

8 September 2017

Comments by Mark L. Twichell, DDS, on the written testimony of Henry M. Spliethoff, M.S., Chief of the Prevention and Sustainability Section in the Division of Environmental Health Assessment, New York State Department of Health as submitted in Exhibit 122 of Case 14-F-0490.

Page 1477, line 4-6: The purpose of my testimony is to provide an overview of health protective audible noise guidelines and their applicability to wind facilities including the proposed Cassadaga Wind LLC facility (“the Applicant”).

Industrial wind turbines produce noise which is not always audible. Inaudible noise is referred to as infrasound and low frequency noise (ILFN).

Page 1477, line 13-15: The purpose [of this testimony] is to ensure that the Siting Board is presented with sufficient evidence to support a finding on the nature of the impacts of the Cassadaga Wind Project on public health.

The Siting Board is not provided with sufficient evidence primarily due to this testimony’s failure to consider the full spectrum of noise emitted by industrial wind turbines inclusive of ILFN. Although testimony notes that many residences in the project area will be negatively impacted by the Applicant’s design goal in audible measurements, the number of negatively impacted residences is understated by the omission of ILFN measurements.(1.)

Even in its consideration of the audible component of wind turbine noise this testimony is deficient in providing Siting Board members with enough evidence to support a finding on the nature of the impacts of this project on the public health of children in the project area.

Page 1478, line 15-17: Wind turbines emit sound or “noise”, created primarily by the interaction of turbine blades and the wind, at levels of over 100 “A-weighted” decibels (dBA) (weighted to account for human hearing).

The testimony here neglects to mention the noise created by the turbine blades as they pass the tower. This blade-pass is a source of ILFN (2). The absence in testimony of reference to blade-pass reflects a fundamental lack

of understanding how wind turbines produce noise. Furthermore, the ILFN created by blade-pass is not reflected in the use of A-weighted decibel measurements (3.)

Page 1479, lines13-17: Although noise from turbines may have certain distinctive qualities (e.g., amplitude modulation, tonality), there is currently not enough evidence to determine whether or how much these qualities could result in health related impacts above and beyond that from the noise level alone.

Testimony is misleading in its consideration of “the noise level alone”. The noise level must be defined as the result of all acoustic energy emitted by wind turbines which result in wave forms in the atmosphere. Perhaps the last four words of line 17 should be replaced by “the audible noise alone”.

Testimony places NYSDOH in synchronicity with wind turbine manufacturers and wind energy developers who steadfastly deny measurement and consideration of ILFN as an etiologic agent in the reporting of adverse health effects ( AHE). Such denial is expressed by the American and Canadian Wind Energy Associations on their respective websites. In the United Kingdom “ETSU-R-97” is a wind turbine noise guideline published by the wind industry which excludes references to ILFN.

The testimony ignores the fact that human perception of noise is based primarily on sound character rather than sound level, and that wind turbines are unique sound sources that exhibit special audible and inaudible modulated and tonal characteristics(4.)

The testimony here does not mention ILFN as one of the “qualities” of wind turbine noise. In contrast to the assertion that there is not enough evidence to determine whether or how “these qualities” could result in health related impacts is the following list of citations(5., 6., 7., 8.,).

Evidence in the above citations 5-8 is from the work of a physician and acousticians. An additional source of evidence for the etiology of ILFN in reported AHE comes from the emerging field of neuroscience research via

electroencephalography {EEG}(9.), and in 2017 via functional magnetic resonance imaging{fMRI}(10.\*) . Although the fMRI study does not involve ILFN from wind turbines, it shows how what humans can't hear can harm them.

Evidence that wind turbine ILFN has resulted in health related impacts has been shown in communities where wind turbines have been declared as health hazards and measurements of ILFN were taken inside the homes of residents who filed the complaints. The complaints of the residents were not of the kind attributable to audible noise(11.,12.). A similar presentation where ILFN was measured inside a home is made by Bray(13.)

Although testimony entirely ignores the role played by ILFN in its presentation of wind turbine noise impacts, it is known that ILFN can amplitude modulate audible noise(14.) Thus wind turbine ILFN exists both as its own toxic inaudible ingredient, and as a vector for the effects of audible noise measured in dBA. ILFN must be placed in the context of wind turbine noise and its effects.

Page 1480, lines 13-16: Q. Can you identify what you believe to be the most relevant noise level guidelines from the WHO documents? A. An annual average of 40 dBA and a one night maximum of 45 dBA were established for nighttime noise by WHO 2009 and WHO 1999, respectively.

