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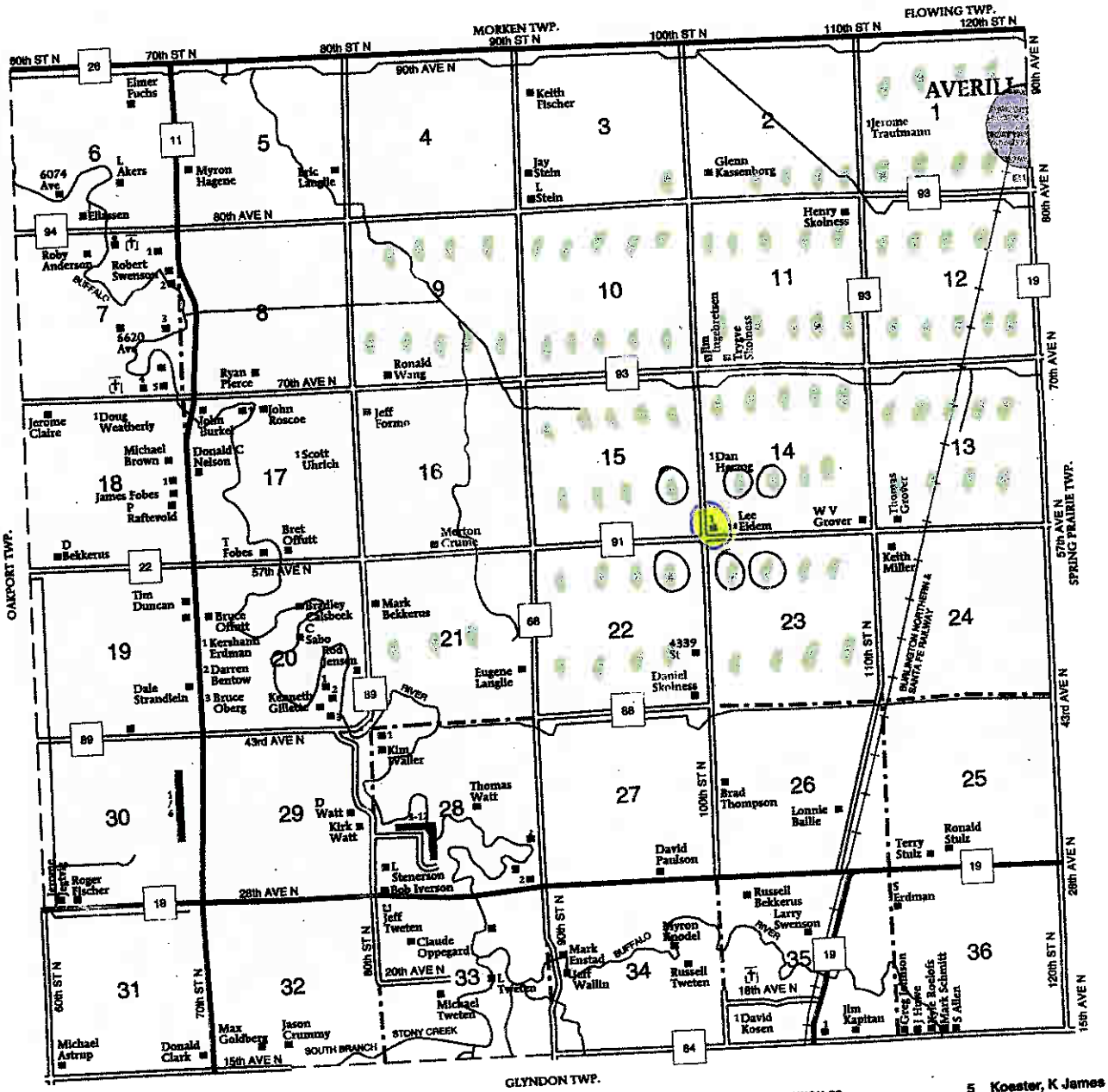

MOLAND TOWNSHIP

SECTION 7
1 Wang, Richard
2 Hukreide, Jeff
3 Johnson, Donald
4 Hagene, Valdemar
5 Winter, Jeff

SECTION 28
1 Oberg, Barry
2 Blair, Craig
3 8154 31ST AVE N
4 Mooney, Scott
5 Waller, Jerry
6 Butze, John
7 Hong, Christopher
8 Johnson, J
9 Heirass, Randy
10 Trubrill, Mike
11 Johnk, K
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SECTION 30
1 Grove, Allen
2 Lynde, Curt
3 Lynde, P
4 3411 70TH ST NI
5 Koester, K James
6 Jegtvig, Virgi

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ATTORNEY GENERAL CUOMO LAUNCHES INVESTIGATION INTO WIND POWER COMPANIES' CONDUCT ACROSS UPSTATE NEW YORK

Subpoenas were served on Newton, Massachusetts-based First Wind (formerly known as UPC Wind) and Essex, Connecticut-based Noble Environmental Power, LLC. They are part of an investigation into whether companies developing wind farms improperly sought or obtained land-use agreements with citizens and public officials; whether improper benefits were given to public officials to influence their actions, and whether they entered into anti-competitive agreements or practices.

