Review of the Noble Environmental DEIS for Ellenburg, NY

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Abstract:

1) Benefits claimed for wind power are inflated by failure to use realistic, published capacity factors. No evidence is presented to support industry claims that production of wind-generated electricity lessens fossil fuel consumption.

2) The quality of the DEIS is superficial and presentation is deceptive. The avowed goal of the company which prepared the DEIS is fast permitting, not protection of environment or community.

3) Safety with regard to turbine fires, lightning strikes, and ice or blade throw is not adequately addressed.

4) Data on turbine stability in the presence of earthquakes is not presented. The DEIS preparers failed to note an earthquake of magnitude 5.1 which occurred 25 miles from the proposed project area in 2002 and caused $4 million worth of damage. Setback of 500 ft. from roads and 587 ft. from on-site buildings, as specified in the Ellenburg, Clinton, and Altona Wind Energy Facilities Ordinances, is not adequate to protect the public should one of these slender 400 ft. structures with 100 tons of equipment near the top fall over.

5) Noise standards adopted in the Ellenburg, Clinton, and Altona Wind Energy Facilities Ordinances do not comply with community noise standards promulgated by non-industry agencies such as the NYS DEC or the World Health Organization, and as such will not protect the public from the health impacts of excessive community noise. Noise modeling did not use up-to-date models of the known distant propagation of annoying noise from wind turbines under conditions of nighttime atmospheric stability. Noble Environmental's acoustics consultant is well aware of these models and was negligent in not requiring their use. While recognizing that wind turbines produce low-frequency noise, the acoustics consultant appears to be ignorant of the medical research literature on the brain, lung, and heart pathology caused by long-term exposure to noise at frequencies too low to be heard.

6) Shadow flicker produces symptoms of motion sickness in susceptible people and has the potential to trigger seizures in individuals with epilepsy.

7) Bird and bat studies are inadequate with regard to standards communicated by USFWS to Noble with regard to migratory birds, threatened and endangered species, and eagles. No population figures can be derived from the data obtained and presented in the DEIS. Multi-year studies were not performed. There is no adequate baseline created here by which to use this wind turbine installation to study the effects of wind turbines on bird and bat populations.

8) The non-avian wildlife section shows incompetence. As in (7), no population data is presented on which to base studies of the effects of wind power development on game species such as deer and bear.

9) It is not clear in the DEIS that appropriate state and federal (Army Corps of Engineers) oversight and permitting has taken place with regard to wetlands within the project areas. In fact it has not, according to the responsible Army Corps of Engineers official I spoke to on May 31, 2006, at which point review of the Clinton Project application was in the early stages and review of the Ellenburg and Altona Project applications not yet under way. Permits are required for all activities impinging on any wetland or stream connected ultimately to a navigable waterway. Federal review under the Fish and Wildlife Coordination Act and the National Historic Preservation Act are also required, triggered by projects falling under Army Corps of Engineers jurisdiction.

Introduction:

I am a graduate of Yale (BA 1977, Biology), Princeton (PhD 1985, Population Biology), and Johns Hopkins (MD, 1991). Population Biology is ecology, evolution, and animal behavior. I studied the behavior and ecology of Amazonian birds, spending two years in the field in South America forests. Besides this, I did a year-long (1985-6) post-doctoral fellowship in ornithology at the American Museum of Natural History, NYC. I have lived in this region (Franklin County) of NY State, where I practice behavioral and developmental pediatrics, for nine years. I am familiar with local ecology as well, as a physician, with health and safety issues.

It is "the intention of the Legislature that the protection and enhancement of the environment, human and community resources should be given appropriate weight with social and economic considerations in determining public policy, and that these factors be considered together in reaching decisions on proposed activities" (SEQRA 617.1 Authority, intent, and purpose.). The first issue to be considered here is thus whether there is sufficient social and economic gain anticipated from this project to make it worth the environmental impacts it will have.

SEQRA emphasizes the importance of cumulative impacts from simultaneous or subsequent projects in addition to the specific current project. Industrial wind generating installations are in the planning stages across northern New York State from Cape Vincent to Plattsburgh. The first wave of a large installation has already been built on the high ground east of Lake Ontario (Tug Hill Plateau, Lewis County). The current Noble Environmental applications represent only "Phase 1" in the locations of Ellenburg, Clinton, and Altona. Between Noble Environmental and Marble River, the two companies operating in Franklin and Clinton Counties, 800 or more turbines are currently proposed (data from applications to the New York Independent Systems Operator [NYISO]).[1] The cumulative viewpoint significantly alters how we view issues of land use, agricultural land preservation, community character, and impacts on wildlife. In the Noble Environmental DEIS's, the cumulative viewpoint is limited to their own current projects and

[1] www.nyiso.org. See "NYISO Interconnection Queue," under NYISO Planning, under the Services drop-down menu.

does not consider the wider problem of many hundreds of wind turbines spanning the length of the highlands above the St. Lawrence River Valley from Lake Ontario eastward. Moving further west, turbine installations are also in planning south of Lake Ontario and throughout rural upstate NY.

I will address first the issue of social and economic benefits, and then the following areas in which I have expertise and find Noble Environmental's assessment of environmental risks to be inadequate or faulty: creation of hazards to human health, noise levels, wildlife effects (including game animals and migratory birds), and wetlands.

1. Assertions about the project's public benefit

Noble Environmental makes assertions about the positive effects its product, wind-generated electricity, will have on reduction of emissions from other power plants (DEIS p. 4 and 1-16). These assertions are based on the stated assumption (p. 1-16) that this 81 MW windplant (54 turbines x 1.5 MW per turbine) will indeed deliver 81 MW of electric power to the power grid. This assumption is inflated and deliberately deceptive with regard to the project's public benefits. General Electric, the turbine manufacturer, in a report to the New York State Energy Research and Development Authority (NYSERDA) on March 4, 2005, stated, "Capacity factors of inland wind sites in New York are on the order of 30% of their rated capacity. Their effective capacities, however, are about 10% [of rated capacity], due to both the seasonal and daily patterns of the wind generation being largely 'out of phase' with the NYISO load patterns."[2] The erratic nature of wind and the impossibility of matching supply to demand with wind-generated power make it the least preferred power source for the Independent Systems Operator (New York State power grid), which does not want the proportion of wind-generated power to approach current goals of the NYS Renewable Portfolio Standard (25% for all renewable sources) because of grid stability issues and because the NYISO's need is for capacity (power generated at the specific time to match needs) not energy (power generated at other times) (testimony presented at the RPS Hearing of the Energy Committee of the NYS Assembly, March 7, 2006). NYSERDA further states that wind power can produce, at most, 1.7% of NY State's electricity needs.[3] Noble Environmental is aware of these limitations and writes with intent to deceive about proposed project benefits in the DEIS.

It would be possible to present actual data from existing wind turbine installations in New York State (Fenner, Wethersfield, and Tug Hill) on electricity generation and consumption and matching data on state power generation from other sources over the same and earlier time periods to see if, in fact, fossil fuel consumption is reduced by the presence of wind generation, and if so, by how much. Since wind generation is erratic, it would be useful to know which alternative sources (fossil fuel vs. nuclear vs. hydro) are dialed down when wind plants are producing. The strength of this analysis could be enhanced by similar information from the states of Vermont, Pennsylvania, and West Virginia, where there are also wind generation facilities in operation. Independent analysts have difficulty gaining access to these figures, perhaps because the data are not favorable to the wind industry.

2. General quality of the DEIS

[2] "The Effects of Integrating Wind Power on Transmission System Planning, Reliability, and Operations, Report on Phase 2: System Performance Evaluation," prepared for NYSERDA by GE Energy et al., March 4, 2005, p. 7.16. See also "The Effects of Integrating Wind Power on Transmission System Planning, Reliability, and Operations, Report on Phase 1: Preliminary Overall Reliability Assessment," prepared for NYSERDA by GE Energy et al., February 2, 2004. Both are posted on the NYSERDA website: www.nyserda.com

[3] Ibid.

