTDEP noise criteria and shown to be in compliance.

13. What is the basis for this conclusion?

The "Introduction" states that predicted sound levels were compared to Connecticut Department of Environmental Protection (CTDEP) noise regulations (Regulations of Connecticut State Agencies (RCSA) Title 22a, Section 22a-69-1 and 22a-69-7). The "Conclusion" states that these regulations would be met. Section 22a-69-3.2 provides limitations for impulsive noise. The study did not address nor assess impulsive noise and thus falsely claims such a requirement is achieved. Section 22a-69-3.3 provides limitations for sound with prominent discrete tones. The study does not address nor assess prominent discrete (pure) tones and thus falsely claims such requirement is achieved. Section 22a-69-3.4 provides limitations for infrasonic and ultrasonic sound. The study does not assess nor address infrasonic or ultrasonic sound and thus falsely claims such requirement is achieved.

14. Are impulsive, prominent discrete tones, infrasonic and ultrasonic types of noise likely to occur for a wind turbine?

Only two of these noise types are likely to occur. These are prominent discrete tones (or pure tones) and infrasonic noise. Impulsive and ultrasonic noise would not typically be an expected concern for wind turbines.

15. Can you tell us the second of the five specific conclusions?

My second conclusion is that the VHB report has incorrectly selected the CTDEP A-weighted sound pressure level (SPL) noise limit.

16. What is the basis for this conclusion?

The VHB report classifies the **Town of Prospect** and **State of Connecticut** noise criteria based on the "emitter zone" (i.e. the location of the noise source) as being "Industrial". The Town of Prospect Zoning Map shows the subject location for the two wind turbines to be "Residential". If the emitter zones were classified correctly as "Residential", the noise limits listed would be 6 dB lower (i.e. going from 61 to 55 dB(A) during for daytime and going from 51 to 45 dB(A) during the nighttime).

17. Can you tell us the third of the five specific conclusions?

My third conclusion is that the methods used to predict project sound levels at the receptors are not worst case.

18. What do you mean?

A worst case evaluation would make assumptions for maximum justifiable source sound levels and minimal justifiable attenuation factors. The result of such a computation would result in higher predicted SPL at the receptors. However, if such a result meets the noise criteria it is unlikely to be incorrect given the accuracy of the computations and all the variability in the input assumptions such as wind speed, direction, etc.

19. What is the basis for this conclusion?

First, the sound level computation included a parameter for geometrical divergences (attenuation of sound with distance) and atmospheric absorption (absorption of sound due to molecular interaction). The atmospheric absorption factor, reported in dB/km (or dB/m) is controlled by meteorological conditions (temperature and relative humidity) and is defined in

octave bands from 63 to 8,000 Hertz. The factor is typically small compared with geometrical divergence.

The value of atmospheric absorption factor used for the Wind Prospect is 5 dB/km (0.005 dB/m) which is found at the top of the sound computation worksheets under the heading absorption coefficient. Based on examination of ISO-9613-2, the factor appears to be for the condition of 20°C (68°F), 70% RH and 1,000 Hertz octave band. According to ISO-9613-2 when performing the computations in overall A-weighted SPL the atmospheric absorption factor for the 500 Hertz octave band should be used. Accordingly, the value of the factor that should have then been used for the above meteorological conditions is 2.8 dB/km. Further, for a worst case situation the minimum factor should be used which would have been at meteorological conditions of 10°C (50°F), 70% RH. In this case the value would be 1.9 dB/km. In many of my evaluation studies I have not taken into account this factor (i.e. the coefficient is set to 0 dB/km). This would provide an even more conservative assessment.

The lower this factor the higher the predicted SPL. The report's conclusion states that the computation is a "worst case analysis". This does not appear to be the case. If the 1.9 dB/km value were to be used the predicted SPL would be 1 to 5 decibels higher. If no atmospheric absorption was taken into account (0 dB/km) the predicted SPL would be 2-8 decibels higher.

20. Were there any other problems you found with the computation methodology?

Yes, I also have problem with the selection of the "source sound power levels" which are measured and reported by the manufacturer of the wind turbines and are a function of wind speed.

21. What was the problem with the turbine source sound level section?

The section, "Project Generated Sound Levels" describes the wind speed conditions assumed for the noise predictions. It states that the wind turbines will operate between 3 meters/second (cut in speed) and 12 meter/second (cut out speed). Further, the report states that the maximum daytime sound levels would occur at maximum wind speeds of 9 meters/second and the maximum nighttime sound levels would occur at maximum wind speeds of 8 meters/second. It is unclear why a lower wind speed and thus a lower source sound power level (Lw) would be applicable during the night. Over the course of a year, it is entirely possible that higher source sound level from daytime could occur on some nights and would then be a better choice for a worst case evaluation.

22. Are those the only problems you found with the computation methodology?

No, the subject VHB report used a sound computation method given in ISO-9613-2. This method generally applies to computations performed in octave bands. NCE reviewed the sound level calculations given in the appendix and finds that VHB performed the computation using a less rigorous method wherein only the overall A-weighted sound pressure levels (SPL) were used. Overall A-weighted SPL is determined from individual octave band SPL in frequencies from 63 to 8,000 Hertz octave bands. This method is acceptable for sources of sound with minimal frequency characteristics such as typical HVAC machinery. A wind turbine has a significant frequency and temporal characteristics, in which case the less rigorous method may result incorrect noise predictions. Further, this less rigorous method does not allow determination of compliance with CTDEP regulations sections 22a-69-3.2, 22a-69-3.3 and 22a-69-3.3 as discussed in Question 13 above.