July 15, 2008

Allegations of Improper Dealings with Public Officials and Anti-Competitive Practices

Subpoenas Served on First Wind/UPC Wind and Noble Environmental Power, LLC

Attorney General Andrew M. Cuomo announced today the launching of an investigation into two companies developing and operating wind farms across New York state amid allegations of improper dealings with public officials and anti-competitive practices.

Wind farms are clusters of large electricity-generating turbines powered by wind and connected to the electric grid.

Subpoenas were served on Newton, Massachusetts-based First Wind (formerly known as UPC Wind) and Essex, Connecticut-based Noble Environmental Power, LLC. They are part of an investigation into whether companies developing wind farms improperly sought or obtained land-use agreements with citizens and public officials; whether improper benefits were given to public officials to influence their actions, and whether they entered into anti-competitive agreements or practices.

In recent months, the Office of the Attorney General has received numerous complaints regarding the two companies from citizens, groups and public officials in eight counties alleging improper relations between the companies and local officials and other improper practices.

"The use of wind power, like all renewable energy sources, should be encouraged to help clean our air and end our reliance on fossil fuels," said Attorney General Cuomo. "However, public integrity remains a top priority of my office and if dirty tricks are used to facilitate even clean-energy projects, my office will put a stop to it."

The Attorney General's subpoenas seek, among other things:

All documents concerning any benefits conferred on any individual or entity in connection with wind farm activity.

All agreements, easements or contracts with individuals regarding placement of wind turbines.

Agreements between wind companies that may indicate anti-competitive practices.

All documents pertaining to any payments or benefits received from local, state or federal agencies.

First Wind has three operational wind farms and 48 others in development across the country, according to its web site. First Wind developed the Steel Winds wind farm in Erie County and has wind farms in development in Steuben, Chautauqua, Genesee and Wyoming (GenWY Wind) counties.

Noble Environmental Power, LLC, has three active wind farms and five in development in Allegany, Chautauqua, Clinton, Franklin and Wyoming Counties.

The investigation is being led by Assistant Attorney General Andrew Heffner of the Syracuse Regional Office under the supervision of Special Deputy Attorney General Ellen Biben, who oversees the Attorney General's Public Integrity Bureau. Assisting in the case are Investigators Thomas Wolf, David Bruce and Andrea Burnham.

Web link: http://www.oag.state.ny.us/press/2008/july/july15a...

Filed under : New York : General

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Wind company shuts doors in Rutland

A company working to install a wind-power project on Grandpa's Knob in Castleton is closing its Rutland office. ...In October, the Connecticut company laid off workers in New York and stopped work at two wind farms in that state in conection with the failure of Lehman Brothers, one of its chief backers.

January 7, 2009 in Burlington Free Press

A company working to install a wind-power project on Grandpa's Knob in Castleton is closing its Rutland office.

Brad King, Noble Environmental's local project manager, says the company has not given up plans for the wind farm and will continue to gather data from meteorological towers installed on the ridge last year.

In October, the Connecticut company laid off workers in New York and stopped work at two wind farms in that state in conection with the failure of Lehman Brothers, one of its chief backers.

Noble's CEO Walter Howard released a brief statement Monday saying the poor economic outlook prevents the company from speculating on its 2009 development plans, but says it will continue to evaluate the financial markets and the Grandpa's Knob project.

Web link: http://www.burlingtonfreepress.com/article/20090107/BUSINESS/90107013"

Wind-farm workers laid off

By DENISE A. RAYMO
Staff Writer

October 17, 2008 04:00 am

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BELLMONT — Noble Environmental Power has stopped work at its Bellmont and Chateaugay wind-energy projects and laid off its workers.

And it appears the bankruptcy of one of its major financial backers may have played a part.

"Due to conditions in the financial markets, Noble Environmental Power has had to scale back its development plans for 2009," Noble Chief Executive Officer Walter Howard said in a written statement.

No specifics were given as far as the number of workers let go and how long a layoff might last.

But published reports indicate the work may not restart at either wind park until next summer.

"We deeply regret this unfortunate situation," Howard said. "These decisions have been extremely difficult for me, our company founders and others in management.

"We value all of our employees, and we appreciate their hard work and dedication to Noble."

Anna Giovinetto, who had been vice president of public affairs, said Wednesday she could not comment further on the company's situation because she was one of the people laid off.

