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August 25, 2011

Pat Eaton, Town Supervisor and Town Board Members:
John Hare
Jim Hitchcock
Ray Jonak
Hans Sendlakowski
Town of Allegany
52 West Main St.
Allegany, NY 14706

Re: Rezoning for the Everpower project proposal

Dear ~~Mr. Eaton~~ Pat and Town Board Members:

Please consider this letter prior to your your vote on whether to rezone the area south of the Allegheny River to accommodate the Everpower wind farm proposal.

Legitimate questions were identified but left unanswered in the FEIS. These include the nature and seriousness of the noise impact; whether a decline in real property values will occur, offsetting direct payments from the project; Everpower's failure to determine whether it can avoid blasting, and the effect blasting may have on oil and gas wells within the project area; and the ecological degradation of the heavily forested project area that will result from construction traffic and permanent access roads to turbine sites and transmission lines.

Unresolved noise issues

Wind turbine noise is an issue not because it is very loud, but because it is unusually annoying. This is because of its qualities, not the quantity of sound pressure. By itself, a numerical noise level such as 40 dBA may therefore not be very meaningful.[1]

The annoying aspects of wind turbine noise are its low frequency quality, its pulsating quality, and the fact that it is generated at night, when it is the most quiet, and often over several nights in a row. Some people (not all) living near a wind farm will be awakened frequently during operations, and chronic sleeplessness is strongly linked to a variety of

1 The Planning Board's findings regarding noise impact relies entirely on numerical sound levels and fails to address the distinctive qualities of wind turbine noise addressed in generally accepted standards by adding decibels to modeled sound levels. See Findings Statement, pp. 54-57. Such standards are discussed in an appendix to this letter.

adverse health effects.[2] ISO 1996-1971 recommends 25 dBA as the maximum night time limit of noise exposure for rural communities.[3]

A change to the town's zoning ordinance the Board was made on February 24, 2011. At that time the Board required that sound studies follow ANSI standards, or other generally accepted procedures.[4] The FEIS fails to assess noise impacts of the Everpower project in compliance with such standards or procedures in eight areas:

(1) Everpower discounted or reduced the sound level from operations it modeled by applying a "ground absorption" factor, but acoustic standards prohibit such discounts for elevated noise sources.

(2) Everpower's sound model assumes "wind masking" of turbine noise, that is, the model assumes there will be enough wind near ground level to increase the background noise so much that the receptor will not notice wind turbine noise slightly above that level. This increases the baseline "background" to which project noise is compared. CRA adopted and did not criticize the wind masking theory. But there is no standard or procedure that supports this theory.

(3) The state Department of Environmental Conservation has issued guidelines for noise assessments, and DEC commented on this project urging that its guidelines be followed. One of the guidelines recommends 10 decibels be added to modeled project sound levels as a penalty to account for the added annoyance of a noise source that operates at night.[5] The FEIS rejected the recommendation.

(4) DEC also noted in its comments that pulsating or beating noise from wind turbines is more annoying than the same decibel level of noise generated by rail, traffic or airplanes.

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2 Such health effects are a result of sleeplessness, and should be distinguished from effects on the ear or other organic health effects some claim result directly from exposure to wind turbine noise. The latter effects are not being asserted in this letter. See further, Minnesota Department of Health, Environmental Health Division, *Public Health Impacts of Wind Turbines* (May 22, 2009), submitted in full with my letter to Bob Phillips, dated May 26, 2011.

3 The ISO 1997-1971 community noise limits, by community type, are reproduced in FEIS, Appendix N, Comment 3, attachment: George W. Kamperman and Richard R. James, "The 'How To' Guide to Siting Wind Turbines to Prevent Health Risks from Sound" (October 2, 2008), p. 5.

4 See Zoning Ordinance II, as amended February 24, 2011, Definitions, "A WEIGHTED SOUND PRESSURE LEVEL," which states: "The measurement of the sound pressure level may be done according to the American Standard, Quantities and Procedures for Description and Measurement of Environmental Sound (ANSI/ASA S12.9-1993, Parts 1, 2 and 3, reaffirmed by ANSI April 2008), published by the Acoustical Society of America (ASA) and the American National Standards Institute (ANSI), or other accepted procedures." This requirement is not discussed in the Planning Board's findings statement. See Findings Statement, p. 82.

5 DEC's full letter is included as FEIS, Appendix N, Comment 1. Consistent with the "penalty" approach to assessing the distinctive annoyance factors that characterize wind turbine noise, two members of the well-respected Institute of Noise Control Engineering have also recommended "correction factors" in order to accurately predict community reaction to wind turbine noise, including "10 dB for being located in a quiet area, 5 dB for no prior experience and, 5 dB for having a tonal or impulsive sound character." See Stephen Ambrose and Robert Rand, "Wind Turbine Noise: An independent assessment, noise complaints predictable," repr. fr. *Knox County Herald Gazette* (October 30, 2010), enclosed with this letter.

The same observation is made in a review of the scientific literature on wind turbine noise by the Minnesota Department of Health.[6] DEC recommended adding decibels to modeled project sound levels for this feature of wind turbine noise, but the FEIS rejected the recommendation.

(5) The town's zoning ordinance requires a report on low frequency noise, but Everpower did not provide one. Low frequencies are characteristic of wind turbine noise, and it is the low frequency component of the noise that is heard as rhythmic "thumping." There are therefore serious grounds to expect that nearby residents will at times be subjected to low frequency noise, which is particularly annoying.