23. Can you tell us the fourth of the five specific conclusions?

My fourth conclusion is that the study of existing conditions (i.e. background noise measurements) was diminutive for a project of this scale.

24. What is the basis for this conclusion?

I have reviewed the Noise Monitoring Summary provided in the Appendix. NCE Exhibit 4 is a table summarizing the start times and duration of each measurement taken from the monitoring logs provided in the appendix. The table shows that the noise measurements at the sites were only performed for five to fifteen minutes. There is data reported in Table 4 of the report is for which no measurements appear to be taken. No monitoring appears to be performed at Fusco Field during the day, Lacey Lane or Coachlight Circle during the night.

Further, I believe that 15 minutes of sampling is too short a period to accurately characterize the background sound level conditions. For my projects the surveys are usually for a period of three to seven days using an automated "logging" instrumentation which collects the background sound levels continuously. Page 6 of the VHB report says noise monitoring was performed "following the procedures of Section 22a-69-4 of the CTDEP noise control regulation. This section of the regulation codifies requirements for personnel performing the study, instrumentation used and instrumentation settings. It does not provide guidance on the duration of the noise measurements.

25. Can you tell us the fifth of the five specific conclusions?

Yes. My fifth conclusion is that based on my own computations of expected noise levels from the project, I have estimated worst case sound levels that will exceed the State of Connecticut Department of Environmental Protection (CTDEP) noise regulations.

26. What is the basis for this conclusion?

I do not believe the VHB report represents a worst case computation so I recomputed the expected noise level using the same methodology but making three changes.

27. What were the three changes?

First, for a nighttime assessment, I used the daytime turbine sound source level of 106 dB(A) as discussed in Question 21. Second, I used 0 dB/km absorption coefficient as discussed in Question 19. Third, I compared the results to the residential-to-residential nighttime noise limit of 45 dB(A) as discussed in Question 16. The results are given in a table in NCE Exhibit 5 for only the receptors within 1,250 feet of the turbines.

28. What did these results show?

The table in NCE Exhibit 5 show excesses to the CTDEP nighttime limit of 45 dB(A) at all receptors within 1,250 feet. These results show 1 to 3 dB excess to CTDEP limits.

29. If the Siting Council were to decide that BNE may proceed based on VHB Report, which you have called into question, and it is later determined that actual sound levels are excessive or interfere unreasonably with neighboring property owners' rights to the peaceful use and enjoyment of their property, are there any mitigation strategies that can be applied to the turbines to reduce the noise impacts?

No. There are no noise control treatments such as barriers, silencers or acoustical cladding that can be added after the wind turbine is installed. The only method of minimizing noise after-the-fact is to shut the turbine down during noisy (i.e. windy) conditions. However, this option reduces the owner's ability to produce electricity.

I would also like to add from personal involvement with a case in Falmouth, Massachusetts that such a situation is highly disruptive to the abutters, many of which suffer headaches, sleep loss, stress and anxiety. With the size of the wind turbines, the sound they

produce envelopes an abutter's entire property. This is unlike sound from a rooftop HVAC unit which may only impact one side of an abutter's home. It is also a major burden to the municipality that is required to enforce noise ordinances who then needs to have very complex sound monitoring performed to determine if the installed wind turbines are compliant with regulations.

Q28. Does that conclude your testimony?

Yes it does.

NCE EXHIBIT LIST

Michael Bahtiarian, INCE Bd. Cert.

NCE Exhibit 1	Professional Biography of Michael Bahtiarian.
NCE Exhibit 2	VHB Report, Noise Evaluation Wind Prospect, dated October 2010.
NCE Exhibit 3	Town of Prospect Zoning Map
NCE Exhibit 4	Table compiling the start time and duration of the background noise monitoring as reported in the VHB Report, dated October 2010, Appendix, Noise Monitoring Summary.
NCE Exhibit 5	Table of estimated Project Generated Sound Pressure Level in dB(A) recomputed based on assumptions listed in Question 27 and listed for receptor locations within 1,250 feet of the either wind turbine.

NCE EXHIBIT 4

Table compiling the start time and duration of the background noise monitoring as reported in the VHB Report, dated October 2010, Appendix, Noise Monitoring Summary.

Monitoring Site	Daytime		Nighttime	
	Start Time	**Duration**	**Start Time**	**Duration**
M1 - Kluge Road	5:20pm	20 min.	3:30am	15 min.
M2 – Lacey Lane	6:20pm	20 min.	**	**
M3 – Coachlight Cir.	6:00pm	5 min.	**	**
M4 – Fusco Field	**	**	3:55am	15 min

** *No log sheets were supplied for these locations.*

NCE EXHIBIT 5

Table of estimated Project Generated Sound Pressure Level in dB(A) recomputed based on assumptions listed in Question 27 and listed for receptor locations within 1,250 feet of the either wind turbine.

RECEPTOR ID	**R1**	**R2**	**R3**	**R4**
SPL, Wind Turbine 1, dB(A)	45	45	43	40
SPL, Wind Turbine 2, dB(A)	39	43	46	45
Total SPL, dB(A)	**46**	**47**	**48**	**46**
CTDEP Nighttime Noise Limit, dB(A)	**45**			
Excess to the Limit, dB	***1***	***2***	***3***	***1***