The work stoppage and layoffs could also be connected to the ongoing investigation Attorney General Andrew Cuomo launched in July against Noble and another wind-energy company, First Wind of Massachusetts.

He issued subpoenas to both firms requesting all paperwork associated with the land agreements and easements that each received from property owners and public officials.

Cuomo's office is investigating whether the officials were unduly influenced or bribed to make deals.

News of the investigation came just a few months after Noble filed paperwork with the U.S. Securities and Exchange Commission in May for permission to offer stock to the public in hopes of raising $375 million.

On Sept. 2, the company said it would be offering about 24.4 million common shares and trade under the NASDAQ ticker symbol NEPI.

According to the Massachusetts Biotech and Technology News Journal of New England Technology, the co-lead underwriters for the stock offering were Lehman Brothers, Credit Suiss Securities (USA) LLC, JP Morgan Securities Inc. and Citigroup Global Markets Inc.

But two weeks after the announcement, Lehman Brothers collapsed under the heavy debt load it was carrying and filed for bankruptcy, ending its 158-year presence in the nation's economic picture.

That loss of support apparently led to Noble's decision to lay off workers and cease further construction and development at the wind parks it is building in eastern Franklin County in the towns of Bellmont and Chateaugay.

Noble Environmental Power lost $7.8 million in 2005, $20.7 million in 2006 and $42.5 million in 2007, according to information supplied to the Securities and Exchange Commission for its initial public offering application.

Noble's operation in the Town of Altona doesn't appear to be impacted by the Franklin County layoffs.

Town Supervisor Larry Ross said he just received an update on the progress at Altona's wind farm on Monday, and nothing was mentioned to him about shutdowns or layoffs.

"I'm sure they're going to be working because they just finished up the first circuit, and they're starting up our windmills now.

"I haven't heard a thing like that, but maybe it's because we're farther along and ready to start," Ross said.

He said some parts and equipment have been brought in from other operations to help Altona get online faster "because we're so close to being done."

The Noble Altona Windpark is to be a 97.5-megawatt operation; the combined 85 turbines at the Noble Bellmont Windpark and Noble Chateaugay Windpark are to produce 127.5 megawatts of power a year; and the Noble Clinton and Noble Ellenburg projects are expected to generate 100.5 megawatts and 81 megawatts, respectively.

E-mail Denise A. Raymo at: draymo@pressrepublican.com

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Wind Turbine Syndrome:
Noise, shadow flicker, and health

by

Nina Pierpont, MD, PhD

August 1, 2006

The following pages are the sections on noise, shadow flicker, and health excerpted from my rebuttal to the Draft Environmental Impact Statement prepared by Noble Environmental, LLC, for the towns of Altona, Clinton, and Ellenburg, NY, spring of 2006.

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 New York State Department of Environmental Conservation (NYS DEC)[1] or the World Health Organization (WHO).[2]

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.[3] These

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

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

[3] 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

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.[4]

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.[5]

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 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.[6]

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.[7] 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,[8] and 1.5 miles away in Appalachian valleys.[9] 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.[10] These and other health effects of excessive community

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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.

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

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

[6] 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

[7] 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.

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

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

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

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.[11]

- 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.[12] Certain types of nighttime noise are especially bothersome, including noise which has impulses rather than being continuous, noise combined with physical vibration, noise with low-frequency components,[13] and sources in environments with low ambient background noise.[14] 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.[15]

- 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.[16] The percentage of highly annoyed people in a population starts to increase at 42 dB, and the percentage of moderately annoyed at 37 dB.[17]

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

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[11] Ibid., pp. 42-44.
[12] Ibid., p. 44.
[13] 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.
[14] WHO, 1999. *Guidelines for Community Noise*, p. 46
[15] Ibid., pp. 49-50
[16] Ibid., p. 50
[17] Ibid., p. 51

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, just as laws for air pollution set ambient air quality standards to protect the most sensitive individuals.

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.[18] 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.
- 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.[19] 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.[20]

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[18] 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.

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

[20] 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

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 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).[21] 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,[22] 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.

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.

[21] 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.

[22] 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.

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.[23] A difference of 10 dB between A and C weighting represents a significant amount of low-frequency noise by World Health Organization standards.[24] 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.[25] 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"[26] (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 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.[27] 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.

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

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

[25] 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.

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

[27] 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.

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 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.[28] 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,[29] 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 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;[30] 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 get dizzy, 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

[28] van den Berg, GP. 2006. "Sound of high winds."
[29] Ibid., p. 4-5
[30] 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).

Health, hazard, and quality of life near wind power installations

How close is too close?

