State of New Hampshire Site Evaluation Committee Docket 2012-01 Antrim Wind, LLC Final Brief Stoddard Conservation Commission

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The following is a summary of the Stoddard Conservations concerns and recommendations, regarding the proposed Antrim Wind Energy proposal for Tuttle Hill, Antrim, NH:

Salient Facts:

1. The town of Stoddard has 21,431 acres (63% of the town) in conservation land, which physically connects with over 40,000 acres of conservation lands in the abutting towns of Antrim, Hancock, Gilsum, Harrisville, Marlow, Gilsum, Washington, and Windsor. This remarkable regional land protection effort has involved six regional, state, and national land trusts and conservation organizations including the *Harris Center, NH Audubon, Society for the Protection of NH Forests, The Nature Conservancy, Sweet Water Trust, and Trust for Public Lands over a 30+ year span*;

2. The 1,700 acre Robb Reservoir, located in southeastern Stoddard along the Antrim/Stoddard town line (was the NH 2006 #1 Forest Legacy project in the state) abuts the proposed AWE site to the west;

3. The proposed AWE wind farm is a part of a 12,994 acre unfragmented forest block that the NH Fish & Game Department *Wildlife Action Plan* has classified as having the highest ranked wildlife and ecological habitat in the state; lies in the Quabbin to Cardigan corridor (a multi-state effort to protect lands that have high wildlife and conservation values); and has been identified in the Town of Antrim's Open Space Conservation Plan;

4. Many of the seasonal and year round residents of Stoddard choose to live here because of the scenic, undeveloped countryside that provides the green, scenic backdrop to their homes;

5. Allowing an industrial wind farm to be placed on Tuttle Hill ridge is inconsistent with the SEC statutory requirements under RSA 162-H:16

which states: " (c) Will not have an unreasonable adverse effect on aesthetics, historic sites, air and water quality, the natural environment, and public health and safety."

6. Tuttle Hill area is a marginal wind generation site, hence the proposed 500-ft of the wind towers.

7. The proposed conservation easements with four private landowners to protect 685 acres that is part of the AWE application is inadequate, as they do not preclude future residential development of the ridgeline along with ancillary forestry and agriculture buildings; they do not include the largest property on the ridge that is location of four of the 10 turbines; they do not protect against permanent fragmentation of the Willard-Tuttle ridge after the life of the project. (The 11th hour addition of an additional 123 acres, while an improvement, still does not offset the negative wildlife impacts, that this project poses).

8. The Stoddard conservation commission is comprised of 2 professional foresters and 1 high school science teacher, who collectively have over 90 years worth of applied natural resource experience. It is our opinion that the AWE project will result in habitat fragmentation that will negatively impact the conservation and habitat values of the land hosting the project, but also on the adjacent conservation lands, of which Stoddard is a key stakeholder. We do not agree with *and challenge* the Oct. 11, 2012 testimony of wildlife biologists Dana Valleau and Adam Gravel that the proposed AWE Industrial Wind Farm project "will not fragment the habitat of the 12,994 acre unfragmented forest, because the project will occupy a relatively small slice within a much larger landscape". It will have long-term negative impacts.

What the Scientists & Experts Tell Us:

If you are ecologically and environmentally literate, you see the damage everywhere. In lieu of comprehensive state and federal standards, this damage can only be lessened one land use decision at a time, by informed decision makers. Please consider what the experts are telling us:

Conversion of forestland to non-forest uses (fragmentation) and the ensuing loss of habitat has been identified as a major threat that needs to be addressed by preventing further loss through good planning and by finding alternative, less ecologically damaging sites. This alarm has been sounded by the following renowned individuals and organizations;

a. The NH Fish & Game Wildlife Action Plan identifies a strategy for "minimizing the human footprint on the state's natural habitats" and encourages land use decision makers throughout the state to protect these habitats through good planning and by finding alternative, less intrusive sites;

b. According to internationally renowned biologist and Pulitzer Prize author, Dr. E. O. Wilson (Harvard University professor for over 5 decades and author of more than twenty books), the greatest threat to life on planet earth comes from habitat fragmentation and invasive species invasions through human development;

c. The 1993 Society of American Foresters "Task Force Report on Sustaining Long-Term Forest Health & Productivity" identified the need to "maintain the biological and physical integrity of the forest" if they are to remain ecologically and economically viable;

d. Aldo Leopold, forester, wildlife biologist, conservationist made the observation: "What avail are forty freedoms without a blank spot

on the map";

e. Henry David Thoreau said: "In wildness lies the preservation of the world".