Testimony here is selective in its citation of WHO guidelines. In fact WHO places a special emphasis on low frequency noise as an environmental problem and source of sleep disturbance, even at low levels. WHO(15.) acknowledges that a noise consisting of a large proportion of low-frequency components may considerably increase AHE and should be limited to below 40 dBA.

It is important to note, as in testimony, that WHO's guidelines are based on transportation noise, not on wind turbine noise.

Even sound levels of 40 dBA trigger high levels of community pushback(16.) And as cited in testimony the NYS Department of Environmental Conservation advises 6 dBA above ambient levels for non-industrial settings. Most of the children of Chautauqua County who will be living in and adjacent to the project area are accustomed to nighttime noise levels characteristic of other rural areas, 25-30 dBA.(17.) Testimony supports

increasing nighttime noise exposure for these children by 10-15 dBA, or up to 60%. It is understood that a 10 decibel increase in noise is perceived as being twice as loud. The risks of AHE for children from environmental noise is greater than for adults.(18.\*)

Page 1482, line 6-11: There is limited evidence (few or inconclusive studies but a biologically plausible pathway that could be constructed) that disturbed sleep causes fatigue, accidents and reduced cognitive performance, hormone level changes, and clinical conditions such as cardiovascular illness, depression, and other mental illness. A biologically plausible causation model with sufficient evidence is discussed in the Guidelines.

Testimony could have cited both the United Nations Committee against Torture and the Physicians for Human Rights in regards to the known AHE of sleep deprivation which causes significant cognitive impairments including deficits in memory, learning, logical reasoning, complex verbal processing, and decision making.(19.)

Testimony again fails to consider the impact of wind turbine noise as a cause of sleep deprivation specifically in children for whom the AHE of sleep deprivation are particularly concerning.(20.,21.,22)

Testimony is inconsistent with regards to significance of biologically plausible pathways in explaining AHE. Biological plausibility is not admitted in regards to citations 5.-13. above. Yet here the concept of biological plausibility is acknowledged in reference to sleep deprivation.

Page 1483-1484, lines 12-15 and 1-5: Health Canada, in cooperation with Statistics Canada, conducted a large-scale epidemiological "Community Noise and Health Study" in 2012. The study's purpose was "to support a broader evidence base on which to provide federal advice and in acknowledgement of the community health concerns expressed in relation to wind turbines".(5) That study assessed measured noise levels representative of yearly averages which could be directly compared to the WHO 2009 guideline. Results of the study were released in a series of peer reviewed papers in 2016.(6,7) Annoyance was found to be the only effect significantly associated with turbine noise up to the study maximum annual average nighttime level of 45dBA.

Testimony incorrectly refers to the Health Canada “Community Noise and Health Study” as an epidemiological study. The Health Canada study design specifically states: “This design does not permit any conclusions to be made with respect to causality.” As per Wikipedia: “Epidemiology is the study, and analysis of the patterns, causes, and effects of health and disease conditions in defined populations.” The fact that the Health Canada study is not epidemiological explains why, as noted in testimony, Health Canada has not developed any guidelines from this study.

Testimony’s citation of the Health Canada study does little to provide evidence in favor of Department recommendations, and illustrates reasons for concern should they be adopted. Limitations and criticisms of the Health Canada Study are well understood(23\*) and include:

1. Exclusion of children and people under age 18
2. The finding of annoyance is not to be trivialized since the WHO defines health as a state of complete physical, mental, and social well being and not merely the absence of disease or infirmity. Therefore, a high level of annoyance caused by environmental noise should be considered one of the environmental burdens, as stated in WHO Burdens of Disease from Environmental Noise (2011). Furthermore the WHO has described annoyance as an AHE, in that in some people it is associated with stress, sleep disturbance, and interference with daily living.(24.\*)
3. The Health Canada study concluded that 25% of people living close to industrial wind turbines report feeling very or extremely annoyed by wind turbine noise
4. The Health Canada study is based on wind turbine noise, while WHO ’09 is based on transportation noise. Thus the results of this study can not be directly compared to WHO ’09.
5. The health Canada study evaluated only audible wind turbine noise. Finding no association between audible wind turbine noise and various types of health effects does not preclude the impact of ILFN not included in the study analysis.

Page 1484, line 5-7: For example sleep disturbance was not significantly associated with turbine noise in the [Health Canada] study population.