The Noble Environmental DEIS is a document remarkably naïve of useful data. Data there is, or at least lists of information and tables of numbers which were measured in some way, but the measurements and numbers stop short of demonstrating anything meaningful, even when comparisons are made. Ecology and Environment, Inc. has created for Noble Environmental a soothing, pleasing, and mind-numbing document whose conclusions, section after section, are unsupported assertions of a most vague nature. Problems are masked by inadequate data gathering or presentation. There is no interest in realistic solutions even when problems are documented. The document relies heavily on the unspoken assumption that our presumption is that the project has no environmental impact. If this is the case, inadequate data leads us back to the conclusion that the project has no environmental impact, because the presumption, or null hypothesis as it is called in science, has not been disproven. In reality our presumption in requiring a study of environmental impact is that the impact is significant, and the burden of proof rests with Noble Environmental and its contractor, Ecology and Environment, to demonstrate that the project's environmental impact is sufficiently low relative to the social and economic benefits to be gained. If the data is inadequate or not pertinent to the problem at hand, then our presumption of significant environmental impact has not been disproven.

It is hardly surprising that the creators of this document lack commitment to a scientific approach or to environmental protection, however, given the website description of what Ecology and Environment offers its clients:

> "The right environmental permitting strategy can mean the difference between spinning assets and a multi-million dollar write-off. E & E provides strategic environmental permitting approaches to get you the permits you need ahead of schedule and with the operational flexibility you need. From site selection and planning through construction, startup and long-term compliance, E & E's nationwide team specializes in environmental consulting services. We get the approvals you need to get your project on-line ahead of the competition." (http://www.ene.com/services/power.asp)

This approach is not the intent of SEQRA.

The graphic of a wind turbine presented in several locations in the DEIS (Figure 1-3, for example) is deceptive because it does not represent rotor size accurately relative to the height of the tower. Hub height is marked as 80 m, while rotor diameter, marked as 77 m, is represented graphically by a diameter only 59% of what it should be to be proportional to the hub height. Thus the rotor, whose blade reaches essentially half-way down the tower (77 m being approximately equal to 80 m), is represented graphically as a little pinwheel in this diagram. Little jagged lines are added on either side of the tower base to further the illusion that the tower is even taller compared to the rotor size. This diagram is reproduced in the Avian Risk Assessment to misrepresent the rotor-swept area, a critical concept with regard to avian impacts.

3. Safety from lightning, fires, falling turbines, dislocated pieces of turbine, or ice throw.

In section 2.29.1 and 2.29.3, the DEIS fails to acknowledge that none of the fire departments it names has the capability to fight fires in turbine nacelles (generator and gear box) 265 ft. above the ground. Turbine nacelles contain significant amounts of lubricants and hydraulic fluids. Fires may be started by lightning or brake malfunction. A fire may leave wind turbine controls malfunctioning until the equipment in the nacelle is repaired or replaced, making it more susceptible to accidents.

The Ellenburg, Clinton, and Altona Wind Energy Facilities Ordinances allow wind turbines to be erected 500 ft. from roads, 587 ft. (1½ times the total height) from buildings or above-ground utilities, and 1000 ft. from off-site homes. None of these distances are safe with regard to projectiles thrown from spinning 126 ft. turbine blades 390 ft. in the air, such as ice or pieces of blade, which can travel over 1600 ft. In Germany in 2003, in high storm winds, brakes on a wind turbine failed and the blades spun out of control. A blade struck the tower and the entire nacelle flew off the tower. The blades and other parts landed as far as 1650 ft (0.31 mile) from the base of the tower.[4] This was an "upwind," three-bladed, industrial-sized turbines like those in the Project; "downwind" turbines have not been built since the 1980's. This distance is nearly identical to calculations of ice throw from turbines with 100 ft. blades rotating 20 times per minute (1680 ft) made by a Rutgers University physics professor.[5]

The "Health and Safety Plan" in section 2.29.2 and Appendix P is an exercise in vagueness and promise, without substance, as is "Fire Safety Planning" in 2.29.3. "Ice shed" in section 2.29.5 does not provide for adequate protection for cars driving past turbines 500 ft. away. "Generally," this paragraph reads, "ice buildup slows a turbine's rotation and will be sensed by the turbine's control system, causing the turbine to shut down" (DEIS p. 2-193). "Generally" is not good enough, nor is reliance on a mechanical system without the back-up of adequate setback. There are no plans or preventive measures for lightning strikes or other significant accidents. The most important preventive measure, adequate setback, has not been taken.

Both these considerations – the problems with fire-fighting and the possibilities for projectile throw – were raised with the Ellenburg Town Board before the Wind Energy Facilities Ordinance was passed. The board had the knowledge they needed to build safer setbacks into the ordinance but failed to do so.

Wind turbines themselves cause irregularities in the power supply as wind speed changes, including power surges as the wind gusts. Residents living near a new wind turbine installation in Meyersdale, PA, which came on line in December 2003, have had to replace stove elements and small appliances due to power surges which started at that time. Residents of Lincoln Township, WI, near a wind installation noticed an increase in lightning strikes in their area after the turbines went on-line in June 1999. Two computers protected by surge protectors and a TV set, all in different houses, were simultaneously "fried" one evening when lightning struck a nearby wind turbine tower.[6]

The DEIS does not discuss lightning precautions or data on lightning strikes from other installations. A search on the word "lightning" yields one hit, in Appendix P, with regard to performing a "risk analysis" and developing a safety plan sometime in the future. The time, however, is now, before permits are issued to allow construction.

4. Seismic activity

DEIS Section 2.1.3:
"According to the USGS, which maintains records extending back to 1638 [sic], two significant earthquake epicenters (magnitude 5.0 or greater) have been recorded in the region. The Project Site is located within a low to moderately active seismic region. One magnitude 5.8 quake occurred in the Massena, New York area in 1944 and one quake with magnitude between 5.0 and 5.9 occurred South of Montreal, Quebec in 1877. Both areas are located between 50 and 100 miles from the Project Site.

[4] See photos at http://www.pbase.com/wp/wind_turbine_photos.
[5] Personal communication, Prof. Terry Matilsky, Dept. of Physics and Astronomy, Rutgers Univ., Piscataway, NJ.
[6] Bittner-Mackin, E. 2003. "Excerpts from the final report of the Township of Lincoln Wind Turbine Moratorium Committee," 12-4-03.

However, no earthquake epicenters with a magnitude of 6.0 or greater have been recorded within 100 miles (U.S. Geological Survey 2006). In addition, no significant tectonic faults have been mapped in Clinton County, and there are no known active faults (i.e., younger than 1.6 million years) in this region (U.S. Geological Survey 2002)" (DEIS p. 2-2).

DEIS Section 2.2.3:
"As described in Section 2.1.3, the USGS states that one significant earthquake epicenter (magnitude 5.2) has been recorded within 50 miles of the Project Site and that the Project Site is not located within an active seismic region (U.S. Geological Survey2001). No significant tectonic faults have been mapped in Clinton County, and there are no known active faults (i.e., younger than 1.6 million years) in this region (U.S. Geological Survey2002)" (DEIS p. 2-7).

The DEIS preparers cannot even figure out what they themselves are saying in these two contradictory paragraphs and they did not do their homework.