(6) DEC commended the DEIS for utilizing the L90 statistic to designate the existing background sound level near the project area. This is the sound level exceeded 90% of the time measured, and represents the quiet lulls between sporadic natural and human sounds (like insect sounds and nearby road traffic). The residual background sound level is the baseline against which a new, potentially intrusive noise is noticed. However, the FEIS does not use the L90 measure, and instead modifies the L90 designation upward. This increases the reported background level compared to L90. No basis in any standard or procedure is given for this change.

(7) DEC's guidelines classify the level of annoyance of a noise by how much it increases above the existing background sound. A 6 dBA increase results in complaints, according to the guidelines, and a 20 dBA increase is "very noticeable to intolerable." The town's consultant CRA measured L90 levels as low as 18.3 dBA in Chipmonk, and Everpower predicts 40 dBA at that location. That will be "intolerable" under DEC's guidelines.

(8) Finally, DEC's guidelines recommend noise assessments be based on "worst case" conditions. However, by refusing to incorporate any of the previous seven issues into its model, Everpower failed to meet this standard.

Each of these issues are detailed in an appendix to this letter by summarizing previously submitted comments, the supporting information that was provided for each, and the FEIS responses.

The Town Board should also consider the intent of the zoning ordinance provision that limits project sound levels to no more 3 dBA above ambient within 2,500 feet of the project. It is respectfully suggested that the Board's original intent in adopting this limit was not to through out limits altogether for those who live farther from the project. DEC's standard of 6 dBA over ambient is a generally accepted standard for avoiding adverse noise impacts. It is inappropriate to allow up to 20 dBA of new, pulsating noise to be visited on residents even if they live farther away than 2,500 feet.

6 Minnesota Health Department, *Public Health Impacts of Wind Turbines*, p. 20-22

Property value impacts

In previously submitted comments I raised the question whether the value of homes with a view of the Everpower project will decline such that erosion of the town's property tax base over time will offset financial gains the town obtains from the project. Recent professional studies that discredit the analysis of property value impacts provided by Everpower were discussed and submitted in their entirety.[7] I urge the Town Board to look seriously at those submissions.

However, it may be common sense to conclude that where scenic vistas are an important part of the value of rural residential property, siting a wind farm that blocks or mars such vistas will adversely affect the property's value. Thus, a realtor in Wyoming found that properties so situated became "virtually unmarketable."[8]

Recently, a "hedonic" analysis (using the same methodology as Everpower's analysis)[9] was issued by a Clarkson University professor, finding that homes 0.5 miles away had 10.87%-17.77% declines in sales price, and at a distance of one mile declines in value of between 7.73% and 14.87%.[10] The 2006 Hoen study, used by Everpower, looked at 280 home sales over 9.5 years, and the 2009 Hoen study, also used by Everpower was a hedonic analysis looking at over 24 different regions across the country from Washington to Texas to New York.[11] By contrast, the Clarkson University analysis uses "data on 11,369 arms-length residential and agricultural property transactions between 2000 and 2009 in Clinton, Franklin, and Lewis Counties in Northern New York to explore the effects of relatively new wind facilities."[12]

The conflict between the Hoen studies, which find no impact on property values, and alternative studies which find the impact can be significant, should create sufficient doubt that the Town Board should consider additional mitigating conditions such as homeowner compensation if the project is approved.[13]

If, as Everpower says, there is no impact, there should be objection to requiring independent appraisals of homes before and after the project, for those who choose to move away.

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7 These were submitted with my May 26, 2011 letter to Bob Phillips.

8 Greg Fladager, Properties 'virtually unmarketable', *Casper Journal* (September 21, 2010), available at <http://www.casperjournal.com/article_113f34f7-c657-53b7-a042-3afafc2d2139.html>.

9 See Planning Board Findings Statement, p. 18.

10 Martin D. Heintzelman, *Values in the Wind: A Hedonic Analysis of Wind Power Facilities* (March 3, 2011), p. 26. A recent *Batavia News* article on this study, as well as a copy of the study itself are enclosed.

11 Heintzelman, *Values in the Wind*, p. 8.

12 Id., p. 9.

13 "From a policy perspective, these results indicate that there remains a need to compensate local homeowners/communities for allowing wind development within their borders." Id., p. 26. A property protection plan was urged as a condition of approval in my letter to Bob Phillips, dated May 26, 2011, pp. 3-5.

Blasting impacts

A high-resolution aerial photograph of the Everpower project area available in the DEIS shows that the southern portion of the project area is located in the midst of over a hundred oil and gas wells.[14] As discussed in previously submitted comments, it has come to light that frequently reported well water contamination near hydraulically fractured gas wells is probably caused not by migration of contaminants from two miles or so below ground, but by the cracking of the upper well casings of nearby wells during the fracking process. Fluids injected at pressures of about 10,000 psi create explosive vibrations that affect neighboring wells. Blasting could have similar impacts.[15]

Everpower has not provided the Town with an answer to the question, whether blasting will be required in the project area. The Planning Board's findings statement states only that "a final blasting plan will be prepared based on the preliminary blasting plan contained in the Allegany Wind DEIS and blasting will be conducted in compliance with the final blasting plan."[16] However, the DEIS preliminary plan calls for no more than reports and testing that has not been done and provides little insight into what impacts would result from blasting.[17]

Those familiar with the project area know that bedrock of the kind visible at the surface at Rock City commonly emerges at the surface.[18] The round concrete base for Everpower's wind turbines will need to be ten feet thick and accommodate about 500 cubic yards of concrete. This includes an embedment ring entirely below ground level and a central flange that protrudes above ground level to which the tower is bolted. Excavation, including blasting, for turbine bases commonly releases ground water into the excavation which must be pumped out and discharged somewhere.[19]

It is improbable that blasting can be avoided in the project area. The Town Board should not rezone the area until it obtains an adequate report on potential impacts of blasting, has had an opportunity to review the report independently, and has considered measures to avoid

14 DEIS, Fig. 3.

15 The issue of blasting was raised in my letter to Bob Phillips, dated February 23, 2010, found at FEIS, Appendix N, Comment 3, attachment starting at PDF page 98; and again in my letter to Bob Phillips, dated May 11, 2011, pp. 9-10 (not included in the FEIS).