The Stoddard CC Primary Recommendations:

The Stoddard conservation commission respectfully requests that the SEC deny the AWE permit to built an industrial wind farm on Tuttle Hill, for all of aforementioned and following reasons:

1. Allowing the wind farm to be permitted on this site will be in direct conflict with the requirements in 162-H:16, so the certificate should not be granted.

If natural resource professionals, land trusts, conservation organizations and state natural resource agencies do not heed the aforementioned warnings, and defend the conservation values of an important area like Tuttle Hill, WHO WILL?

2. The SEC is comprised of department heads and/or representatives from three state agencies: NH Fish & Game; NH Division of Forest & Lands; NH Division of Parks & Recreation, whose collective responsibility is to conserve, manage, and protect the states' natural resources. We challenge them to follow their own advice as outlined by the WAP and their respective agency's missions AND *defend the core wildlife habitat and conservation values of this large unfragmented forest block* ***by voting against this project.***

The Stoddard CC Alternative Recommendations:

If the SEC approves of the AWE permit to build the proposed wind farm, the Stoddard conservation commission respectfully requests the following:

- ✓ Remove towers 9 and 10 from the project;
- ✓ Strengthen the proposed conservation protection of this area by expanding the acreage under the proposed conservation easements, to include all of the landowners whose land this project will be sited on;
- ✓ Strengthen all proposed and ensuing conservations easements by prohibiting any development, residential or otherwise.

Threat to NH Scenic Values & Rural Values??

As the state tries to find alternative forms of renewable energy, the hills and ridgelines of NH will come under increasing pressure to host these facilities. While some folks might welcome wind farms on the scenic landscape of NH as forms of "kinetic art with values that far outweigh the visual impact" others will lament that it will leads to habitat fragmentation and an "aesthetic famine" in the state, that once touted "Scenic" on its license plates.

We implore the SEC and the state to adopt a strong set of siting guidelines that will help prioritize where these facilities will be located, without compromising or undermining the conservation and scenic values of this state.

The proposed May 29, 2007 Guidelines were a good start. They should be strengthened and adopted!

Respectfully submitted,

Geoffrey T. Jones
Stoddard Conservation Commission, chair

Addendum (submitted by Fred Ward, Stoddard)

Introduction

Antrim Wind Energy (AWE) has repeatedly stated that there will be some days when their wind farm will be operating with all the turbines producing energy (and noise), other days when none of them produce energy (or noise), and still others when only some are operating. But while the wind alone determines when they will spin, there are additional meteorological factors which determine their actual noise output, and how far their noise will be broadcast to neighbors. This means that these noise problems will change as the weather changes, with the "worst case" noise occurring only in very specific weather.

AWE installed a met tower on Tuttle Hill to measure the weather, but has never shown what specific "worst weather" will produce their "worst case". Lacking a specific determination of "worst weather", AWE cannot calculate how loud the noise will be when the "worst weather" occurs, nor how often it will occur. But there is an additional problem arising from this ignorance. Since the "worst weather" will only happen in very identifiable, and repeatable, weather situations, then the "worst case weather" will affect different neighbors differently, preferentially annoying some neighbors, but not others. Without knowing what kind of weather will produce the worst case, AWE cannot know which neighbors will be most affected, nor how often or how much they will be affected.

In addition, the AWE testimony about the difference in noise output depending on whether the blades are sited in front of, rather than behind, the hub also shows that the hub and structure "interfere" with the air flow past the blades, guaranteeing (no matter which position AWE chooses) that the noise from these turbines will NOT be broadcast in all directions equally. Any such preferentially directed noise effects will be added to the preferential effects of weather, increasing the preferential annoyance for specific neighbors.