Many studies have found a relationship between sleep disturbance and proximity to wind turbines(25. 26.,27.,28.,29., in addition to 29 other citations noted in Punch and James “Wind Turbine Noise and Human Health”)

Page 1488, line 14; and page 1489, line 3: Testimony here refers to 678 non- participating residences and 72 participating residences in the project area, for a total of 750 total permanent residences potentially impacted by wind turbine noise from this project.

Page 1488, line 18: Testimony here refers to potential impact on seasonal residences, indicating that four of six such residences will experience noise in excess of WHO guidelines.

Testimony states that 13 of the 72 participating residences will experience audible noise in exceedance of the WHO 1999, and likely the WHO 2009 guidelines.

The Health Canada study as cited above concluded that 25% of people living close to wind turbines are at least highly annoyed by turbine noise. Using that percentage in reference to the Cassadaga Wind Project results in a total of 189 residences ( permanent and seasonal) to be negatively impacted. Testimony has thus understated the number of harmed residences by a factor of 14.

Page 1491, line 6-8: DOH staff believe that the adoption of a higher design goal for participating residences could be considered, but it should be premised on the informed consent of those landowners to potentially higher noise impacts.

The doctrine of informed consent implies that participating landowners be informed of all risks and hazards known to exist in relation to exposure to wind turbine noise. Neither the Department nor the Cassadaga Wind Project developer would be capable of publishing a legitimate consent form since both fail to acknowledge an etiology explaining the full range of AHE reported by residents in proximity to wind farms.

Testimony fails to consider the impact of higher noise levels on the children who live at participating residences. Children do not sign informed consent documents.

#### Additional Comments

This testimony consists of a review of published literature and lacks citations of epidemiologic studies in support of its disregard of ILFN. In fact there are no epidemiologic studies which assert that wind turbine noise is harmless(30., 31). Citations 5.-13. noted above contain references to all of the qualities of an epidemiologic study, as defined by Wikipedia, of the effects of wind turbine ILFN. But the conclusions of these reports are not cited by this testimony, presumably since they are considered as merely anecdotal or founded on biological plausibility.

As a health care professional I am trained to seek, acknowledge, and cite all characteristics of the toxicity of a harmful agent in its complex interaction with human health. I find it puzzling that testimony not only fails to mention ILFN as an ingredient of wind turbine noise pollution, but also to not consider the harmful effects of wind turbine noise as the result of a whole process. Such negligence suggests an environmental toxicologist who considers combustive heat harmless in its dispersal of poisons through smokestack effluent, or an environmental epidemiologist claiming the innocence of deer in the cycle of Lyme disease.

A description of an epidemiological study inclusive of all elements of wind turbine noise in actual proximate residences and employing comprehensive biometric monitoring of test subjects has been published in 2017(32.\*) Such a study would require the cooperation of the wind industry and the informed consent of participants.

Public health policy decisions are made using “greater good”, “utilitarian”, or “risk/benefit” calculations. Such decisions are invalid, and unethical without recognition of who might be harmed, and by what means, and how the harm can be mitigated. Lacking such recognition calls for the adoption of the precautionary principle in the siting of industrial wind turbines. As stated in testimony precautionary guidance is forthcoming in WHO’s update regarding wind turbine noise(33.) In the case of the Cassadaga Wind Project precaution calls for setback distances greater than those illustrated in citations 11 .-13. above, and greater than those proposed for this project. Testimony does not refer to

the turbine setback distances proposed for this project and does not provide the Siting Board with information relative to the role of distance in the attenuation of noise perception.

Rural families in Chautauqua County now have two disparate guidelines for environmental noise. As noted in testimony the Department of Environmental Conservation advises a limit of 6 dB above ambient levels. In support of allowing at least as much as a 15 dB increase, the Department of Health cites no epidemiological evidence that harm will not be done.

Prior to the inclusion of wind farm siting in New York State's Article 10 law the NYSDOH had published no references to environmental noise as a public health issue. As an adjunct to New York State's Article 10 process the Department of Health is tasked with providing its assessment of wind turbine noise risk. The Department has done this without citing its own efforts in evaluating noise conditions or residents' complaints in New York State neighborhoods already negatively impacted by wind turbine noise at Eagle [Noble Bliss] in Wyoming County(34\*.), Chateaugay [Jericho Rise](35\*.), Cohocton(36.\*), Herkimer County [Hardscrabble](37.\*), Tug Hill [Maple Ridge](38.\*), and Cape Vincent[Wolfe Island](39.\*).