16 Findings Statement, p. 4.

17 DEIS, Preliminary Blasting Plan. This plan is less than two and one-half pages long. Specifics are missing to support the Planning Board's conclusion that no impacts are expected. (E.g., "Dewatering activities will not result in the direct discharge of water into any streams or wetlands." Findings Statement, p. 4.)

18 Cf. Planning Board Findings Statement, pp. 19-20, discussing "rock outcroppings" in the project area. See also DEIS, "Revised Preliminary Geotechnical Evaluation," dated January 15, 2010, stating that the project area includes "large 'house-sized' boulders and boulder fields within the current proposed turbine array, which could make turbine foundation construction difficult," (p. 1), bedrock is "exposed or generally within 1 meter of the surface," (p. 6) and bedrock outcrops were observed within the project area. (p. 7; see also pictures at pp. 7-8).

19 Kirk Morgan and Eric Ntambakwa, *Wind Turbine Foundation Behavior and Design Considerations*, Am. Wind Energy Assn. Windpower Conference, Houston (June 2008), available at <http://www.garradhassan.com/downloads/reports/Wind_Turbine_Foundation_Behavior_and_Design_Considerations.pdf>. This description is consistent with the Planning Board's findings.

and mitigate adverse impacts.

Wildlife impacts

In its comments on the DEIS, DEC noted that the long term loss of a substantial amount of forest habitat will result from the Everpower project. Each turbine site will clear five acres, but DEC noted lost forest acreage would be more extensive, owing to the need to disturb additional area. Following construction, "[m]aximum permanent road width will be approximately 20 feet."[20] "Installation of buried electrical lines would typically require a width of up to 40 feet of vegetation clearing."[21]

The Planning Board's findings statement says that some project roads "will follow existing logging trails."[22] However, logging trails are not paved and become overgrown, greatly reducing the fragmentation of habitat adverse to wildlife, compared to the planned access roads, permanent turbine sites, permanent crane pads and transmission lines. The Audubon Society commented that "[t]his project will result in permanent habitat loss and fragmentation [of wildlife habitat]" because the Allegheny Forest Tract where the project area is located "mostly consists of mature forests" and "[c]ontrary to statements included in the DEIS about the disturbed nature of the project area, . . . Audubon New York believes the project site is providing quality breeding habitat for several species of birds of conservation concern."[23]

The Planning Board's findings statement acknowledges that habitat fragmentation will occur. However, the statement relies on later monitoring, after operations have begun, to reduce the impact. Nothing in the findings statement contradicts Audubon's comments.[24]

Recently, U.S. Fish and Wildlife Service notified Everpower that it does not agree with the FEIS conclusion that the project poses only a "low" risk of collisions with Bald Eagle, which nest and winter in the vicinity of the project, and Golden Eagle, which migrate through the area. USFWS concluded that the risk of such collisions is "moderate," sufficient to trigger a recommendation that Everpower obtain a "take" permit from the agency. Everpower based its assessment on data from wind farms in the western U.S. I am enclosing a copy of the USFWS letter.

USFWS also called on Everpower to develop additional protective measures for eagles and for migratory birds, both of which are expected to be killed by the project.

USFWS finds that the project is located adjacent to an Important Bird Area, the Allegheny Forest Tract, an area vital to birds and other biodiversity, and the project is

20 Findings Statement, p. 7.
21 Findings Statement, p. 8.
22 Findings Statement, pp. 6-7.
23 Letter from Jillian N. Miner, Director of Bird Conservation, Audubon New York, to Town of Allegany Planing board, dated May 3, 2010, p. 2, found at FEIS, Appendix N, Comment 2.
24 See Findings Statement, pp. 44-47.

actually within 5% of the Allegheny Forest Tract IBA. This puts at risk eleven specific bird species and additional species of conservation concern that require forest cover for habitat.

Finally, the Pennsylvania Game Commission found that bat populations already decimated by "white-nose" fungus virus are being killed by wind turbines at an average rate of 25 per turbine per year.[25] That would mean about 725 bats per year would be killed by the Everpower project. "Bats are something of a one-species stimulus program for farmers, every year gobbling up millions of bugs that could ruin a harvest."[26] The Planning Board did not find that bats would not be killed in large numbers, it found on that two protected species were not found by Everpower in the project area.[27]

The prospect of killing protected or important bird species and bats by means of wind turbine blade collisions, or substantially degrading their habitat, is another reason the Town Board should be reluctant to approve this project.

Conclusions

The work of the Planning Board has been insufficient to protect residents and the environment from the likely impacts of the Everpower project. The Board found that the purpose of the town's zoning for wind projects "is to ensure the development of WECS will have a minimal impact on adjacent properties and will protect the health, safety, and welfare of residents of the Town."[28] The SEQRA standard, which requires a finding that "the applicant has mitigated potential adverse environmental impacts to the maximum extent practicable,"[29] if it does not ensure minimal impact will be insufficient to ensure the zoning requirements have been met.