Nina Pierpont, MD, PhD*

Malone (New York, USA) Telegram,

March 2, 2005, p. 5

Falling over

A nacelle (generator and gearbox) weighing up to 60 tons atop a 265 ft. metal tower, equipped with 135 ft. blades, is a significant hazard to people, livestock, buildings, and traffic within a radius equal to the height of the structure (400 ft) and beyond. In Germany in 2003, in high storm winds, the 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.[1] (Note that all turbines discussed in this article are "upwind," three-bladed, industrial-sized turbines. "Downwind" turbines have not been built since the 1980's.) Given the date, this turbine was probably smaller than the ones proposed for current construction, and thus could not throw pieces as far. This distance is nearly identical to calculations of ice throw from turbines with 100 ft blades rotating 20 times per minute (1680 ft).[2]

Fires

Most fires in wind turbines are started by lightning and fueled by up to 200 gallons of hydraulic oil in the nacelle. Fire-fighting at 265 ft (26 stories) may not be possible with the equipment of a rural town. A fire may leave wind turbine controls malfunctioning until the equipment in the nacelle is repaired or replaced, making it more susceptible to the kind of accident described above.

Lightning and power surges

Wind turbines themselves cause irregularities in the power supply as wind speed changes. Within the power grid, supply and demand must always be balanced; there is no storage of electricity on this scale. When the wind dies, there is less power (brown-out) until a coal- or gas-powered plant at some distance from the wind installation fires up to increase production. When the wind gusts, there are power surges. 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.[3]

Flicker

When turning with the sun behind them, turbine blades cast moving shadows across the landscape and houses, described as a strobe effect within houses, which can be difficult to block out. Some people lose their balance or become nauseated from seeing the movement. As with car or sea sickness, this is because the three organs of position perception (the inner ear, eyes, and stretch receptors in muscles and joints) are not agreeing with each other: the eyes say there is 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 can also provoke seizures in people with epilepsy.

In Lincoln Township, WI, two years after installation, 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 (230 people sampled).

Noise

In the same survey in Lincoln Township in 2001, 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 (229 people sampled). Under certain conditions the turbines could be heard up to 2 miles away. These numbers correspond well to measurements made by a sound engineer 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. The engineer found that measured sound levels were higher than predicted by standard models because of differences in daytime and nighttime wind patterns, and that annoyance was increased by the impulsive nature or rhythmic thumping of the sound, a pattern found at a distance from the turbines (documented at 1500 m, or 0.9 mile) but not immediately under or among the turbines.[4] This was described as a "low pitched thumping sound."

Noise levels sufficient to prevent or interrupt sleep, even with windows closed, are reported in dwellings close to wind power installations in all surveys. Low frequency sound, defined as 10-200 Hz, travels farther and comes through walls and around obstacles because of its long wavelength; sounds in the range of 25-150 Hz have wavelengths similar to room dimensions, and can reverberate in rooms. Low frequency sound is especially bothersome, according to the World Health Organization:[5]

"Low frequency noise, for example from ventilation systems, can disturb rest and sleep even at low sound levels."

"For noise with a large proportion of low frequency sounds a still lower [measurement] guideline (than 30dBA) is recommended." [This means 30 dB total sound pressure using an "A" filter.]

"When prominent low frequency components are present, noise measures based on A-weighting are inappropriate." [An "A" filter, which filters out low-frequency sounds, is standard in loudness measurement.]

"Since A-weighting underestimates the sound pressure level of noise with low frequency components, a better assessment of health effects would be to use C-weighting." [A "C" filter filters out less of the low-frequency sound.]

"It should be noted that a large proportion of low frequency components in a noise may increase considerably the adverse effects on health."

In other words, the World Health Organization recommends that threshold standards for noise in communities be set lower than 30dB (as measured with the standard "A" filter) whenever the noise has a substantial low-pitched component—as it does from wind turbines. Again, this is because low-pitched noise is more disturbing and has a greater impact on health at low levels than higher-pitched noise. When measuring such noise, a "C" filter will give a more accurate reading of loudness by including more of the low-frequency sounds.

Dr. Amanda Harry, 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.[6]

Noise itself can induce dizziness and loss of balance in people with a previous history of noise-induced hearing loss, since, when people damage their hearing through too much exposure to loud (e.g., machine) noise, the balance organs in the inner ear may also be damaged. This is known as the Tullio phenomenon.

Dizziness (specifically, vertigo) and anxiety are neurologically linked phenomena.[7] Hence the anxiety and depression seen in association with other symptoms near wind installations are not a neurotic response to symptoms, but rather a neurologically linked response to the balance disturbances people experience from shadow flicker or low-frequency noise. Sleep deprivation, by the way, also causes anxiety and depression.