An earthquake of magnitude 5.1 according to the USGS and 5.5 according to the Canadian Geological Survey with an epicenter 15 miles southwest of Plattsburgh occurred on April 20, 2002, at latitude 44.51 and longitude -73.66, 25 miles from the proposed project site. This earthquake was felt all over New York, New England (to Maine), and down to Maryland. Clinton and Essex Counties were declared federal disaster areas due to $4.06 million worth of damage to roads, buildings, and wells.[7]

Dr. Frank Revetta, professor of earth science and geophysics at SUNY Potsdam and director of the Potsdam Seismic Network, states, "There is an east-west trending gravity high north of the Adirondacks in northern New York [which] correlates with a belt of earthquakes of shallow depth (<18 km). This is the most seismically active area in New York State." [8]

Small quakes of less than magnitude 4 are frequent in the region, including a 3.3 earthquake in Plattsburgh on 5/24/02, two 3.0 earthquakes with epicenters close to that of the larger 4/02 earthquake on 6/25/02 and 12/25/02, a 3.5 earthquake centered in Owl's Head on 4/8/03, and a 2.5 earthquake 3 miles west of the village of Malone on 3/3/05. An earthquake with magnitude 3.7 (4.1 according to the Canadian Geological Survey) occurred on January 9, 2006, just north of the Canadian border 5 miles from the village of Churubusco, NY, the location of Noble Environmental's Clinton project, and 12 miles from the Ellenburg project and 15 miles from Altona. "There is a belt of earthquakes that extends from the Adirondacks into Western Quebec," Professor Revetta said to the Plattsburgh Press-Republican. "You can expect earthquakes there quite frequently."[9]

It is unclear whether Noble Environmental's omission of this publicly available information was accidental and careless or deliberate and deceptive, but with regard to public safety neither type of oversight is acceptable. The proposed wind turbines are nearly 400 ft. tall. They are slender columns of tubular steel with a 60-ton nacelle and hub of the 40-ton propeller at 265 ft. The DEIS contains no data on the stability of industrial wind turbines in the presence of earthquakes despite a significant quake occurring 25 miles from the Ellenburg project site four years ago and frequent smaller quakes as close as

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[7] Reports on North Country earthquakes from the archives of the *Plattsburgh Press-Republican*; "Northeast of US quivers in rare quake," *CNN.COM*, April 20, 2002; Angus McCusker & Frank A. Revetta, "Geographic information system as a research & teaching tool," Geological Society of America, *Abstracts with Programs* 37, no. 1 (March 15, 2005):58; "Earthquake rattles northern New York Saturday," *Clarkson Integrator*, May 14, 2002; Stephen Bartlett, "Minor earthquake shakes up the North Country," *Plattsburgh Press-Republican*, January 10, 2006.

[8] Presented March 15, 2005, at the 40th Annual Meeting of the Geological Society of America, Abstracts and Programs, vol. 37, no. 1, p. 58.

[9], [3] *Plattsburgh Press-Republican*, 1-10-06. The distances given from Chateaugay and Altona were triangulated to a unique point north of the international border and the distance to Churubusco and Ellenburg Center measured.

5 miles from project sites. A 500-587 ft. setback is not adequate to protect the public or leaseholders from harm should a structure of this weight, nearly 400 ft. tall, fall over. For reasons of public safety the setbacks specified in the Ellenburg, Clinton, and Altona Wind Energy Facilities Ordinances must be revised. Construction cannot be permitted under these conditions.

5. Noise and Noise-related Health Issues

The noise standards adopted in the Ellenburg, Clinton, and Altona Wind Energy Facilities Ordinances are wind turbine "industry standards." As such they make things easier on the operators of wind turbines by allowing more noise, but they do not comply with community noise standards promulgated by non-industry agencies such as the NYS DEC[10] or the World Health Organization.[11]

Compliance with NYS DEC noise standards (increasing the noise level no more than 6 dB over ambient) is anticipated to be almost non-existent near the Project: "Sound pressure increases of more than 6 dBA over existing conditions will occur at most residences within the vicinity of the Project" (DEIS p. 2-129). Though this information is included, it is discussed only with regard to the fact that legally there does not need to be compliance with this standard because NYS DEC is not the lead agency. There is no plan to mitigate these noise effects. This represents a significant alteration in noise levels judged by state agency (DEC) standards and a significant change in community character, quietness being an important part the community character which leads people to build and live in rural areas.

In Lincoln Township, WI, a University of Wisconsin survey of residents near a 22 turbine installation in 2001, 2 years after construction, documented that 44% of residents 800 ft to ¼ mile from the turbines found noise to be a problem in their households, 52% ¼ to ½ mile away, 32% ½ to 1 mile away, and 4% 1 to 2 miles away. Under certain conditions the turbines could be heard up to 2 miles away.[12] These numbers correspond well to measurements made by Dr. GP van den Berg of the University of Groningen in the Netherlands near a more recent 30 MW, 17 turbine installation on the Dutch-German border, where residents living 500 m (1640 ft, or 0.31 mile) and more from the turbines were reacting strongly to the noise, and residents up to 1900 m (1.2 miles) away expressed annoyance.[13]

In a 2005 survey of 200 adult residents within ¾ mile of the French St. Crepin Windfarm, 83% responded. Of these, 27% considered the noise to be intolerable at night, 58% considered the noise to be disturbing, and 10% considered the noise to be disturbing by day. This is only a 6 turbine, 9 MW installation.[14]

Dr. van den Berg has now published his research as a book (his dissertation) which is available on-line at http://dissertations.ub.rug.nl/faculties/science/2006/g.p.van.den.berg/; introductory and concluding chapters are reproduced in the accompanying material. His work focuses on figuring out why noise from

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[10] NYS DEC, 2001. *Assessing and Mitigating Noise Impacts*.

[11] World Health Organization, 1999. *Guidelines for Community Noise*. Ed. by Berglund B et al. Available at www.who.int/docstore/peh/noise/guidelines2.html

[12] Lincoln Township Wind Turbine Survey, Agricultural Resource Center, University of Wisconsin Extension/Cooperative Extension, May 16, 2001, by David E. Kabes & Crystal Smith. See tables at end of survey. See Bittner-Mackin, E. 2003. "Excerpts from the final report of the Township of Lincoln Wind Turbine Moratorium Committee," 12-4-03; Arlin Monfils, Supervisor, Lincoln Town Board, Letter dated 2-1-00 regarding the grim realities of the windpower project to his community.

[13] van den Berg, GP. 2004. "Effects of the wind profile at night on wind turbine sound." *Journal of Sound and Vibration*, 277:955-970.

[14] French St. Crepin windplant noise survey results (2005), personal communication from J-L Butre, Ventducobage, 11-5-05.

wind turbines carries so much farther than expected and on developing new acoustic models based on known properties of the atmosphere to improve the current poor accuracy of acoustic modeling in predicting how loudly and how far noise will carry from wind turbines. The introductory chapter provides an engaging, readable description of both the scientific and political aspects of the debate about wind turbine noise. Van den Berg's research also points to design features which could be incorporated into newer turbines which would both improve their capacity factors and reduce the annoying types of noise they make.[15]

The audible noise produced by wind turbines has a thumping, pulsing character, especially at night, when it is louder. The noise is louder at night because of the contrast between the still, cool air at ground level and the steady stream of wind at the level of the turbine hubs, known as a "stable atmosphere" in which there is little vertical movement of air.[16] This nighttime noise travels long distances. It has been documented to be disturbing to residents 1.2 miles away from wind turbines in regular rolling terrain,[17] and 1.5 miles away in Appalachian valleys.[18] Van den Berg documents how mountainous terrain can either lessen or increase the effect of a stable atmosphere in allowing sound to travel further.

At night, the WHO recommends, the level of continuous noise at the outside a dwelling should be 45 dB or less, and inside, 30 dB or less. The wind turbine noise at levels permitted by the Ellenburg, Clinton, and Altona Wind Energy Facilities Ordinances are in the range of decibel levels which disturb sleep, even if permitted noise levels are not surpassed. Higher levels of noise disturb sleep and produce a host of effects on health, well-being, and productivity.[19] These and other health effects of excessive community noise are documented in the WHO report with reference to scientific and medical literature. These include:

- For people to understand each other easily when talking, environmental noise levels should be 35 dB or less. For vulnerable groups (hearing impaired, elderly, children in the process of reading and language acquisition, foreign language speakers, and children with developmental disabilities) even lower background levels are needed. When noise interferes with speech comprehension, problems with concentration, fatigue, uncertainty, lack of self-confidence, irritation, misunderstandings, decreased work capacity, problems in human relations, and a number of stress reactions arise.[20]

- Effects of noise-induced sleep disturbance include fatigue, depressed mood or well-being, decreased performance, and increased use of sedatives or sleeping pills. Measured physiologic effects of noise during sleep are increased blood pressure and heart rate, changes in breathing pattern, and cardiac arrhythmias.[21] Certain types of nighttime noise are especially bothersome, including noise which has impulses rather than being continuous, noise combined with physical

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[15] van den Berg, GP. 2006. "The sound of high winds: The effect of atmospheric stability on wind turbine sound and microphone noise." PhD dissertation, University of Groningen, The Netherlands. http://irs.ub.rug.nl/ppn/294294104

[16] van den Berg, GP. 2005. "The beat is getting stronger: The effect of atmospheric stability on low frequency modulated sound of wind turbines." *Journal of Low Frequency Noise, Vibration, and Active Control*, 24(1):1-24.