The Town Board was elected to protect the community and now has an opportunity to do so. Community has to be about more than reducing budgetary burdens. Representing the community requires the Town Board to be responsive to the needs of all who belong to the community. If monetary benefits justify disregard for a whole area of the town, there really is no community.[30]

Protecting the community as a whole is why we have a town board. Everpower and the

25 Erich Schwartzel, "Game Commission says turbines killed more than 10K bats last year," *Pittsburgh Post-Gazette* (August 22, 2011).
26 Id.
27 See Findings Statement, p. 42.
28 Findings Statement, p. 86.
29 Id.
30 The Planning Board also found that the benefits to the State of New York weigh in favor of the project, because the state has an interest in "fuel diversity for power production." Findings Statement, p. 68. However, cumulatively all wind farms in the state (there about a dozen operating now) provide less than one percent of the state's electricity needs, and hydropower provides about 20% of the state's power production from renewable sources, the highest rate of reliance on renewables of any state in the U.S. See FEIS, Appendix N, comment 4, Appendix for a full discussion. The degree to which the Everpower project would contribute to "fuel diversity for power production" is therefore rather limited.

Planning Board have not demonstrated this project will avoid serious unprecedented burdens on those who live on the south side of the river that go beyond a minimal impact, nor have they demonstrated that the benefits of the project justify such burdens. Only the Town Board can do that, and you should find the burdens are too much.

Sincerely yours,

Gary A. Abraham

gaa/enclosures:

1. Stephen Ambrose and Robert Rand, "Wind Turbine Noise: An independent assessment, noise complaints predictable," repr. fr. *Knox County Herald Gazette* (October 30, 2010). [2 pages]
2. Don Butler, "The great divide over wind power," *The Ottawa Citizen*, May 21, 2011.
3. Matt Surtel, "Study hints at cost of wind development [on property value]," *Batavia News*, August 3, 2011.
4. Martin D. Heintzelman and Carrie M. Tuttle, *Values in the Wind: A Hedonic Analysis of Wind Power Facilities* (March 3, 2011).
5. David A. Stillwell, U.S. Fish and Wildlife Service, Letter to Michael Speerschneider, EverPower Wind Holdings, Inc., dated July 11, 2011.
6. ISO 9613-2 Acoustics – *Attenuation of sound during propagation outdoors* (1996) (excerpts).

APPENDIX
Noise Issues

1. The FEIS improperly applies a "ground absorption" discount. ISO 9613-2 Acoustics – *Attenuation of sound during propagation outdoors* is a generally accepted standard and is, in fact the basis for the Cadna/A computer-based model Everpower utilized to model project sound levels.

Cadna/A allows one to "turn off" or "turn on" a sound level discount for ground absorption, the degradation of noise caused by the ground over distance. A comment on the DEIS questioned Everpower's use of the discount, noting that ISO 9613-2 states that results *will not be accurate* for noise sources elevated more than 30 meters.[31] At that elevation, wooded areas and fields provide little or no absorption of sound, and the sound is radiated downward toward receptors on the ground.

The standard also assumes flat terrain[32] and "ideal weather conditions."[33]

The FEIS response to this comment asserts that it is appropriate to reduce modeled project sound level results for ground absorption over distance because there is

> [an] error analysis in Section 9 [of ISO 9613-2] where the accuracy of the methodology is given as +/- 3 dBA for sources that are less than 30 m above ground level and up to 1000 m from the source. *In this case, the turbines are out of this range at 80 m above ground level implying a somewhat wider error margin than +/- 3 dBA at large distances.* It is not that the standard is invalid for situations with higher sources or longer prediction distances, it's just that a specific error margin is not given. Numerous comparisons between modeled sound levels from typical wind projects (with turbines at 80 m hub heights) and actual measurements strongly indicate that the actual accuracy of this prediction methodology is much higher than suggested by the standard itself, probably because of the intrinsic simplicity of wind turbine modeling where basic point sources are essentially suspended in the air and the only propagation factors of any consequence are distance, air and ground absorption.[34]

The italicized statement acknowledges that ISO 9613-2 prohibits use of a discount for

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31 See ISO 9613-2, p. 14, *Table 5 - Estimated accuracy for broadband noise*.

32 The method of calculating the ground effect prescribed by the standard "is applicable only to ground which is approximately flat, either horizontally or with a constant slope." ISO 9613-2, Subsection 7.3.1.

33 This was pointed out by CCCC's acoustic consultant Richard James in comments to the Planning Board dated February 19, 2009, p. 2, found at FEIS, Appendix N, Comment 3.

34 FEIS, Section 4.8, p. 10. Note that none of the "numerous comparisons" supporting this statement are provided in the FEIS.

ground absorption for elevated noise sources higher than 30 meters. However, the statement asserts that ground absorption should be taken as a discount nevertheless. Even then, the response states that the error level exceeds 3 dBA by some unspecified amount.[35]

For a wind project in Cape Vincent, NY, acoustic engineering firm Cavanaugh Tocci Associates (CTA) commented on a noise assessment prepared by the firm Everpower used. CTA recommended "turning-off the the ground absorption calculation, as it may underestimate wind turbine sound levels by 3 to 4 dBA."[36]

2. There is no support in any generally accepted standards for Everpower's "wind masking" theory. A comment on the DEIS pointed out that current independent research—driven by the need to understand why wind developers' predictions of noise impacts has often fails to predict complaints after operations begin[37]—finds that about half the time wind farms operate, increased background noise caused by wind at near ground level does not occur, with the result that there is frequently no "masking" of turbine-generated noise. This is because of "wind shear," elevated winds become detached from near ground level atmosphere. When wind shear occurs, near ground level air is still while air 80 meters (262 feet) or more in height (the height of the top of the tower; blades pass overhead another 230 feet or so) moves at sufficient speeds to operate wind turbines.[38]

This is a matter of atmospheric physics—laws of nature. Nevertheless, Everpower modeled noise impacts on the assumption that "wind masking" will *always* occur *whenever* wind turbines are in operation.