Older people, who often sleep less soundly, are more likely to have their sleep disturbed by turbine noise. They may also suffer more disturbances in equilibrium near turbines because of age-related problems with the function of the inner ear (e.g., dizziness and tinnitus: ringing in the ears) or from the nerves or parts of the brain receiving signals from the inner ear. It is noteworthy that among healthy people age 57 to 91, 5% have chronic dizziness, and 24% tinnitus.[8]

Setback

Based on these health effects and hazards, turbines should not be placed within 1700 feet of any road or dwelling. Those living within ½ mile (2640 ft) should be apprised that they are likely to experience very bothersome levels of noise and flicker, which continue (though to a lesser degree) to a mile or more from the turbines. At 2 miles, noise is sometimes heard, but few people are bothered. In Lincoln Township, WI, after two years with the turbines, 73% of people said they would not consider buying or building a house within a mile of the turbines, and 23% wished to be at least 2 miles away (212 people sampled).

It is significant that each of these setbacks (the first for hazard of falling objects, the second for noise) is supported by two unrelated pieces of data yielding the same result. For noise, the data from two wind installations of different ages in different countries, one by resident survey and the other an engineer's measurements, yield the same distance at which noise stops being bothersome: at something greater than 1-1.2 miles. Thus the age or specific type of equipment is not relevant to the noise issue, and specific measurements, properly done, support what neighbors of wind installations are saying.

In conclusion, based on these data, wind turbines should not be built within 1.5 miles of people's homes. Let it be understood, however, that there will still be health and life quality problems caused by wind turbines beyond this radius. People living 1.5 to 3 miles from a proposed turbine site should be notified of potential health and life quality effects, and for this they should be appropriately compensated.

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[1] See photos at **http://www.pbase.com/wp/wind_turbine_photos**.

[2] Personal communication, Prof. Terry Matilsky, Dept. of Physics and Astronomy, Rutgers Univ., Piscataway, NJ. See **http://xray.rutgers.edu/~matilsky/windmills/throw.html**

[3] Bittner-Mackin, E. Excerpts from the Final Report of the Township of Lincoln [Wisconsin] Wind Turbine Moratorium Committee, 12/4/03.

[4] van den Berg, GP, 2004. Effects of the wind profile at night on wind turbine sound. Journal of Sound and Vibration 277:955-970. Contact **g.p.van.den.berg@phys.rug.nl** . For a pre-publication copy of this article, go to **http:/www.nowap.co.uk/docs/windnoise.pdf**

[5] Berglund, B, et al, 2000. Guidelines for Community Noise, World Health Organization. Quoted in Leventhall, G, 2003, A Review of Published Research on Low Frequency Noise and its Effects; see **http://www.defra.gov.uk/environment/noise/lowfrequency/pdf/lowfreqnoise.pdf**

[6] Milner, C. 2004. Wind farms "make people sick who live up to a mile away." Telegraph.co.uk, 1/25/04; see **www.telegraph.co.uk**

[7] Balaban, CD, and Thayer, JF. 2001. Neurological bases for balance-anxiety links. Journal of Anxiety Disorders 15:53-79.

[8] 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.

Wind farm tempest blows through Trempealeau; Developer considers suing county over ordinance

Trempealeau County's wind farm ordinance hasn't yet generated a lawsuit, but that might be AgWind Energy Partners LLC's only choice. At least that's how Jordan Hemaidan of Madison-based Michael Best & Friedrich LLP sees it. "There are many considerations that have to go into when or whether or not to file a lawsuit," he said. "AgWind is not pursuing one at this time, but it reserves the right to bring a lawsuit forward at the time of its choice." Hemaidan represents the Holmen-based wind farm developer and, earlier this month, he sent a letter to county officials saying judicial review of the ordinance and a court order overturning it could be in order.

January 29, 2008 by Paul Snyder in The Daily Reporter

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Hemaidan represents the Holmen-based wind farm developer and, earlier this month, he sent a letter to county officials saying judicial review of the ordinance and a court order overturning it could be in order.

Jim Naleid, AgWind's managing director, opposed the county's ordinance when it passed at the end of November because it placed a vast amount of restrictions on wind farm development.

The ordinance requires that developers place wind turbines at least one mile from neighboring residences, schools, hospitals and businesses. It is the longest setback distance imposed to date by a Wisconsin government.

"There is not one square inch of land," Naleid told the County Board in December, "where a commercial wind turbine can be legally sited under this ordinance."

Hemaidan said the legal problem is state law requires that restrictions on renewable-energy development only be established in lieu of public health or safety concerns, if the restrictions don't significantly increase or decrease efficiency costs, or if they allow for alternative and comparable systems.

"It is our belief," Hemaidan said, "that any court reviewing (Trempealeau County's ordinance) would have the basis to conclude that many of the requirements were not developed in faithfulness to public health and safety."