[17] van den Berg, GP. 2004. "Effects of the wind profile at night on wind turbine sound." *Journal of Sound and Vibration* 277:955-970.

[18] Linda Cooper, Citizens for Responsible Windpower, "Activist shares wind power concerns," *The Pendleton Times*, March 3, 2005, p. 4.

[19] WHO, 1999. *Guidelines for Community Noise.*

[20] Ibid., pp. 42-44.

[21] Ibid., p. 44.

vibration, noise with low-frequency components,[22] and sources in environments with low ambient background noise.[23] Children, the elderly, and people with preexisting illnesses, especially depression, are especially vulnerable to sleep disturbance.

- Noise has an adverse effect on performance over and above its effects on speech comprehension. The most strongly affected cognitive areas are reading, attention, problem solving, and memory. Children in school are adversely affected by noise, and it is the uncontrollability of noise, rather than its intensity, which is most critical. The effort to tune out the noise comes at the price of increased levels of stress hormones and elevation of resting blood pressure. The adverse effects are larger in children with lower school achievement.[24]

- What is commonly referred to as noise "annoyance" is in fact a range of negative emotions, documented in people exposed to community noise, including anger, disappointment, dissatisfaction, withdrawal, helplessness, depression, anxiety, distraction, agitation, and exhaustion.[25] The percentage of highly annoyed people in a population starts to increase at 42 dB, and the percentage of moderately annoyed at 37 dB.[26]

Participants in noise studies are selected from the general population and are usually adults. Vulnerable groups of people are underrepresented in studies, and if included, would show stronger effects at lower levels of noise. Vulnerable groups include the elderly, people who are sick or have chronic medical conditions, people with depression or other forms of mental illness, babies and young children in general, children with developmental disabilities, children dealing with complex cognitive tasks such as reading acquisition, and people who are blind or hearing impaired. These people may be less able to cope with the impacts of noise exposure and at greater risk for harmful effects than is documented in studies. Attention needs to be paid to them when developing noise setbacks requirements.

There are additional symptoms reported by neighbors of industrial wind turbine installations. Amanda Harry, MD, a British physician, found near a 16-turbine installation in 2003 that 13 out of 14 people surveyed reported an increase in headaches, and 10 reported sleep problems and anxiety. Other symptoms included migraine, nausea, dizziness, palpitations, stress, and depression.[27] Dr. Harry's study is in preparation for publication.

Many individual accounts from across the world support the same set of symptoms (in submitted material and clinical interviews I have performed as part of a study in progress). Based on accounts and interviews, and in discussion with Dr. Harry, I have defined the Wind Turbine Syndrome, a complex of symptoms which start when local turbines go into operation and resolve when the turbines are off or when the person is out of the area. The symptoms include:

- Sleep problems: audible noise or physical sensations of pulsation or pressure make it hard to go to sleep and cause frequent awakening.

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[22] Waye. 2004. "Effects of low frequency noise on sleep." *Noise & Health* 6, no. 23:87-91; Waye et al. 2003. "A descriptive cross-sectional study of annoyance from low frequency noise installations in an urban environment." *Noise & Health* 5, no. 20:35-46; Waye et al. 2001. "Low frequency noise pollution interferes with performance." *Noise & Health* 4, no. 13:33-49; Berglund et al. 1996. "Sources and effects of low-frequency noise." *Journal of the Acoustical Society of America* 99, no. 5:2985-3002.

[23] WHO, 1999. *Guidelines for Community Noise*, p. 46

[24] Ibid., pp. 49-50

[25] Ibid., p. 50

[26] Ibid., p. 51

[27] Milner, C. 2004. "Wind farms make people sick who live up to a mile away." *Sunday Telegraph*, 1-25-04; and personal communication from Dr. Harry.

- Headaches which are increased in frequency or severity.
- Dizziness, unsteadiness, and nausea.
- Exhaustion, anxiety, anger, irritability, and depression.
- Problems with concentration and learning.
- Tinnitus (ringing in the ears).

Not everyone near turbines has these symptoms. This does not mean people are making them up; it means there are differences among people in susceptibility. These differences are known as risk factors. Defining risk factors and the proportion of people who get symptoms is the role of epidemiologic studies, which are in progress.

Chronic sleep disturbance is the most common symptom. Exhaustion, mood problems, and problems with concentration and learning are natural outcomes of poor sleep.

Sensitivity to low frequency noise is a potential risk factor. Some people sense low-frequency noise as pressure in the ears rather than heard as sound, or experience a feeling or vibration in the chest or throat.[28] Neighbors of industrial wind turbines describe the distressing sensation of having to breathe in sync with a rhythmic pulsation from the turbines which is not necessarily audible, especially at night when trying to sleep.[29]

Preexisting migraine disorder is emerging as a risk factor for sensitivity to Wind Turbine Syndrome. Migraine is not just a bad headache, but rather a complex neurologic phenomenon that affects the visual, hearing, and balance systems and at times motor control and consciousness itself. Many people with migraine have increased sensitivity to noise and to motion – they get carsick as youngsters, seasick, or very sick on carnival rides. Migraine-associated vertigo (which is the spinning type of dizziness, often with nausea) is a described medical entity. Migraine occurs in 12% of Americans. It is a common, familial, inherited condition.

To keep our balance and feel steady in space, we use three types of input: from our eyes, from stretch receptors in joints and muscles, and from balance organs in the inner ear. At least two of these systems have to be working, and agreeing, to maintain balance. If the systems don't agree, as in seasickness or vertigo, one feels both ill and unsteady. Wind turbines impinge on this system via the visual disturbance

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[28] Moller, H, and CS Pedersen. 2004. "Hearing at low and infrasonic frequencies." *Noise & Health* 6 (23):37-57.

[29] See, for example, Ian McCausland, "Factual information about wind turbine noise," Report on wind turbine noise filed by residents of Upper Lachlan, Australia, August 9, 2005; Karen Ervin, Letter to Calvin Luther Martin, March 2, 2005; Rodger Hutzell, Jr., Letter describing wind turbine noise, February 13, 2005; David E. Kabes & Crystal Smith, "Comments on Noise," and "Comments on Health," and "Comments on Shadow Flicker," and "Comments on Sleeplessness," Lincoln Township Wind Turbine Survey, University of Wisconsin Extension/Cooperative Extension, May 15, 2001; Linda Cooper, "Activist shares wind power concerns," *Pendleton Times (Franklin, W. Va.*), March 3, 2005, p. 4; Misty Edgecomb, "'Whoosh' spells uneasy progress: Many say wind … turbines are noise, nuisance," *Democrat & Chronicle (NY)*, December 4, 2005; Pam Foringer, "Our Fenner wind farm story," *Malone Telegram*, Autumn 2004; "Neighbors complain of wind farm nuisances," *Albuquerque Tribune*, April 28, 2006; Seth Robson, "Noisy turbine annoys neighbours," *Stuff.CO.NZ*, August 11, 2003; Nick Churchouse, "Manawatu residents say they are being 'driven stupid' by the sound," *Dominion Post (NZ*), November 16, 2005; "Flurry of complaints after wind change," *TVNZ.CO. NZ*, July 24, 2005; David Brierley, Letter to the editor, *Plattsburgh Press Republican*, November 1, 2004; Tom Venesky, "Waymart facility troubles residents," *ZWIRE.COM (PA)*, May 16, 2005; Gwen Burkhardt, "Wind farm illness," *Western Mail (UK)*, June 6, 2005; Kathy Webb, "And the beat goes on … and on and on," *Hawke's Bay Today (NZ)*, February 18, 2006; "Wind turbine meeting," *Newsquest Media Group Newspapers (UK*), July 27, 2005; Eleanor Tillinghast, "The dark side of wind power," *Malone Telegram*, February 12, 2005; Donald F. Goetz, "Promises gone with wind," *Scranton Times Tribune (PA)*, February 7, 2004.

of the moving blades and shadows, and, I hypothesize, by low-frequency air pressure waves impinging on the balance organs of the inner ear.