Nothing in this testimony illustrates the Article 10 process as more protective of citizens in Chautauqua County than that observed in the SEQRA process in the six communities above, since turbine setback distances for the Cassadaga Wind Project are not significantly different than in those cited. Many townships hosting wind facilities under SEQRA have 50 dBA noise limits and 1,000 foot setbacks. While the Department's recommendation of 40 dBA nighttime might appear to be more protective, the unacknowledged yet well documented effects of ILFN will continue unabated. AHE in NY State and elsewhere in the USA and abroad have been reported by residents at distances exceeding one-half mile from wind plants. One such complaint is cited from Chateaugay, NY where 50 dBA is allowed(40.\*). Such a distance would be expected to attenuate a noise at 50 dBA (1,000ft.) to approximately 40 dBA (2500 ft.) due to the inverse square law of sound propagation(41\*). Such reports as above account for the state of Vermont's [PSB] recommendation that wind turbines not be placed closer than 5,000 feet from residences, or 10 times the turbine height(42\*). Do NY State residents deserve a less protective consideration than those in our neighbor state?

This testimony reveals a NYSDOH evaluation which understates the public health impact of audible wind turbine noise by deficiencies including incomplete citation of WHO guidelines and misinterpretation of the Health Canada study. Both the Department and the wind turbine industry share a refusal to acknowledge ILFN as a significant ingredient in the toxicity of wind turbine noise. By these and other oversights the Department risks the appearance of an agency facing the challenges of regulatory capture(43.\*)

## Summary

Siting Board members will find little assurance from this testimony that they are making just decisions in locating wind turbines under the terms of the Applicant. As public servants participating in NY State's first Article 10 wind facility location, these appointees should appreciate their opportunity to set a replicable and honorable precedent in the interest of public health. The NY State Department of Health should be asked for a more fact-based, protective turbine setback distance advisory.



Mark L. Twichell, DDS

Fredonia, NY

21 August, 2017

## References

- (1.) World Health Organization( WHO),” Night Noise Guidelines for Europe 2009” as cited in Punch and James “Wind Turbine Noise and Human Health: A Four Decade History of Evidence that Wind Turbines Pose Risks” in Evidentiary Hearing Exhibit 76, p.11
- (2.) Ibid, p.12
- (3.) Audiology Today “Wind Turbine Noise: What Audiologists Should Know” Punch, James, Pabst (2010)
- (4.) Thorne B. The problems with “noise numbers” for wind farm noise assessment. Bulletin of Science, Technology and Society 2011;31:262-290 as cited by Punch and James Exhibit 76, p.11
- (5.) Pierpont N. “Wind Turbine Syndrome: A Report On a Natural Experiment. Santa Fe (NM) K-Selected Books 2009, Ibid. p.24
- (6.) The Acoustic Group. “ The results of an acoustic program: Cape Bridgewater Wind Farm”. Report prepared for Energy Pacific (Vic), Melbourne, Vic 3000, January 2015. Op. cit. Punch and James p. 21
- (7.) Salt AN “Wind Turbines Can Be Hazardous to Human Health” www. Google.com/url?sa=t&rct=j&q=&esrc..... Ibid. p.24
- (8.) Jung SS, et. al. “Experimental identification of the acoustic emission characteristics of large wind turbines, with emphasis on infrasound and low frequency noise”. Journal of the Korean Physical Society 2008;53:1897-1905. Ibid. p.24
- (9.) Kasprzak C. “The influence of infrasound noise from wind turbines on EEG signal patterns in humans”. Acoustic Biomedical Engineering 2014;125:A-20-A-23 Ibid. p.29
- (10\*) Weichenberger M, et.al. “Altered cortical and subcortical connectivity due to infrasound administered near the hearing threshold-evidence from fMRI”. journals.plos.org/plosone/article?id=10.1371/journal.pone.074420 2017
- (11.)Walker B, et.al. “A cooperative measurement survey and analysis of low frequency and infrasound at the Shirley Wind Farm in Brown County, Wisconsin”. Report number 122412-1, December 24, 2012. Op. cit. Punch and James, p. 10
- (12.) Rand RW, Ambrose SE, Krogh CME “Occupational health and industrial wind turbines: a case study” Bulletin of Science, Technology and Society 2011;31:329-362. Ibid p.9.