In response to the comment the FEIS states, "no ANSI or ISO standards currently exist with respect to measuring background sound levels as a function of wind speed for wind turbine applications."[39] This response asks the reviewer to believe that background noise is "a function of wind speed for wind turbine applications." No peer-reviewed published research is offered to support this theory; no professional standards for measuring sound or

35 Furthermore, because its accuracy is limited to broadband noise sources, ISO 9613-2 does not "provide any insight into the degree of fluctuating noise that will be heard outdoors on one's property, or whether the low frequency noise emissions will be a cause of problems inside adjacent homes. This latter issue is especially important [in order] to know whether the wind project, when operating at night, may cause sleep disturbance." R. James memo, my comments to the Planning Board dated February 23, 2011, Attachment 3, p. 2.

36 The CTA report in full was submitted with my letter to Bob Phillips dated May 26, 2011.

37 See my letter to Bob Phillips dated May 26, 2011, pp. 1-2. See also Don Butler, "The great divide over wind power," *The Ottawa Citizen*, May 21, 2011, enclosed.

38 The leading study of the effect of wind shear on wind farm noise is by G.P. van den Berg, based on measurements of a wind farm every half-hour for one year. Van den Berg concluded, "A high wind shear at night is very common and must be regarded a standard feature of the night time atmosphere in the temperate zone and over land." Quoted and discussed in my letter to Bob Phillips, dated May 11, 2011, pp. 6-7. The FEIS asserts that this is "an irrelevant study conducted in Europe for an area of flat topography, near the ocean." Van den Berg's study is actually a compilation and updating of several studies he conducted at a number of different wind farms before 2006 to explain why complaints occurred where pre-operational studies had concluded there should be none. The closest to the ocean of any of these facilities is 100 miles away. More importantly, as noted above, the FEIS provides no basis for its alternative "wind masking" theory.

39 FEIS, Section 4.8, p. 15.

assessing noise impacts is provided that would support this theory; and no technical guidelines or any other basis is provided to support the theory.[40]

The Minnesota Health Department credited van den Berg's research showing that near ground background levels are frequently not related to elevated wind speed.[41]

Three different, unaffiliated acoustic engineers' opinions rejecting the wind masking theory for wind turbine applications were submitted to the Planning Board. Richard James' memo, dated February 19, 2010, concludes that Everpower's noise assessment does not comply with ANSI or ASA standards for outdoor measurement of sound.[42]

Dr. Paul Schomer, reviewing a Cape Vincent, NY wind farm noise assessment by the same firm Everpower used, stated: "regularly and frequently, especially at night, the relation between wind speed and altitude cited by Hessler breaks down completely. It is simply wrong. This is not some idle theory; it is a well known and well documented fact." Dr. Schomer recommends modeling ignore wind masking as a factor. Dr. Schomer specifically recommends the approach to assessing wind turbine noise effects developed by Kamperman and James which is based on ANSI standards.[43]

Finally, the acoustic engineering firm Cavanaugh Tocci Associates (CTA) also reviewed Hessler's report for Cape Vincent, on behalf of the Cape Vincent planning board. CTA recommended that no wind masking be assumed. Comparing their recommended approach to Hessler, CTA concluded: "The analysis method employed by Hessler Associates would underestimate wind turbine sound impacts half the time on average, and considerably more often at quieter receptor locations."[44]

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40 The lack of any basis in science or "normal practice" in noise assessment for the wind masking theory is addressed by Bowdler in an article attached to FEIS, Appendix N, Comment 3, PDF pages 125-132.

41 "Aerodynamic noise from a wind turbine may be underestimated during planning. One source of error is that most meteorological wind speed measurements noted in wind farm literature are taken at 10 meters above the ground. Wind speed above this elevation, in the area of the wind turbine rotor, is then calculated using established modeling relationships. In one study (van den Berg, 2004) it was determined that the wind speeds at the hub at night were up to 2.6 times higher than modeled. Subsequently, it was found that noise levels were 15 dB higher than anticipated." Minnesota Health Department, *Public Health Impacts of Wind Turbines*, pp. 11-12.

42 This memo is attached to my letter to Bob Phillips, dated February 20, 2009, FEIS, Appendix N, Comment 3. In an article attached to the memo co-authored with Kamperman ("Simple guidelines," p. 8) it is stated: "Including wind as a masking source in the criteria is one method for elevating the permissible limits. Indeed the background noise level does increase with surface wind speed. When it does occur, it can be argued that the increased wind noise provides some masking of the wind farm turbine noise emission. However, in the middle of the night when the atmosphere is defined as stable (no vertical flow from surface heat radiation) the layers of the lower atmosphere can separate and permit wind velocities at the turbine hubs to be 2 to 2.5 times the wind velocity at the 10m high wind monitor but remain near calm at ground level. The result is the wind turbines can be operating at or close to full capacity while it is very quiet outside the nearby dwellings."

43 Dr. Schomer's comments in full are attached to my letter to Bob Phillips, dated May 26, 2011 (not included in the FEIS). The Kamperman and James guidelines in full are found in FEIS, Appendix N, Comment 3, attachment: "Simple guidelines for siting wind turbines to prevent health risks" (2008).