Older people are may also be at increased risk for effects because of age-related problems with the function of the inner ear or the nerves and parts of the brain which receive signals from the inner ear. Many healthy people age 57 to 91 have such problems: 5% have chronic dizziness, and 24% tinnitus (ringing in the ears).[30] Older people often sleep less soundly and are more likely to have their sleep disturbed by noise.

People with a previous history of noise-induced hearing loss may also be at risk for effects since, when people damage their hearing through too much exposure to loud machine noise or music, the balance organs in the inner ear may also be damaged. This damage accounts for the Tullio phenomenon, in which exposure to a loud noise causes loss of balance in people with noise-induced hearing loss.

Dizziness (specifically vertigo) and anxiety are neurologically linked phenomena,[31] so the anxiety and depression seen in association with other symptoms near wind installations are not necessarily an emotional response to symptoms, but may be a neurologically linked response to the balance disturbances themselves. Sleep deprivation also causes anxiety and depression.

I estimate the proportion of the population likely to be susceptible to the symptoms of Wind Turbine Syndrome to be in the range of 20-30%, including the 12% of the American population with migraine disorder, older people with age-related problems with inner ear function, children with disabilities (especially autism spectrum disorders, of which a common attribute is auditory oversensitivity and scrambling of incoming auditory signals), and some proportion of people with noise-induced hearing loss.

Industrial wind turbines produce low-frequency as well as audible noise. Dr. Oguz Soysal, Professor and Chairman of the Dept. of Physics and Engineering at Frostburg State University in Maryland, measured sound levels over half a mile away from the 20 turbine wind farm in Meyersdale, PA, in 2005. Audible (A-weighted) dB (decibel) levels were in the 50-60 range, and audible plus low-frequency (C-weighted) dB were in the 65-70 range.[32] A difference of 10 dB between A and C weighting represents a significant amount of low-frequency noise by World Health Organization standards.[33] Dr. van den Berg measured wind turbine sound spectra 750 m (0.47 mile) from a 17 turbine installation in 2002. His graphs reveal dB levels averaging 68-90 dB in the frequency range less than 10 Hz, and over 60 dB in the 10-100 Hz frequency range.[34] Van den Berg states in his dissertation, "I agreed with delegate Jørgen Jakobsen, who presented a paper on low frequency wind turbine noise [Jakobsen 2004], that **even though wind turbines did produce an appreciable amount of infrasound**, the level was so far below the average human hearing threshold that it could not be a large scale problem"[35] (emphasis added).

Dr. van den Berg shares the perception common in both the medical and acoustic fields that if you can't hear a noise, it can't affect you, but the world's leading researchers in the health effects of low-frequency

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[30] Sataloff, J, et al. 1987. "Tinnitus and vertigo in healthy senior citizens without a history of noise exposure." *American Journal of Otolaryngology* 8:87-89.

[31] Balaban, CD, and JF Thayer. 2001. "Neurological bases for balance-anxiety links." *Journal of Anxiety Disorders* 15:53-79; Furman & Jacob. 2001. "A clinical taxonomy of dizziness and anxiety in the otoneurological setting." *Journal of Anxiety Disorders* 15:9-26.

[32] Soysal, OA. 2005. "Acoustic noise generated by wind turbines." Presented to the Lycoming County, PA, Zoning Board 12-14-05. osoysal@frostburg.edu

[33] WHO, 1999. *Guidelines for Community Noise.*

[34] van den Berg, GP. 2004. "Do wind turbines produce significant low frequency sound levels?" 11th International meeting on low frequency noise & vibration and its control, Maastricht, The Netherlands, 30 August to 1 September.

[35] van den Berg, GP. 2006. "Sound of high winds," p. 4-5.

noise exposure, Nuno Castello Branco, MD (Head of the Scientific Board, Center for Human Performance, Alverca, Portugal, and Principal Investigator for the Vibroacoustic Disease Project supported by the Portuguese Ministry of Science and Technology) and Mariana Alvez-Pereira (a biomedical engineer at the New University of Lisbon) do not agree.

This international research group, centered in Portugal and including physicians from Poland, Russia, and the United States, has published extensively on the effects of low-frequency noise on parts of the body other than the ears, particularly on the cardiovascular, pulmonary, and neurologic systems.[36] The research, ongoing since the late 1980's, includes clinical, pathological, and experimental (animal model) investigations. The entity these physicians and PhD's describe, called Vibroacoustic Disease (VAD), includes fibrosis (laying down of additional fibrous thickening in the form of collagen) in the cardiovascular and pulmonary systems and seizures and cognitive changes in the brain. The disease is caused by long-term exposure to low-frequency noise (less than 500 Hz), most of which cannot be heard.

Just as we cannot detect X rays (because our eyes are not sensitive to this frequency) yet can be harmed by them, so we can be harmed by non-audible noise (pressure waves in the air), though our ears are not sensitive to them. The mechanism of this harm is the differing resonance frequencies of different parts of the human body, especially the chest and skull. Air pressure (sound) waves of certain wavelengths resonate inside these walled spaces, setting up vibrations to which the body responds by reinforcing its softer tissues with extra collagen, causing such problems as thickening of the pericardium (membrane inside which the heart beats) and cardiac valves, fibrosis of the lungs, and proliferation of glial (supporting) cells in the brain.

Vibroacoustic disease has been studied mostly in aviation workers (including pilots, flight attendants, and technicians) but is also found in other industries and community settings. One of the researchers, Mariana Alves-Pereira, a biomedical engineer, has recently compared the noise spectrum of an environment known to predispose occupants to VAD – the cockpit of a commercial jetliner – to the noise spectra of other common community settings. She finds that a variety of community settings have the low-frequency noise potential for causing VAD. She has examined noise measurements of industrial wind turbines provided to her by Amanda Harry, MD, and her collaborating acoustician, Dr. Manley in England and found the low frequency noise intensities to be in the range which can cause VAD, especially given prolonged in-home and overnight exposures. Alves-Pereira has also examined graphs of wind turbine sound pressure levels vs. frequency measured by van den Berg and considers the noise intensities at the lower frequencies to be concerning with regard to their potential for causing VAD. She is aware of the symptomatology of the d'Entremont family in Pubnico, Nova Scotia, who had to move out of their home 1000 ft. from a wind turbine, and notes the similarity of their symptoms to those of people with pathologically proven VAD. Part of our research in progress is to provide Alves-Pereira with additional wind turbine noise measurements.

Alves-Pereira has helped clarify how neighbors and town governments should be handling noise measurements related to wind turbines. An A-weighted decibel measurement misses all the low-frequency noise, since A weighting is designed to mimic the frequency response pattern of the human ear and screens out low-frequency noise. Rather than a single measurement of loudness, noise needs to be characterized by measurement of linear (unweighted) decibel levels in 1/3 octave bands across the sound

[36] Papers submitted are a selection from many: Branco M, and M Alves-Pereira. 2004. "Vibroacoustic disease." *Noise and Health* 6 (23):3-20; Alves-Pereira M. 1999. "Noise-induced extra-aural pathology: A review and commentary." *Aviation, Space, and Environmental Medicine* 70 (3 Pt 2):A7-21; Martinho Pimenta AJ et al. 1999. "Balance disturbances in individuals with vibroacoustic disease." *Aviation, Space, and Environmental Medicine* 70, no. 3, section II:A96-99; Marciniak W, et al. 1999. "Echocardiographic evaluation of 485 aeronautical workers exposed to different noise environments." *Aviation, Space, and Environmental Medicine* 70 (3 Pt 2):A46-53.

frequency spectrum. Measurements should be taken inside homes, since the longer wavelengths in low-frequency noise resonate within rooms, magnifying their loudness relative to the outside. Low frequency noise also comes through walls with less attenuation than the 15 dB decrease assumed for audible noise.