Introduction to Research on Property Value Impacts

Concern for the impact of wind turbines on property values was a recurring theme in comments made to the committee by Township residents. Property value concerns raised by township residents include impacts of numerous very large turbines, night lighting and the impacts of an expanded electrical infrastructure with larger and more numerous electrical transmission lines and substations. While property values cannot be directly regulated through zoning, controlling factors that affect land values can minimize negative impacts. According to the Michigan Townships Association, the purpose of zoning is to "ensure the compatibility of land uses, protect natural resources and protect property values."

As documented in the attached document, the committee considered a variety of sources and research on property value impacts. *The Wind Energy Handbook* addresses tower size, view shed issues and also the associated issue that neighboring residents believe they are paying the cost of a financial benefit accruing to other landowners. The REPP study, *The Effect of Wind Development on Local Property Values,* which is frequently cited by wind farm developers, is seen to be incomplete and flawed by many, including David Maturen, a real estate appraiser in Kalamazoo, as he documented in a letter written to the MI Wind Working Group in 2005. The committee concluded that the impact on property values depends on location.

Large wind turbines can affect neighboring property values due to noise, health effects and visual impacts on residents. These adverse impacts on property values may not exist in agricultural areas that have huge farms. Centerville Township, however, allows 1 1/2 -acre residential parcels within agriculturally zoned land, and small residential parcels are scattered throughout the township. Adequate setbacks can minimize negative impacts and potential complaints from residents living near commercial wind turbines. The township supervisor of Lincoln Twp, WI told a committee member about problems that residents experienced after two public utilities constructed wind farms in Door County. Even residents living 1200-1500 feet from turbines complained of noise impacts and health problems. Several residences purchased by the power company were subsequently razed. In hindsight, the supervisor's opinion was that many of the problems could have been avoided with 2,000' setbacks and 40 decibel noise limits.

Large wind turbines can also affect neighboring property values due to incompatibility with non-residential adjacent land uses. Centerville Township has large vineyards, and several wineries have opened tasting rooms within the township. The Centerville Master Plan states, "we encourage those tourist related enterprises which are locally owned and generate Economic benefit for the local area and people, as opposed to a tourist business where the economic benefit is exported out of the area." At the August 7, 2006 committee meeting, township resident Dan Matthies shared his recent experience as a real estate agent, specializing in vineyard properties. He had lost the sale of a large parcel within Centerville Township, because of the wind farm proposal by Noble Environmental. Based on Mr. Matthies' report, it seems a real possibility that large-scale wind development could seriously affect the agri-tourism business in Centerville Township.

DO WIND TURBINE GENERATORS AFFECT THE VALUE OF HOMES?

Findings

Yes, it is reasonable to conclude the presence of wind turbine generators (WTG) near residential housing causes property values to decline. This is common sense, and there are no serious scholarly studies that support an opposite conclusion.

Sources

Four reasonable source documents exist which discuss the impact on property values.

1. Wind Energy Handbook. Tony Burton, David Sharpe, Nick Jenkins, Ervin Bossanyi. John Wiley & Sons, New York, 2001.

2. "The Effect of Wind Development on Local Property Values." Renewable Energy Policy Project, May 2003.

3. "A Study of Wind Energy Development in Wisconsin." Energy Center of Wisconsin, July 1, 2004.

4. "The Net Benefits of Utility-scale Wind Generated Electricity in Western North Carolina." Todd L. Cherry, Appalachian State University, June 2004.

Common Sense

The most important citation is common sense. The old saying about residential real estate values is that price and salability depend on "location, location, location." The locating of a WTG near a residential house can, at best, have no effect on the value and salability of the house. That is, the presence of a nearby WTG might be a matter of indifference to a potential buyer. For example, if wind turbines were only five feet tall and made no more noise than an air conditioner, nearby properties would be unaffected. But logically, as wind turbines are larger and larger, in some cases 400 feet tall, and as they produce constant audible noise over a large area, as they intrude on the viewshed, the only valid conclusion is that nearby residences are less valuable than they would be if there was no turbine nearby. Why would a buyer choose a house within sight and sound of a turbine, if a comparable house at the same price were available elsewhere, beyond the sight and sound of the turbine? It is totally counter-intuitive to suggest anything else.

Property Values and Salability

Researchers do best when studying data that can be verified and replicated. Residential property values are subject to multiple variables at all times; so that isolating the effect of any one variable (such as the nearby presence of a WTG) is difficult. Particularly difficult is measuring the transaction that doesn't occur. In a buyer's market (which is currently a nationwide situation), a negative location factor can reduce the number of potential buyers significantly. This is, presumably, ultimately reflected in lowered prices, but some homes have been reported as "not salable" because of WTG proximity. This salability factor exists as common sense, it is probably significant, but is probably impossible to quantify statistically. There are no studies or surveys on this subject.