The preferential, and repeatable, occurrence of "worst weather" suggests a likely explanation for the testimony that some neighbors around existing wind farms have many noise complaints, while others do not. AWE has never identified the "worst weather", nor even recognized why such an identification was important.

The wind rose presented in V-Bar report (4 September 2012, p 4) is just one example of the preferential occurrence of weather events. However, the diagram shows only that the turbines will produce noise most OFTEN with winds from the northwest. It does NOT show whether northwest winds will cause the turbines to produce the LOUDEST noises!

Noise Factors & their Simultaneity

The meteorological events which conspire to produce the "worst case" noise fall into two categories; those which magnify the noise generated at the turbine, and those which magnify and extend the area over which this noise is broadcast. The first set are the wind speed and the wind shear (the difference

in wind from the top to the bottom of the turbines), the second set are the wind direction and speed, the wind shear, the topography, and the atmospheric stability. The first set depends on the meteorology and topography close to the turbines. The higher the wind, the higher the wind shear, and the higher the turbulence, the more noise the turbines make. The second set depends on the meteorology and topography between the site and its neighbors, and determines how far and how loud the turbine noise will be broadcast.

The V-BAR report, page 5, states that the highest winds (at turbine height) occur at night. By contrast, a scan of the (low-level) wind data from surface weather stations published by USAF, ETAC, Worldwide Airfield Climatic Data, Volume VIII, Part 7, pp 404 & 414, March 1970 (Ex 1-3) confirms that such low-level winds are almost always lower at night. This necessarily leads to the conclusion that the wind shear, the difference between high-level and low-level winds, has to be highest at night also. This is hard evidence that the highest winds, and the highest wind shears occur together, guaranteeing that they will combine their effects to increase the noise from the turbines, and at night! Possible additional noise due to the effect of turbulence from the peculiar topography of Tuttle Hill, as mentioned in the V-Bar report, page 3, was passed over with little comment.

The next area of concern is whether the factors which conspire to broadcast this nighttime noise far and wide will also occur at the same time, at night, adding to the factors mentioned previously which produce the maximum noise. These broadcast factors are the atmospheric stability (the increase or decrease of temperature from the ground upward), the wind shear, and the wind speed. As noted above the wind shear and wind speed are highest at night, so their

contribution to the noise is felt in a second way. The atmospheric stability will determine whether the air over Tuttle Hill will "trap" sound near the ground, or let the noise disperse upward and outward. The air is considered "stable" (trapping mode) when the temperature at the ground is cold, and the temperature warms with altitude. Meteorology 101 teaches that the low-level atmosphere is generally stable at night.

THE CONCLUSION IS THAT THE MAXIMUM VALUES OF ALL THE METEOROLOGIGAL FACTORS WHICH DETERMINE THE NOISE OUTPUT FROM THE TURBINES, ***AND*** THE EXTENT TO WHICH THIS NOISE WILL BE BROADCAST TO ITS NEIGHBORS, ARE ALL HIGHEST AT THE SAME TIME, AT NIGHT. THIS SIMULTANEITY GUARANTEES THAT THE "WORST CASE" NOISE WILL BE AT NIGHT, AND WILL BE SUBSTANTIALLY IN EXCESS OF THE LEVELS PRESENTED BY AWE. COMPARE THIS WITH THE LOWEST AMBIENT NOISE, WHICH IS ALSO HAPPENS TO BE AT NIGHT!

Hurricane SANDY

Hurricane Sandy is instructive in how the simultaneity of occurrence between various meteorological and topographical factors can make a huge difference in effect! There were a number a meteorological (and other) factors which combined to enhance the destructive power of Sandy, the wind, the rain, the storm surge, the low pressure, high tides, etc., no one of which separately would have been particularly destructive. New York has had higher winds, in tornadoes, with limited destruction. It has had as low pressure and winds as high as those in Sandy, but with winds that did not blow onshore. It has had much heavier rain in thunderstorms, but with only minor flooding. It has also

had higher tides. But when these factors were combined in Sandy, the destruction was much greater that in any of these single prior events. In fact, Sandy's destruction exceeded the sum of the damages from all such events. Sandy came with winds that blew onshore, with a full moon to enhance the tides and storm surge, and onto a topography consisting of low lying, barrier islands. The massive destruction of Sandy resulted when these factors came together simultaneously**.** Storms like Sandy are rare, while the additive factors on Tuttle Hill that produce the "worst case" noise will be frequent, 2-3 nights each week, every week. We don't know precisely how often, and we won't know without the data, which AWE has not supplied.