Noble Environmental's analysis of noise impacts in this DEIS was technically inadequate with regard to current knowledge. Specifically:

- Ambient noise levels were not measured (Appendix H, Section 3.4, p. 3-3). Assumed rural background noise levels are too high, especially for nighttime, the critical time for noise.
- Sound intensity decreases with distance in complex ways depending on the frequency of the sound (low-frequency sound carries further and passes obstructions with less attenuation), the stability of the atmosphere (turbine noise carries further in a stable atmosphere as occurs at night), and the presence of reflective surfaces (increased propagation across open or frozen lakes or in the presence of a temperature inversion providing a reflective atmospheric layer). The discussion of sound propagation on p. 3-3 of Appendix H is oversimplified and allows for underestimation of the distances to which turbine noise is predicted to be propagated.
- Modeling of sound transmission did not look at the worst case scenario of the nighttime stable atmosphere, and thus underestimated the amount of noise likely to occur at various distances from the turbine installation at night, the critical time in terms of disturbance and health effects. Dr. Leventhall, the project acoustics consultant, is aware of these more accurate models of sound propagation from wind turbines but did not require them to be used in the modeling, showing negligence in his function as a technical consultant.
- The statement on p. 3-10, "Nor would use of alternative equipment further reduce sound levels," may apply to equipment which can be purchased right now but not to equipment which may be designed in the near future to vary blade pitch during rotation as recommended by van den Berg to reduce or eliminate the nighttime thumping which develops in stable atmosphere.[37] There is a rush to build because the developer stands to make a lot of money, while from the point of view of community sustainability of this type of development it would make sense to wait a few years until equipment which solves the nighttime noise problem is available.
- The measurement of wind turbine noise at Fenner Wind Farm to screen for low frequency noise occurred over a 17 minute period during the day, though van den Berg points out that to eliminate the interference of wind blowing on the microphone (which can confuse the issue of whether there is low frequency noise) it is better to measure at night under conditions of atmospheric stability (little to no wind at ground level, substantial wind at turbine hub height).
- The acoustic weighting network (or lack of a weighting network) used for the Fenner noise sample was not specified.
- Dr. Leventhall, the Project consultant, dismisses the low-frequency noise documented in this measurement [note rise in dB level on the left, low-frequency sides of the graphs] as irrelevant for two reasons: 1) Interference with microphone noise, and 2) below range of human hearing. Point (1) could be corrected by measuring at another time of day/atmospheric condition, and (2) is contradicted by the research on vibroacoustic disease. Dr. Leventhall does not go so far as to say that there is no low-frequency noise, just that it is "not unusual," in which he is accurate. Wind turbines in general produce low-frequency noise,[38] which is a problem elsewhere and is likely to be a problem here, too.

In summary, this Project has substantial potential for adverse noise effects on neighboring residents for which adequate studies have not been performed nor realistic mitigation proposed. Noise impact analysis

[37] van den Berg, GP. 2006. "Sound of high winds."
[38] Ibid., p. 4-5

was performed in a superficial fashion ignoring current knowledge so as to bias results in favor of the developers. Realistic mitigation with current technology means adequate setback. The Academy of Medicine of France has recommended a 1.5 km (0.96 mile) setback because of noise and health issues;[39] ours should be at least this. Delaying the Project until the technology is available for varying of blade pitch to increase capacity factor and decrease noise would also be appropriate.

6. Shadow flicker

When turning with the sun behind them, turbine blades cast moving shadows across the landscape and houses, creating as a strobe effect within houses which can be difficult to block out. Some people lose their balance or become nauseated when they see the movement of shadows or the movement of the huge blades themselves. As with car or sea sickness, such symptoms occur when the three organs of position and movement perception (the inner ear, eyes, and stretch receptors in muscles and joints) do not agree with each other: the eyes perceive movement while the ears and stretch receptors do not. People with a personal or family history of migraine, or migraine-associated phenomena such as car sickness or vertigo, are more susceptible to these effects. The strobe effect also has the potential, like other flashing lights, to trigger seizures in people with epilepsy.

In Lincoln Township, WI, two years after installation of 22 industrial wind turbines, 33% of residents 800 ft to ¼ mile from the turbines found shadows from the blades to be a problem, 40% ¼ to ½ mile away, 18% ½ to 1 mile away, and 3% 1 to 2 miles away.[40]

Seventy-one houses will be subjected to shadow flicker from the Ellenburg Project (DEIS p. 2-115). No mitigation measures were proposed, but rather indefinitely deferred: "Site-specific mitigation will be proposed for residences where turbine shadow impacts are predicted." (DEIS p. 2-117) The only realistic form of mitigation is setback, which is inadequate under Ellenburg municipal law. From the Lincoln Township data, setback of at least one mile is needed.

7. Birds and bats

The federal government is concerned enough about the potential wildlife mortality due to wide scale development of wind turbines that the GAO (Government Accountability Office) issued a lengthy report in September 2005[41] and the National Academy of Sciences commissioned a 20-month study whose period does not end until December 2006:

> "The National Academies will establish an expert committee of approximately 14 members to carry out a scientific study of the environmental impacts of wind-energy projects, focusing on the Mid-Atlantic Highlands as a case example. The study will consider adverse and beneficial effects, including impacts on landscapes, viewsheds, wildlife, habitats, water resources, air pollution, greenhouse gases, materials-acquisition costs, and other impacts. Using information from wind-

[39] Chouard, Claude-Henri. 2006. <<Le retentissement du fonctionnement des eoliennes sur la sante de l'homme>> ("The repercussions of wind turbine functioning on human health"), Academie Nationale de Medicine (French National Academy of Medicine).

[40] Lincoln Township Wind Turbine Survey, Agricultural Resource Center, University of Wisconsin Extension/Cooperative Extension, May 16, 2001, by David E. Kabes & Crystal Smith. See tables at end of survey. See also Arlin Monfils, Supervisor, Lincoln Town Board, Letter dated 2-1-00 regarding the grim realities of the windpower project to his community.

[41] GAO, September 2005. "Wind power: Impacts on wildlife and government responsibilities for regulating development and protecting wildlife." http://www.gao.gov/new.items/d05906.pdf

> power projects proposed or in place in the Mid-Atlantic Highlands and other regions as appropriate, the committee will develop an analytical framework for evaluating those effects that can inform siting decisions for wind energy projects. The study also will identify major areas of research and development needed to better understand the environmental impacts of wind-energy projects and reduce or mitigate negative environmental effects. The approximate starting date for the project is April 21, 2005. A pre-publication report will be issued at the end of the project in December, 2006."[42]

I refer below to a letter to Patrick McCarthy at Ecology and Environment from David Stilwell, Field Supervisor, US Fish & Wildlife Service, dated May 13, 2005.[43] This letter is appended to the Environmental Assessment Form on the Noble Environmental website at:
http://www.noblepower.com/our-projects/ellenburg/documents/NEPEburgSEQR-EAF.pdf
Since Noble Environmental locked its website against copying or printing (despite their avowed commitment to "transparency"), the attached reproduction is reduced in size and blurred but still legible. The original may be viewed on the website.

Under *Recommendations* in the above letter (Stilwell to McCarthy, 5-13-05), the USFWS states, "Pre-construction studies of bats for this location are recommended. These studies should be of sufficient rigor to determine the temporal and spatial distribution of resident and migrating bat and bird species in and adjacent to the project area during various weather conditions (e.g. fog, rain, low cloud ceilings, clear skies, etc.)." Further, "In order to determine the potential collision-hazard for a particular site, and to account for annual variability, the spatial and temporal uses of the project airspace by birds and bats need to be defined during a multi-year period. This can best be accomplished by using remote sensing technology (radar, acoustic, and infrared) to collect data in various spatial and temporal scales (day and night, season to season, and year to year). Traditional sampling protocols (e.g. visual observation and/or mist netting) may be appropriate to supplement the remote sensing work and would likely be necessary to ground truth the data for individual species. Survey techniques are currently evolving and the project sponsor should work closely with this office and the New York State Department of Environmental Conservation (NYSDEC) to develop a draft study design prior to conducting any studies. Survey results should also be submitted to us for review and comment, along with proposed project-specific avoidance and minimization methods to reduce the risk of bat and bird mortality."