There are indeed some offsetting considerations for non-residential properties. First, if land (with a house on it) is being sold as fertile farmland, then the presence or absence of a nearby wind turbine is probably irrelevant. Second, if there is a chance that a future wind turbine might be placed on the farmland, a potential buyer might think the land was slightly more valuable.

Recently, in Centerville Township, a 150-acre real estate sale fell through when the potential buyer heard of the possibilities of wind turbines coming to the area. The buyer had a friend in Minnesota whose property value declined when a wind farm was located nearby. This buyer did not want to take a chance that the value of the property he wanted to purchase could decline also if a wind farm were to be located in Centerville Township.

Source: Wind Energy Handbook.
This is a comprehensive, pro-wind power textbook. There are these three references to viewshed and property values:

Page 513: "...their size makes visual effects a particularly important aspect of the environmental impact...

Page 513: "success or failure hinges critically on environmental considerations...and dialogue with...local inhabitants..."

Page 527: "In particular, there is the difficult issue that some local residents consider they are paying a high cost for a benefit, either financial or environmental, which accrues to others." (emphasis added)

Source: "The Effect of Wind Development on Local Property Values." (Renewable Energy Policy Project).
REPP is an outspoken advocate for wind turbine generators. They received a Federal grant to study the question of local property values. (It is common for researchers to be a proponent of a particular viewpoint, without their scholarship being impaired.) REPP's (unsurprising) conclusion: wind farms result in increased property values! The study is widely quoted, usually to make the point that there is divided opinion on the question.

The problem is, the REPP study is badly flawed. The flaws are
:

a. The study itself calculates several correlation coefficients, to prove the relevance of their data. But the data are not added up. Adding up the data gives a coefficient of 46%, which, in statistical terms, is inconclusive. That is, the data vary too much to be persuasive.

b. Ten projects were analyzed by REPP. Two of them were add-ons to projects begun fifteen years before. These two projects should have been excluded. Deleting them, the coefficient falls to 39%, which is approaching the conclusion that very little of the actual variation is explained by the analysis. A compilation of these data is attached.

c. The REPP study reached the remarkable (but wrong) conclusion that property values increased, but they did no follow up to verify this conclusion. Any credible researcher

would then have used a simple follow up questionnaire to property purchasers (when the researchers had the names and addresses in front of them), which would have been such a verification. They failed to do so, thus making their conclusion not valid. A good researcher always double-checks the facts.

d. The REPP study only examined change in comparable property values over a three-year period. In most cases, the projects had been announced and debated long before the three-year window opened, so any depressive effect on property values would have occurred prior to the start of the study.

e. The REPP study did not look at other indices of real estate value, such as rising or falling inventory values, or the number of days from listing to sale. By limiting the study to percentages of change, the data can become tricky. Suppose two houses were each worth $100,000 ten years ago, and the value of one of them falls to $25,000 because a wind farm is announced. Then, if seven years later the first house sells for $110,000 and the second sells for $28,000, you can see that House One has an increase of 10% and House Two has an increase of 12%. So, REPP would conclude, that the owners of House Two are better off due to the presence of WTGs. In this hypothetical example, the REPP methodology would have ignored the 75% LOSS in value incurred when the WTG news first hit the papers.

f. And so on. Other criticisms of REPP are listed in the following sources.

Source: "A Study of Wind Energy Development in Wisconsin." Energy Center of Wisconsin
This is an objective study of WTGs, including the question of property values. The authors are unable to reach a definitive databased conclusion because of too few property transactions. This is a Catch-22 situation: wind farms are often located in areas of low population density; so that there never will be a statistically significant number of home sales transactions to analyze! However the Energy Center criticizes the REPP study as follows:

a. Part 3 page 125: REPP did not analyze whether the properties they studied "had a direct line of sight to the turbines."

b. Page 125: REPP "did not incorporate distance from the development as a variable…"

c. Page 126: "for a study such as (REPP) the real statistic is the confidence band surrounding the estimates…without these confidence intervals, it is impossible to determine whether the data…support any kind of conclusion…"

d. Page 135: "Nearly half of the property sales (in the Wisconsin study) could not be considered arms-length transactions." REPP ignored this element.

e. Page 137: "There are inherently opposing forces at work here, in the sense that while impacts on property values are likely to be strongest close to the development and taper off with distance, the number of property transactions decreases the closer one approaches the development. This…undermine(s) the credibility of the REPP study conclusion that 'there is no support for the claim that wind development will harm property values.'"