44 CTA's comments are also attached to my letter to Bob Phillips, dated May 26, 2011. See also Jim Cummings, "AEI Special Report: Wind Turbine Noise Impacts," Acoustic Ecology Institute (Santa Fe, NM) 2009, <AcousticEcology.org/srwind.html>. The AEI report finds that use of the "wind masking" theory has been

3. DEC guidelines call for a 10 decibel penalty for noise sources operating at night. DEC commented on the DEIS that the agency's guidelines recommend that 10 decibels be added to project sound levels modeled by Everpower:

> As our guidelines discuss (below), given situations which involve night-time noise (such as that generated by wind projects), a discussion of impacts on residents should consider possible disruption during the night. As mentioned below in the quote from our guidelines, weighting night-time noise more heavily, such as the Ldn, may be appropriate as an [sic] supplemental means to assess possible effects on local residents. As stated in our guidelines:
>
> > Equivalent Sound Level (Leq) . . . can be combined with other types of noise analyses such as Composite Noise Rating, Community Noise Equivalent Level and daynight noise levels characterized by Ldn where an Leq(24) is measured and 10 dBA is added to all noise levels measured between 10 pm and 7 am. These different types of noise analyses basically combine noise measurements into measures of cumulative noise exposure and may weight noise occurring at different times by adding decibels to the actual decibel level. Some of these analyses require more complex noise analysis than is mentioned in this guidance.
>
> However, care should be taken that this approach not substitute for analysis involving short term worse case analysis — such as worse case 10 minute nighttime sound pressure level.[45]

DEC encouraged the addition of a penalty to modeled project sound also because wind shear commonly makes wind turbine noise more noticeable than would occur for other kinds of noise sources.[46]

There is no discussion in the FEIS of the special problem of nighttime project noise. Wind farms operate more often at night than during the day, and wind shear occurs most often during the night. By not adding a penalty or otherwise considering the effect of wind turbine noise at night, the FEIS has departed without justification from DEC's guidelines.

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consistently rejected by independent acoustic experts. Thus, the assertion in the FEIS that the condition where it is "nearly calm and therefore quiet at ground level (i.e. stable atmospheric conditions) . . . is more of an extreme case than a commonplace situation" is not supported by any research, and none is cited in the FEIS. See FEIS, Appendix K, p. 4.

45 FEIS, Appendix N, Comment 1, at p. 10, quoting New York State Department of Environmental Conservation, *Assessing and Mitigating Noise Impacts* (rev. 2001), p. 7. The DEC guidelines are included in FEIS, Appendix N, Comment 4, attachment and are available on line at <http://www.dec.ny.gov/docs/permits_ej_operations_pdf/noise2000.pdf>.

46 FEIS, Appendix N, Comment 1, at p. 11.

4. Pulsating noise is more annoying than non-pulsating noise at the same level and should also be penalized. DEC also commented that:

> wind turbine generator noise is characterized by amplitude modulation (whooshing, for example) . . .
>
> Different wind speeds within the rotor-swept area is also a common occurrence, and results in low-frequency "thumping" sounds, which carry long distances. These sounds are also not well masked by even wind-related sounds at ground level, which are broad band sounds. Broad band noise does not cover up low frequency beating sounds, because the two kinds of sounds are very different.[47]

The Minnesota Department of Public Health also attributes the source of pulsating noise to different wind speeds within the rotor swept area.[48]

The FEIS response to this comment is not in fact responsive:

> Wind turbine noise is sometimes characterized by amplitude modulation, or a periodic swishing sound, that makes it *more perceptible than a steady sound with the same magnitude* and most complaints about turbine noise tend to involve this quality in one way or another. This phenomenon is not continuous, however, and occurs sporadically and variably depending on atmospheric conditions or other factors. *If it happened all the time one might consider it to be similar in nature to a tonal or impulsive sound and apply a 5 dBA penalty* - but it does not happen all the time and the application of a 5 dBA factor (added to the predicted level, for example) would dramatically increase and probably overstate the apparent impact of this or most wind projects.
>
> Because it is difficult to deal with numerically, the Appendix N assessment discusses the issue verbally and frankly describes the nature of wind turbine noise in an effort to convey an idea of what might be expected. *No claim is made that absolutely no annoyance will result from this phenomenon*; however, amplitude modulation is largely universal at all similar wind projects and field tests of completed projects in New York and elsewhere indicate that complaints are few at the sound levels predicted for the Allegany project at the nearest homes. In other words, when the intermittently adverse character of wind turbine noise is combined with relatively high mean predicted sound levels of about 45 dBA or more complaints can be expected, but when the mean sound level is lower, particularly when it is lower than 40 dBA, adverse reaction is usually minimal. Levels of about 40 dBA or, in the vast majority of cases, less, are predicted at the

47 DEC letter to Everpower, dated April 30, 2010, reprinted at FEIS, Appendix N, Comment 1, p. 10. See also FEIS, Section 4.8, p. 5.

48 Minnesota Health Department, *Public Health Impacts of Wind Turbines*, p. 13.

> majority of homes (participating and non-participating) within the environs of the Project area.[49]

The first italicized statement acknowledges that the comment identifies a real problem. The second italicized statement acknowledges that "thumping" sounds from wind turbines will be annoying.

The FEIS response also acknowledges project noise as modeled will be perceptible on account of its pulsating character, and that atmospheric conditions can exacerbate or intensify this effect, particularly at night. Nevertheless, the FEIS relies on the 40 dBA numerical limit imposed by the Planning Board, which treats all noise the same regardless of quality.