Problems with the V-Bar Report

In addition to omitting the obvious calculation of the "worst case" noise levels, and the "worst affected" neighbors, there are a number of errors in the meteorology supplied by V-Bar. The following is a partial list, incomplete because AWE has refused to supply the actual data on which some of the V-Bar conclusions were based.

In the 4 September 2012 report by V-BAR, which the appellant used as its meteorological source, there is a section on page 2 titled "Long-term Wind Climate". In this section, V-BAR states that they selected the National Weather Service stations at Concord and Manchester airports for their "long-term reference points". They state that such "stations must have suitable correlation to the winds at the site in question". The Concord airport is at 339' above sea level, the Manchester airport is even further down river, and about 100' lower in elevation. Both are in the Merrimack River Valley. The project site is on an

exposed ridge, with the turbine heights above 2000'. The report by the Air Force Weather Service (referenced above) shows that Concord and Manchester airports have their lowest winds at night, while the V-Bar report says Tuttle Hill has its highest winds at night. Does this support the V-Bar statement (p2), that the winds at these valley stations "must have suitable correlation to the winds at the site"? Moreover, there are nearby weather stations at much higher elevations available, with the weather station in Jaffrey an obvious candidate. It is almost 1000' higher than the stations in Concord and Manchester, and half the distance from Tuttle Hill as these stations.

If AWE is also using these airport weather stations to fit AWE's assumption that the "prevailing" wind will be from the northwest, orthogonal to the Tuttle Hill ridge line, it should again be noted that Concord and Manchester airports are in the Merrimack River valley, while there are weather stations more representative of the elevation of Tuttle Hill. The three closest stations in the area, Mt. Washington in NH, and Worcester and Blue Hill in MA, do not show a prevailing wind from the NW. The prevailing wind on Mt. Washington is from the west, the prevailing wind at 1000' high Worcester airport varies from SW to WNW, and the prevailing wind on Blue Hill varies from southwest to northwest (Ex 4-7). All these exhibits are from NOAA, NCDC, Local Climatological Data Annual Summaries for 1995. All three of these higher level weather stations are on hills, and each hill is topographically different from the others, and from Tuttle Hill. How the special topographic features (and the particular placement of the met tower) on Tuttle Hill affect the prevailing wind are unknown.

An additional problem with the "Wind Power Rose" is shown in the V-Bar report (p4). It is for the wind at some unstated height above the ground. It's not

obvious what conclusion can be drawn from these data, especially in view of the fact that the V-Bar chart shows that the wind blows from the northwest only a fraction of the time, and there are no data to verify the speed of these northwest winds. The evidentiary value of a "prevailing wind" perpendicular to the line of turbines is not obvious.

There are also questions as to the quality and reliability of some of the appellant's meteorological data. There is a very interesting statement in the V-BAR document of 4 September 2012 regarding the Lidar wind data (used to "top off" the wind data from their meteorological tower). It states "We then extrapolate wind speeds up to the hub height of the wind turbine." The Glossary of Meteorology, the official word of the American Meteorological Society, defines "extrapolation" as "The extension of a relationship between two or more variables BEYOND the range covered by knowledge" (Ex 8,9). The Committee cannot know what other "extrapolations" "beyond the range covered by knowledge" have infected the meteorological information supplied by AWE, without access to the AWE data.

These uncertainties merely reinforce the conclusion that the data proffered by the appellant cannot be used to properly calculate either the "worst case" noise from their proposed turbines, or the extent to which this noise will be broadcast to their neighbors. AWE cannot claim that the turbine noise will be at acceptable levels for their neighbors. And V-Bar use of "extrapolated" data is inexcusable.