Source: "The Net Benefits of Utility-scale Wind Generated Electricity in Western North Carolina." Todd L. Cherry
This paper supports a wind project proposed for North Carolina.

a. Page 13: "The empirical results (of the REPP study)...may be questioned on empirical methodology issues shown to be substantially influential on the results."

b. Page 15: "Installing turbines that negatively impact property values essentially takes an attribute of the property that the owner paid for within the purchase price."

c. Page 19: "The most significant...indirect cost is likely the impact on property values (i.e. viewshed)—with it possibly being a larger problem in western North Carolina...due to the region's scenic vistas being such a vital component of its quality of life and economic development."

d. Page 23: "Long term economic development for the local area (meaning jobs and tax revenues) will be minimal."

e. Page 36: In an elaborate table of economic plusses and minuses, Professor Cherry states:

1. "The calculation conservatively assumes viewshed and noise impacts on 500 houses valued at an average of $25,000 per house." (emphasis added)

2. "The net property tax effect is zero."

This last point is important in this discussion. Whatever property value appreciation accrues to landholders who permit installation of WTGs, is exactly offset by the property value depreciation accrued to all other landholders in the area. So the WTG lessee incurs a higher property tax and receives annual rent for signing the lease/easement as more than offsetting compensation. The other landholders find their property values decreased, and they receive nothing. The township has no net gain or loss on property taxes.

Other Sources: Letter from David Maturen, Appraiser, Kalamazoo Michigan, to "Michigan Wind Working Group" dated July 17, 2005
In his letter, Mr. Maturen cites several studies that were based on surveys of real estate agents in Europe and the United States. These studies did not have the rigor of true research. They all support the position that real estate values declined when WTGs were installed.

Other Sources: Renewable Energy Systems, Great Britain, Frequently Asked Questions
This pro-wind resource cites a study by the Royal Institution of Chartered Surveyors (RICS) in England. Despite the claim that "there is no conclusive evidence" regarding impacts on property values, the details provide reasonable evidence that there is a negative impact.

Page 3: "The results of the RICS study clearly demonstrated that…60% of the sample suggested that wind farms decrease the value of residential properties where the development is within view…"

Page 3: "Those living nearest to wind farms are their strongest advocates." The RICS study looked at long-established wind farms. Obviously, opponents of wind farms had moved away. Even so, these advocates were part of the 60% who experienced declines in property values.

Conclusion

Some people have written, "The jury is still out on this question." Presumably people have this view because of the REPP study, which concluded, erroneously, that the presence of wind turbines caused property values to rise! Admittedly, the question of the impact of WTGs on property values is difficult to analyze, and the results difficult to quantify. Many factors affect property values: supply and demand, interest rates, cost of new construction versus prices of used homes, availability of utilities, etc. So, in addressing the question of the impact of WTGs on property values, we can look at the available evidence and make an informed conclusion, using the data that we have, and using common sense.

That conclusion is the presence of WTGs negatively impacts property values. The amount of impact is as high as $25,000 per residence. Overall salability of properties probably declines. The economic benefit to the lessee of the wind development rights is an equal economic detriment to the surrounding residences.

Richard Light
Molly Hyde
Centerville Township, August, 2006

Notes:

1. Some may argue that the nearby presence of a WTG would encourage wind power proponents to purchase a home. While this is theoretically possible, there is no evidence to support it. The purchase of a home is the largest purchase a person makes. Despite individual preferences, the resale of that home is usually a factor in deciding to buy. Thus, a purchaser who is deaf might not care that there is significant noise from a nearby freeway, but the purchaser would recognize that subsequent salability of the home is a factor to consider.

2. Is it fair to dismiss the REPP study completely? In fact, the work of the analysts was very thorough and appears objective. The problem is, the results are so surprising that they needed to be verified, but they were not. The paper was not subjected to peer-review, as any good scholarly work should have been. The three comprehensive, serious studies (which are otherwise pro-wind) subsequent to REPP are completely dismissive of its findings. Yes, it is fair to dismiss the REPP report.

3. Why did REPP publish its results without verification and without peer review? In its paper, REPP laments that its funding ran out so there were questions they did not pursue. It is a reasonable conjecture that they were delighted with their results and did not seek additional funding. They likely concluded, rightly, that any research finding, no matter how flawed the scholarship, that showed no property value decline, would be disarming and confusing to critics of wind power.

4. If it is so obvious that property values decline, why aren't there persuasive data to prove the point? Wind farms exist in many differing locations and are of significantly different sizes. A wind farm in the North Sea off the coast of Denmark is difficult to compare to a proposed Centerville Township project. Wind turbines 150 feet tall in a California desert are similarly difficult to compare. Some wind farms have less than ten WTGs; others have hundreds of WTGs. Importantly, in several European wind developments, the adjacent property owners participate in the economic benefits, through reduced electricity bills: this outcome would certainly be a positive economic influence on attitudes of current property owners and of potential buyers. Further, large wind farms in populated rural and scenic areas are a very recent development. Sufficient time must pass before trends and valid comparisons can be established. By the time such comparative data bases are established and analyzed, decisions about new wind farms will have been made and implemented.