5. Everpower failed to assess low frequency noise. The Town Board, by adopting the wind project provisions in its zoning ordinance, found that wind farms could have serious low frequency noise impacts. Accordingly, the ordinance *requires* a low frequency sound report prior to approval.[50]

Everpower's sound report asserts: "Modern wind turbines of the type proposed for this project do not generate low frequency . . . noise to any significant extent and no impact of any kind is expected from this."[51] Accordingly, no report on low frequency sound was provided. The Planning Board accepted this conclusion, and accepted the FEIS without any report on low frequency noise from this project, based on two studies by Everpower's consultant and one other study.[52]

In sharp contrast, the Minnesota Health Department's comprehensive survey of scientific literature on wind turbine noise complaints was focused on the question, whether low frequency noise is an important part of the problem. The Department concluded it is, and therefore an assessment of low frequency sound effects on residents should be provided prior to approval:

> The most problematic wind turbine noise is a broadband "whooshing" sound produced by interaction of turbine blades with the wind. Newer turbines have upwind rotor blades, minimizing low frequency "infrasound" (i.e., air pressure changes at frequencies below 20-100 Hz that are inaudible). However, the NRC notes that during quiet conditions at night, low frequency modulation of higher [that is, audible] frequency sounds, such as are produced by turbine blades, is possible. . . . the ear is sensitive to only a relatively narrow frequency range of air pressure changes: those between approximately 20 and 20,000 cycles per second

49 Id., pp. 5-6.

50 "The noise report shall include low frequency, infrasound, pure tone, and repetitive/impulsive sound." Zoning Ord. II, sec. 5.25(B)(h)(i). Everpower's failure to provide the required report was first raised as an issue in my comments to Bob Phillips, dated February 23, 2010, pp. 7-9 (FEIS, Appendix N, Comment 3, at PDF pages 104-106).

51 DEIS, Appendix N, sec. 3.6, p. 26. This part of the DEIS is incorporated into the FEIS without change.

52 Findings Statement, p. 35.

or Herz (Hz).[53]

. . . Rhythmic, low frequency pulsing of higher frequency noise (like the sound of an amplified heart beat) is one type of sound that can be caused by wind turbine blades under some conditions.[54]

The World Health Organization (WHO, 1999) suggests that A-weighting noise that has a large low frequency component is not a reliable assessment of loudness.[55]

Some people are more sensitive to low frequency noise. The difference, in dB, between soft (acceptable) and loud (annoying) noise is much less at low frequency (see Figure 4 audible range compression). Furthermore, during the daytime, and especially outdoors, annoying low frequency noise can be masked by high frequency noise.

The observation that "the noise was typically audible indoors and not outdoors" is not particularly intuitive. However, as noted in a previous section, low frequencies are not well attenuated when they pass through walls and windows. Higher frequencies (especially above 1000 Hz) can be efficiently attenuated by walls and windows. In addition, low frequency sounds may be amplified by resonance within rooms and halls of a building. Resonance is often characterized by a throbbing or a rumbling, which has also been associated with many low frequency noise complaints. . . . As reviewed in Leventhall (2003), a study of industrial exposure to low frequency noise found that fluctuations in total noise averaged over 0.5, 1.0 and 2.0 seconds correlated with annoyance (Holmberg et al., 1997). This association was noted elsewhere and led (Broner and Leventhall, 1983) to propose a 3dB "penalty" be added to evaluations of annoyance in cases where low frequency noise fluctuated.[56]

Kjellberg et al. (1997) looked at the ability of different full spectrum weighting schemes to predict annoyance caused by low frequency audio noise. They found that dB(A) is the worst predictor of annoyance of available scales. However, if 6 dB ("penalty") is added to dB(A) when dB(C) – dB(A) is greater than 15 dB, about 71% of the predictions of annoyance are correct. . . . The World Health Organization (WHO) recommends that if dB(C) is greater than 10 dB more than dB(A), the low frequency components of the noise may be important and should be evaluated separately. In addition, WHO says "[i]t should be noted that a large proportion of low-frequency components in noise may increase considerably the adverse effects on health." (WHO, 1999) . . . In their noise guidance, the WHO (1999) recommends 30 dB(A) as a limit for "a good night's sleep". However, they

53 Minnesota Health Department, *Public Health Impacts of Wind Turbines*, p. 6.
54 Id., p. 9.
55 Id., p. 11.
56 Id., p. 16.

> also suggest that guidance for noise with predominating low frequencies be less than 30 dB(A).[57]
>
> The most common complaint in various studies of wind turbine effects on people is annoyance or an impact on quality of life. Sleeplessness and headache are the most common health complaints and are highly correlated (but not perfectly correlated) with annoyance complaints. Complaints are more likely when turbines are visible or when shadow flicker occurs. Most available evidence suggests that reported health effects are related to audible low frequency noise. Complaints appear to rise with increasing outside noise levels above 35 dB(A). . . . Low frequency noise from a wind turbine is generally not easily perceived beyond 1⁄2 mile. However, if a turbine is subject to aerodynamic modulation because of shear caused by terrain (mountains, trees, buildings) or different wind conditions through the rotor plane, turbine noise may be heard at greater distances.[58]
>
> To assure informed decisions: . . . Isopleths for dB(C) - dB(A) greater than 10 dB should also be determined to evaluate the low frequency noise component.[59]

As is apparent from the excerpts above, low frequency sound is an important component of wind turbine noise, accounting for much of the complaints.[60] This conclusion should not be rejected in the absence of any report on this project's low frequency sound.