Problems with the O'Neal analysis

On Day 5, morning session, page 8, Mr. O'Neal testified to a number of meteorological and topographical issues. He noted that sound measurements were made at the site for a week in August (2012?) and 2 1/2 weeks in September and October (2011?). He remarked, page 9, about a low wind speed at the tower, without specifying whether any of the 3 1/2 weeks of sound measurements were taken under high wind speeds, the ones expected to broadcast ambient sound the farthest. Were these ambient noises louder or softer under specific weather conditions? AWE has, or should have, the weather data to test this very important effect, but refuses to reveal any results.

Mr. O'Neal also commented on the model he used to calculate noise, testifying that he "assumes a moderate ground-based temperature inversion for propagation purposes" (Day 4 PM p132), in other words an "average" stability. Since the worst case will never happen under "average" atmospheric stability, and AWE had the data to determine the "worst case" atmospheric stability (and how often such "worst cases" will likely occur), it is strange that he neglected to use AWE data in his model. Average data will always yield average results! Might a noise test, from a balloon at the height of the hub, on nights selected for their "worst case" atmospheric stability, be too difficult, considering that it would eliminate all the discussion of models and their limitations. If the met tower were collecting all the relevant data, and if these data were reasonably accurate, then it should be straightforward to put a noise source on a balloon, operating this source on nights when the atmospheric stability is optimum for the sound to carry, and measure the sound out in different directions and at different distances. All the meteorological and topographic effects would be

naturally included. Another very important factor, which seems to have been ignored to date, would be the effect of an iced-over snow cover, a not infrequent occurrence in this area. The reflection of sound from smooth ice might be the ultimate test. O'Neal also says he was conservative in not using summer vegetation. An interesting comment, considering that Antrim has 7 months without leaves on its trees.

Summary and Conclusions

A glance at the Word Indexes from these hearings shows that the "worst case" noise levels were the subject of many discussions. The reason for this emphasis was obvious, the "worst case" noise will determine whether these giants can live in harmony with their neighbors. Many models were discussed, and lots of meteorological data were presented, but these could never, and in fact did not, answer the question. Worse, they were never used to determine what the specific "worst weather event" produces the "worst case noise". Analysis of individual measurements from a met tower are required to determine which "worst weather event" produces the "worst case noise". The answer could never be gleaned from the data AWE has presented to date, because (as in Sandy) the cumulative effect of the various factors occurring at the same time was never analyzed. The evidence to date supports the conclusion their maximum values occur simultaneously. Their effects will interact, and the actual "worst case" noise will be magnified.

The V-Bar report and comparative analysis show that the highest winds and highest wind shears both occur at night, guaranteeing that the turbines will generate their maximum noise at night. Official meteorological data show that

the atmospheric stability is highest at night, and this stability, combined with the maximum wind shear which also occurs at night, guarantee that the noise from the turbines will be broadcast their maximum distance at night, at the same time as the maximum noise production. Adding all these (simultaneously occurring) factors to the well known observation that the ambient noise levels are lowest at night, one must conclude that there will be many nights on which neighbors will experience unusually high noise. Not every night, and not necessarily on the "average" night, but on many nights, all year round! Moreover, since the specific "worst weather" is likely to preferentially affect some neighbors much more than others, both the specific "worst weather" and the worst affected neighbors need to be identified, along with the frequency of such "worst weather".

The limited meteorological information supplied to date by AWE, does not, and cannot, answer the question of what "worst weather" will produce the "worst case" noise. Since much of the discussion during the hearings centered on just this question, and since this question still remains unanswered, the application is substantially incomplete. Hurricane Sandy is potent evidence that, when the effects at issue occur simultaneously, as in the present case, actual measurements are required in order to determine their cumulative impact. It seems that AWE is in the same position as FEMA prior to Sandy. AWE does not know WHO will be impacted by the noise of their turbines, to WHAT extent, or HOW often!

Hurricane Sandy should be an object lesson for all concerned!

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Exhibits: (Attached)

1-3. USAF, ETAC, Worldwide Airfield Climatic Data, Volume VIII, Part 7, pp 404 & 414, March 1970, day/night wind speeds, Concord & Manchester airports

4-7. NOAA, NCDC, Local Climatological Data Annual Summaries for 1995. Prevailing winds at Mt. Washington, Worcester and Blue Hill

8-9. American Meteorological Society, Glossary of Meteorology, 2000. Definition of “extrapolation”