Multi-year studies were not done. Results have not been submitted to USFWS for review, or if they have, USFWS comments have not been included with the DEIS. Of note, too, is that David Stilwell, Field Supervisor, USFWS, who wrote the above-reference letter to Noble Environmental, strongly criticized the Avian Risk Assessment (ARA) created by the same environmental consultants, Ecology and Environment, Inc., of Lancaster, NY, for the Chautauqua Wind Project in Chautauqua, NY.[44] Many of the critiques leveled at the Chautauqua ARA apply to the ARA in the DEIS for Ellenburg, Clinton, and Altona. These include the need for multi-year studies of bird and bat migration (because of the variability in migration timing and location with wind and weather patterns, variability noted within years and year to year), the limitations of mobile radar in detecting small migrating birds and bats, and the role in observer effort in getting realistic information even about the presence of particular species, especially the more critical rare species. As for Chautauqua, there is no data in the ARA for Ellenburg, Clinton, and

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[42] National Academy of Sciences, "Environmental impacts of wind energy projects." Division of Earth and Life Studies, Board on Environmental Studies & Toxicology.
http://www8.nationalacademies.org/cp/projectview.aspx?key=BEST-K-05-01-A

[43] David Stilwell, USFWS Field Supervisor, Letter to Patrick McCarthy dated 5-13-05.

[44] David Stilwell (signatory) and Timothy Sullivan (biologist), October 12, 2005, "Comments on our review of 2004 Avian Risk Assessment Report. Chautauqua Wind Project."

Altona which pertains to population densities or numbers, yet this is the critical information to have if we are going to be able to assess, in future, the effects of large-scale industrial wind power development on bird and bat populations.

I contacted Timothy Sullivan, the biologist at USFWS in Cortland, NY, (607-753-9334) responsible for the Noble projects in Clinton County, on May 30, 2006. He would like to review the ARA for Ellenburg, Clinton, and Altona as his supervisor, David Stilwell, indicated in his letter of May 13, 2005 would be appropriate, but has not had the time to do this given other responsibilities and the many wind projects under development in NYS. The intensity of development right now, in other words, is undermining our governmental oversight procedures. As I am, he is concerned that the cumulative effect of multiple industrial wind power installations in or just above the St. Lawrence River Valley will have a negative impact on migratory birds of a variety of types. Passerine or songbirds are in a general state of population decline related to the cumulative effects of many insults, including habitat destruction, fragmentation, and loss of quality, impacts with buildings, cell towers, power lines, and other tall objects; and cats and cowbirds (predator accessibility related to habitat fragmentation).

With regard to birds, sensitive species in or near the project area include the Bald Eagle (threatened in NYS), Northern Harrier (a large open-country hawk, threatened in NYS), Pied-Billed Grebe (a small waterfowl, threatened in NYS), Sedge Wren (a wetland species, threatened in NYS), Bicknell's Thrush (a rare eastern thrush, imperiled in NYS), and Common Loon (vulnerable in NYS). Other birds common to our area and on the NYS "Species of special concern" list are Cooper's and Sharp-shinned hawks, Northern Goshawk, Osprey, and American Bittern.

The DEIS description of where Snow Geese occur is inaccurate. Snow Geese use farmlands at least as far west as Malone and east to Lake Champlain in a broad front which is expanding year by year. In fact, we are located in the only flyway (and stop-over, for replenishing energy reserves) of the Greater Snow Goose in the world.[45] Snow geese spend the month of November and most of December here; Canada Geese arrive earlier and disappear about the same time. Geese and other waterfowl use as part of their migratory pathway extensive wetlands along the St. Lawrence River in Quebec. Just over the border from Fort Covington (Franklin County) is the Réserve nationale de faune du lac Saint-François, "created mainly to protect exceptional wetland habitat on the shores of Lac Saint-François that is used by a variety of aquatic and land birds and shelters a number of rare animal and plant species" (website of the Canadian Wildlife Service).

Ground surveys for spring "migratory" birds were done on only May 25 and 26, 2005, though bird migration through our area runs from late March to late May or so; timing and intensity varies year to year. The birds detected were local breeders, but most of the species detected at this time locally are migrant species which winter elsewhere and fall under the Migratory Bird Act. The methodology used – five-minute detection periods by seeing or hearing – is an adaptation of the Breeding Bird Survey technique which has no applicability in this situation, and serves only to limit, by extreme limitation of observer effort, the numbers of species detected. There is no attempt made to estimate population numbers or density in any way. The similar technique used for the Breeding Bird Surveys in early and late June, 2005, with 3-minute detection periods, is also inadequate to obtain data on population sizes. This technique was developed to have a uniform way to get simple, limited data from disparate untrained observers across the country. It is not a recognized way of estimating bird population densities or numbers (see references[46] for discussion).

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[45] "Migration patterns & routes of the Great Snow Goose," compiled by Gerald Duffy, Nina Pierpont, and Calvin Luther Martin, Summer 2005. See map on p. 2

[46] Holmes, RT, and TW Sherry. 2001. Thirty-year population trends in an unfragmented temperate deciduous forest: importance of habitat change. The Auk 118(3):589-609. Jones, J, PJ Doran, and RT Holmes. 2003.

Bat methodology was limited to visual nighttime monitoring in a beam of infrared light and use of bat call detector devices. Very small numbers of bats were detected in the beams. The preparers of the DEIS discuss how the visual and radar data were not similar, so dissimilar that they considered these two forms of measurement to be "independent," though of course they were not independent since they were measuring the same phenomenon (birds and bats flying overhead) at the same time; the unrelatedness of the data obtained reflects measurement problems, not "independence" of data sets. At any rate, the visual studies do not allow one to calculate the proportion of "targets" in the radar study which were bats and birds because the two sets of measurements were so different they did not seem to reflect the same nightly phenomenon. The call detector devices were mounted on silos in farmland, and allowed identification of four species between the two sites. As for bird migrant studies, limitation of effort limited the numbers of species detected and no data was collected on population densities or numbers.

Discussion of bat impacts does not reflect findings of large bat kills by wind turbines on Appalachian ridges and the correlation of bat kill with a generating vs. non-generating spinning turbine blade.[47]

Comparisons of numbers such as rates of radar target objects picked up at the different wind plant sites surveyed is meaningless without statistical analysis, since even superficial inspection of the data presented in the graphs in the radar monitoring study show wide variability day to day. When data is variable, it is more likely that average values pulled from such data sets do not differ from each other. This is a most basic concept in statistics which is ignored in the data presentation in the ARA. It is also unclear what point the preparers were trying to make in presenting such comparisons.

To provide references and discussion of adequate migratory bird monitoring, the USFWS comment on the Chautauqua Wind Project DEIS is attached. The sites are different but the methodologic inadequacies are the same, produced by the same contractor, Ecology and Environment.[48]

In summary, there has not been adequate oversight of wind power development proposals by USFWS due to the agency being overwhelmed by the number of such proposals in the state, yet such oversight and coordination of bird and bat population issues across broad geographic fronts is badly needed, as recognized by the initiation of two federal level agency studies in the last year which focus on wildlife issues. The current Project needs to be delayed for such review to take place, and to bring the bird and bat studies closer to compliance with USFWS recommendations by having the developers sponsor at least another year of wildlife studies. USFWS oversight to bring the studies methodologically closer to usefulness, in terms of obtaining population data, is recommended.

8. Non-avian wildlife

Climate and food synchronize regional forest bird abundances. Ecology 84(1):3-24-3032. Terborgh, J, SK Robinson, TA Parker, CA Munn, and N Pierpont. 1990. Structure and organization of an Amazonian forest bird community. Ecological Monographs 60(2):213-238.