- (13.) Bray W, James R “Dynamic measurements of wind turbine acoustic signals, employing sound quality engineering methods considering the time and frequency sensitivities of human perception” presented at Noise-Con 2011 conference, July 2011. Ibid. p. 9
- (14.) Lichtenhan JT, Salt AN “Amplitude modulation of audible sounds by non-audible sounds: understanding the effects of wind turbine noise” Journal of the Acoustical Society of America 2013;133:3419 Ibid. p.13
- (15.) WHO Op. cit.
- (16.) Cummings J “ Looking for wind industry leadership in reducing noise impacts” February 2011 Op. cit. Punch and James p. 11
- (17.) Berglund B, Lindvall T, Schwela DH (eds.) “Guidelines for Community Noise” WHO April 1999 Ibid. p.16
- (18.\*) WHO “Burden of Disease from Environmental Noise” 2011 p.46
- (19.)Physicians for Human Rights “Leave No Marks: enhanced interrogation techniques and the risk of criminality” August 2007 Op. cit. Punch and James p.17
- (20.) Hanning C “Comments on wind turbine health impact study: report of independent expert panel” ND wind-watch.org/MassDEP-wind-health Ibid. p.16
- (21.) Krough C “Risk of harm to children and industrial wind turbines: health and social-economic impacts in Canada” Health Canada Wind Turbine Noise and Health Study December 27, 2012 Ibid. p.16
- (22.) Bronzcraft, AL “The noise from wind turbines: potential adverse impacts on children’s wellbeing” Bulletin of Science, Technology and Society 2011;31:291-295 Ibid. p.16
- (23.\*) Wind Concerns Ontario, [www.windconcernsontario.ca/wp-content/uploads/2014/11](http://www.windconcernsontario.ca/wp-content/uploads/2014/11)
- (24.\*) WHO, 2011 Op. cit. p. 91
- (25) Ising H., Kruppa B. “Health effects caused by noise: evidence in the literature from the past 25 years” Noise and Health 2004;6:5-13 Punch and James Op. cit. p.16
- (26) Bolin K, et.al “Infrasound and low frequency noise from wind turbines: exposure and health effects” Environmental Research Letters 2011;6:1-12 , Punch and James Ibid. p.16
- (27.) Van Renterghem T, et. al. “Annoyance, detection and recognition of wind turbine noise” Science of the Total Environment 2013;456-7:333-345 Ibid. p.16
- (28) Stigwood M, et.al. “Audible amplitude modulation: results of field measurements and investigations compared to psych-acoustical assessment and theoretical research” 2013 [www.masenv.co.uk/uploads/WTN13 Stigwood Presentation.pdf](http://www.masenv.co.uk/uploads/WTN13_Stigwood_Presentation.pdf) Ibid. p. 16
- (29) Taylor S. “Report on health impacts of wind farms: Shetland 2013 Summary” July 2013 [www.shb.scot.nhs.uk/board/publichealth/documents/Summary Report on Health Impacts Wind Farms.pdf](http://www.shb.scot.nhs.uk/board/publichealth/documents/Summary_Report_on_Health_Impacts_Wind_Farms.pdf) Ibid. p.16

- (30) Hanning C. "Wind turbine noise, sleep, and health" July 2010  
[www.acousticecology.org/wind/winddocs/health/Hanning](http://www.acousticecology.org/wind/winddocs/health/Hanning) Ibid p.15
- (32.) Nissenbaum MA "Industrial wind turbines, human variability, and adverse health effects"  
NOCOEM Reporter, New England College of Occupational and Environmental Medicine. Fall  
2013;2(38) Ibid. p.15
- (33.\*) Evans A. "Environmental Noise Pollution: Has Public Health Become Too Utilitarian?" Open  
Journal of Social Sciences 2017,5,80-107 p.95
- (34\*.) [www.windaction.org](http://www.windaction.org)
- (35\*.) [www.mymaloetelegram.com](http://www.mymaloetelegram.com)
- (36\*.) [www.windaction.com](http://www.windaction.com)
- (37\*.) [www.uticaod.com](http://www.uticaod.com)
- (38\*.) [www.npr.org](http://www.npr.org) April 9, 2008 Wind Farm Buffets Family
- (39\*.) [www.scribd.com](http://www.scribd.com) Tibbetts Road noise complaints
- (40\*.) [www.observertoday.com](http://www.observertoday.com) Sigourney, "Once Turbines Arrive...."
- (41\*.) [www.wkcgroup.com](http://www.wkcgroup.com)
- (42\*.) digital.vpr.net May 4, 2017
- (43\*) wikipedia