6. Generally accepted standards call for the use of L90 as a measure of ambient or background sound levels. In its comments on the DEIS, DEC approved the use of the L90 statistic for reporting the background sound level.[61] This is consistent with DEC guidelines, which state, "L(90) is often used to designate the background noise level."[62]

L90 is the sound level exceeded 90% of the time in a given measurement period, or the most quiet 10% of the time.[63] It reflects the quiet times between sporadic or temporary sounds, the residual background against which new and potentially intrusive noises will be heard. If background sound is measured during the day, L90 will be higher than if measured during the night.

Everpower began with the L90 measure but modified it upward, consistent with its wind

57 Id., pp. 21-22.
58 Id., p. 35.
59 Id., p. 36.
60 See also discussion of the use of A-weighted sound measurement to obscure low frequency components of wind turbine sound in the Everpower sound study, and showing that based on the raw data of wind turbine sound, "most of the sound energy for wind turbines is in the low frequency range." FEIS, Appendix N, Comment 3, at PDF pages 121-122.
61 See FEIS, Section 4.8, p. 1.
62 *Assessing and Mitigating Noise Impacts*, p. 12.
63 Id.

masking theory, using a "regression analysis" that calculates wind speed at near ground level based on wind speed at Everpower's met tower.[64] No generally accepted standards are referenced in the FEIS to support this procedure.

Both Dr. Schomer's and CTA's review of the Cape Vincent sound study criticize the upward modification of L90 and recommend that background be designated using the unmodified L90 results, in order to assess the impact of turbine operations at night.[65] CCCC's acoustic consultant agreed, and provided ANSI standards requiring the unmodified L90 to designate background sound level.[66]

7. DEC guidelines classify the expected noise level from the Everpower project as "intolerable." DEC classifies noise impacts by how much a project's noise exceeds the existing background sound level. According to the agency's guidelines, when project noise is 6 dBA above background, complaints can be expected. When project noise is 20 dBA or more above background, the noise will be experienced as "very noticeable to intolerable."[67]

The Town's consultant CRA measured background sound levels on Chipmonk Road and Hawthorne Lane using DEC's recommended L90 statistic, finding the levels at night are as low as 18.3 dBA.[68] Thus, even with all its flaws, the noise level modeled by Everpower (40 dBA) would increase nighttime sound levels by 21.7 dBA at that location.

DEC's standard of 6 dBA over ambient was noted in comments on the DEIS.[69] However, in the lengthy response to these comments in the FEIS there is no mention of the DEC standard; instead the response relies on the Planning Board's 40 dBA limit.[70] DEC's 6 dBA increase standard for avoiding community complaints was disregarded.

8. DEC guidelines call for a "worst case" noise assessment. The Planning Board tasked Everpower with modeling for a "worst case" condition, following standards set forth in the DEC guidelines.[71] DEC's comments on the project proposal emphasize the importance

64 See FEIS, Appendix K, p. 3. CRA recommended against using L90 to assess night time background sound levels at residential receptors. Instead, CRA reported background sound levels based on the overall average (Leq) of day and night sounds. See CRA Memorandum, Ambient Sound Level Assessment, Town of Allegany, New York (September 17, 2010), p. 7. This avoids assessing night time noise impacts.

65 These reviews were submitted with my May 26, 2001 letter to Bob Phillips.

66 See FEIS, Appendix N, Comment 4, attachment: Richard R. James, *A Report on Background (Ambient) Sound Levels at Selected Sensitive Receivers, Olean/Allegany, New York, April 22-23, 2010* (May 3, 2010). However, the ANSI standards attached to this report and submitted to the Planning Board are not included in the FEIS.

67 *Assessing and Mitigating Noise Impacts*, p. 15, Table B.This is consistent with a standard used by Everpower's acoustic consultant in another project in Ohio, L90 plus 5 dBA or overall 40 dBA. See FEIS, Appendix N, Comment 3, attachment at PDF page 111.

68 CRA, *Ambient Sound Level* Assessment, p. 7. This level was measured at 1:00 AM using L90. Two other locations resulted in L90 levels of 20.2 and 27.1 dBA, respectively.

69 FEIS, Section 4.8, p. 22.

70 See id., pp. 25-28.

71 "Calculations should be performed for each point of reception in all directions being careful to evaluate the worst case noise impact potential by considering activities at the point where they would be closest to a receptor." DEC, *Assessing and Mitigating Noise Impacts*, p. 20.

of a "short term worst case analysis" of noise impacts on residents.[72]

The "wind masking" theory, the use of a ground attenuation factor, the upward modification of the L90 statistic for background, and the rejection of any penalty to account for the annoyance of night time noise, low-frequency noise or pulsating noise each deviate from the worst case circumstance, wind farm operations during quiet nights with little or no wind-induced noise. When stable (calm) ground-level atmosphere exists, most commonly at night, a model based on elevated wind speeds does not predict how noise will be experienced by residents. Independent research shows that this condition will occur frequently during operations. Thus, the FEIS does not model for reasonable worst case conditions. As a result, the predicted noise levels for the Everpower project seriously underestimates the nature and level of noise for those near the project area.

The difference between Everpower's prediction and what can reasonably be expected is almost entirely due to Everpower's departure from ANSI standards or comparable procedures. Incorporating even a few of the generally accepted standards or procedures discussed above would show that project noise impacts will be experienced at times as intolerable. This has been the case at several wind farms sited in rural residential areas around the world (most wind farms are not sited in such areas), and has prompted acoustic scientists to insist on compliance with such standards or procedures.

Because Everpower has not complied with ANSI standards or comparable procedures, the Town Board should not accept as credible its prediction that project noise will be appropriate for the area.

72 FEIS, Appendix N, Comment 1, p. 10.