[47] Arnat, EB, WP Erickson, J Kerns, and J Horn. 2004. Studies to develop bat fatality search protocols and evaluate bat interactions with wind turbines in West Virginia and Pennsylvania: an interim report. Bat Conservation International, Austin, TX; GAO, "Wind power: Impacts on wildlife and government responsibilities for regulating development and protecting wildlife," September 2005; "Onshore wildlife interactions with wind developments: Research meeting V," Proceedings. Landsdowne, VA, November 3-4, 2004. March 2005. See reports by Merlin Tuttle, Greg Johnson, Edward B. Arnett, Wally Erickson, Jessica Kerns, Brian Cooper, and Jason Horn. See Edward B. Arnett (Bat Conservation International), Letter regarding wind company distortion of bat research, June 5, 2005.

[48] David Stilwell (signatory) and Timothy Sullivan (biologist), October 12, 2005, "Comments on our review of 2004 Avian Risk Assessment Report. Chautauqua Wind Project."

With regard to terrestrial and aquatic wildlife, information in the DEIS is thin and suggests both incompetence and lack of effort. Habitat and foraging requirements of the White-tailed deer and Black bear are described with mention that suitable habitat occurs within the Project Area, but population estimates are notably lacking. Pre-construction deer and bear population counts by methods well known to wildlife biologists would be appropriate to allow post-construction comparisons. Without this data, the effects of wind turbine construction on game species cannot be assessed. To my knowledge before and after population comparisons have not been done for other wind turbine projects in New York State or adjacent states, though hunting is a major recreational activity in rural areas and resident accounts from other wind turbine sites report relative scarcity of deer after construction. This project is the second large windplant proposed for NY State, the first being the Tug Hill Project (120 turbines) built last summer. Many additional projects are in the planning stages. Given SEQRA's focus on cumulative effects, I strongly recommend that before further projects go into construction, including this one, that wildlife biologists controlled by NYSDEC obtain two years' worth of population data on significant game species to allow valid post-construction comparisons, and that turbine complexes not be built across a wide area until post-construction data is available for a limited number of sites.

In the DEIS, further discussion of mammals and other vertebrates is relegated to Table 2.9-1, a list by habitat. This table misses even common species such as red squirrel, weasel species, mink, marten, fisher, otter, red fox, coyote, woodchuck, voles, mice, snowshoe hare, etc., which are common in our Adirondack foothills area, showing insufficient care and effort on the part of the preparers of the DEIS. Population data is again lacking. There is no mention of large predators with large home ranges which may include the project area, including cougar which are regularly seen from Altona into St. Lawrence County, including a video of a cougar with a cub filmed in northern Franklin County in 2003. The cougar is a federal endangered species officially considered to be extirpated in NY State, though it does occur and apparently breeds. Other large mammals of which there are reports in the area include bobcat, wolverine, wolf (also a federal endangered species considered extirpated in NY State), and moose. These species are not considered.

Existing research on the effects of wind turbines on wildlife is not mentioned. Lawrence Rabin, Presidential Management Fellow in the US Forest Service R&D in Washington, DC compared the behavior of two groups of California ground squirrels in similar environments, one close to wind turbines and the other not. To be published in a forthcoming issue of Biological Conservation, the study found that squirrels near turbines were more likely to dash back to their burrows when hearing an alarm call and spent more time looking around for predators. A possible reason for the squirrels' increased alertness is their need to compensate for their reduced ability to communicate through sound. Both behaviors can reduce reproductive success by reducing foraging time and increasing energy expenditure, and have the potential to be shared by a number of animal species.[49]

The discussion of the potential impacts of the project on terrestrial wildlife is, like the discussion of wetlands, an account of inevitabilities and minimization without real content, including the failure to acknowledge the significance of potential impacts. Statements such as:

> "Although the Project this [sic] will result in a local reduction in the amount of available forest habitat, this total acreage is minor in comparison with the overall acreage of forested land located in the Project Area." (DEIS p. 2-87)

ignore the issue of cumulative effect highlighted by SEQRA. The authors conclude soothingly, "Indirect impacts on wildlife will occur as a result of habitat alteration in association with construction and

[49] "Wind turbines send wildlife diving for cover," *New Scientist*, Issue 2549, May 3, 2006, p. 18.

operation of the Project. However, these impacts are not expected to be significant" (DEIS p. 2-88), having presented no population data, no before-and-after wildlife population figures from other sites, nor even demonstrated basic competence in the wildlife field by presenting an accurate mammal list.

9. Wetlands

Ecology and Environment's disregard or perhaps ignorance of ecological principals is apparent throughout the DEIS, starting with the Executive Summary: "The loss of wetlands will be compensated for by the construction of new wetlands in the same watershed" (DEIS p. 2). An engineer or a backhoe operator can construct a wet place but not a wetland; wetlands have to regenerate and during regeneration will not support the same communities of plants, insects, invertebrates, fish, amphibians, birds, and mammals as they did before they were disturbed. The type of wetland which regenerates depends on soil type, siltation properties, water flow, and the presence of beaver, and has a specific time course. These issues are given no consideration.

The sections of the DEIS on wetlands, particularly the Wetland Delineation Report in Appendix D, presents a variety of maps and detailed descriptions of methodology and the vegetation of different wetland areas within the project area, but does nothing significant with the information. The language used minimizes the importance, "functional value," and size of the various wetlands, and tells us soothingly that "Project facilities have been sited to minimize or avoid wetland impacts to the greatest extent practicable, while still being able to meet the Project objectives" (DEIS Appendix D, p. 7-2). We are being told that wetlands are not important. The possibility of siting changes during construction is left open and uncontrolled: "However, until the individual turbine sites are designed and the final grade contours are established, it is not possible to determine the actual extent of wetland impacts within the turbine sites" (DEIS Appendix D, p. 7-4). Mitigation plans are vague: "If avoidance of drainages and swales is not possible, the turbine site will be designed in such a way to allow for the continuation of the surface flow" (DEIS Appendix D, p. 7-5). Adjacent sentences contain conflicting, vague information: "No significant impacts are expected to streams in the Project Area as a result of construction or operation of the Ellenburg Windpark. Potential indirect impacts may result from construction activities, including increased sedimentation and turbidity caused by increased surface runoff from work areas" (DEIS Appendix D, p. 7-7).

The USACE has jurisdiction over all wetlands and waterways in the United States, regardless of size, which are connected hydrologically to a navigable waterway. This could be a marsh connected to a ditch to a stream to a river which eventually flows into the St. Lawrence River or other navigable waterway.

The USACE will not issue permits to place turbines in wetlands, because turbines don't need to be in wetlands and can be placed elsewhere. However, they issue permits (and require permits) for all crossing of waterways and wetlands in their jurisdiction by roads or power lines.

I spoke on May 31, 2006, with Kevin Bruce in the Albany Field Office of the US Army Corps of Engineers, 1 Bond St., Troy, NY 12180, 518-273-7420, fax 518-273-2055.

The USACE has received applications for all three Noble projects. Mr. Bruce said they are early in the process of reviewing the application for the Clinton project, and that review of the Ellenburg and Altona projects has not yet started. He is planning a site meeting in the 3rd week of June for the Clinton project.

Mr. Bruce told me he commonly is asked by project sponsors if they can go ahead and start constructing roads or break ground in areas of dry land not under the jurisdiction of the USACE before securing

permits from the USACE. The USACE generally advises project sponsors not to do this, since the USACE might request changes in the project to avoid wetlands, including by access roads or power lines.

USACE review, which falls under the Clean Water Act and the National Environmental Policy Act, also triggers federal level review under the Fish and Wildlife Coordination Act and the National Historic Preservation Act.

In summary, it appears that extensive federal level review of the three Noble projects is still in the early stages. It would not be appropriate for the town boards, as the lead agencies, to issue building permits without certifying that the appropriate federal review processes have been completed and the required permits obtained, nor for Noble to proceed with construction without required federal permits.

It is not at all clear from the DEIS that state or federal law will be upheld in the Ellenburg Project with regard to wetlands. Because of the vagueness and apparent project dominance of decisions being made with regard to wetlands, on-site NYSDEC and federal (USACE) oversight will be critical to modify turbine placement decisions during the project planning phase, to oversee them (to prevent changes) during the construction phase, and to oversee other mitigation measures.