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Details:

(FORM UPDATED: 07/12/2010)

WISCONSIN STATE LEGISLATURE ...
PUBLIC HEARING - COMMITTEE RECORDS

2007-08

(session year)

Senate

(Assembly, Senate or Joint)

Committee on ... Commerce, Utilities and Rail
(SC-CUR)

COMMITTEE NOTICES ...

- Committee Reports ... CR
- Executive Sessions ... ES
- Public Hearings ... PH
- Record of Comm. Proceedings ... RCP

INFORMATION COLLECTED BY COMMITTEE FOR AND AGAINST PROPOSAL

- Appointments ... Appt
- Clearinghouse Rules ... CRule
- Hearing Records ... bills and resolutions
  (ab = Assembly Bill) (ar = Assembly Resolution) (ajr = Assembly Joint Resolution)
  (sb = Senate Bill) (sr = Senate Resolution) (sjr = Senate Joint Resolution)
- Miscellaneous ... Misc

STATE OF WISCONSIN CIRCUIT COURT MANITOWOC COUNTY

EMERGING ENERGIES, LLP,

Plaintiff, Case No. 07 CV 0280

vs

MANITOWOC COUNTY,

Defendant,

GREGORY T. ZAK'S AFFIDAVIT IN SUPPORT OF MOTION FOR PARTIAL SUMMARY JUDGMENT

Gregory T. Zak, being first duly sworn on oath deposes and states as follows:

1. I have been a co-owner and partner of Noise Solutions by Greg Zak, Inc., 1800 Providence Lane, Springfield, IL 62711, an Illinois Corporation, since March, 2001, which is a small business engaged in noise consultation.

2. I was employed by the State of Illinois Environmental Protection Agency, Springfield, Illinois, from May, 1972 through July, 2001. One of my primary duties was to represent the Agency in all noise pollution matters as its Noise Advisor, a position created in March of 1987 (see attached 13 page resume' dated 12-6-07).

3. I have worked in noise pollution control and noise control engineering for over 35 years and have developed considerable expertise in these fields through participating in formulating noise regulations and standards, engineering noise solutions, and practical experience (see attached 13 page resume' dated 12-6-07). I have performed noise impact studies for the majority of wind farm developments in Illinois including follow-up noise measurements. I have read and am familiar with Sections 24.06(14)(a) and (b) of the Defendant's Large Wind Energy System Ordinance. Its simplicity stands in sharp contrast with the Illinois Noise Regulations which are the most comprehensive in the U. S. Illinois regulates the major portion of the audible spectrum including the decibel level of 29 one-third octave bands, 9 octave bands, differing daytime and nighttime limits, prominent discreet tones,

impulsive noise, noise emitted to "Class A & B" land use, along with noise measurement procedures (see attached 11 Sections of the Illinois Administrative Code).

4. It is my professional opinion that Sections 24.06(14)(a) and (b) of the Defendant's Large Wind Energy System Ordinance violate Sec. 66.0401, Wis. Stats., in that said restriction:

a. Does not serve to preserve or protect the public health or safety, because such a small change in noise level while measurable is inconsequential when compared to U.S. Department of Labor, Occupational Safety & Health Administration Regulations (Standards - 29 CFR) Occupational noise exposure - 1926.52 which allows a daily exposure of 90 dB(A) for 8 hours per day. Since decibels are logarithmic 90 dB(A) is more than 300 million times greater than 5 dB(A). The USDOT, FAA, and Federal Railroad Administration allow a 65 dB(A) day-night 24 hour average for transportation noise impact on residential areas. 65 dB(A) is more than one million times greater than 5 dB(A). Not only is the 5 dB(A) quantity based on the ambient which is usually extremely variable, but no time factor for taking the measurement is stated. The duration or averaging time for noise measurements should be based on objective criteria in order to accurately assess the effect of a specific situation on people. Without reasonable noise limits and measurement durations this ordinance has no relationship to public health and safety. This is the first noise regulation I have seen using the ambient plus any amount of dB(A) as a regulatory noise limit.

b. Significantly increases the cost of the system and significantly decreases its efficiency, because there are few if any times the system could be operated.

c. Does not allow for an alternative system of comparable cost and efficiency, because there are no alternative systems manufactured that could adhere to this standard.

5.I make this Affidavit In Support of Plaintiff's Motion For Partial Summary Judgment.

Gregory T. Zak

Gregory T. ~~Zak~~

Subscribed and sworn to before me
this 11th day of December, 2007.

Official Seal
Ryan Dee Wolf
Notary Public State of Illinois
My Commission Expires
06/05/2011

N Li 12/11/07

Notary Public

My commission expires: 6/5/11

NOISE SOLUTIONS BY GREG ZAK, INC.

1800 PROVIDENCE LANE
SPRINGFIELD, ILLINOIS 62711
(217) **698-3507**
(217) **698-5666-FAX**
e-mail: gregzak@gregzak.com

Greg Zak, INCE

RESUME'

EXPERIENCE

Greg Zak has over 35 years of experience dealing with noise measurement, noise control engineering and the effects of noise on people and communities. He established Noise Solutions by Greg Zak in March of 2001, which has become a full time activity since August 1, 2001. Since its inception, Noise Solutions by Greg Zak has served over 60 clients from the private and public sectors, as well as the power industry, with particular emphasis in the development of wind energy.

In the last six years, Greg Zak has appeared before County Planning Commissions, Zoning Boards and County Boards to testify at hearings stating his opinion as an expert, on projected sound levels related to the establishment of wind farms in various locations in Illinois. In addition, he has authored reports and/or reviewed the professional reports of other firms to give his opinion and has also provided his clients with signed certifications attesting to their accuracy. He has served as the noise expert for the following wind energy projects and their related wind turbines: Crescent Ridge (NEG Micon 72C); Crescent Ridge (NEG Micon 82C); Manlius for Bureau Valley School (V47); Butler Ridge (NM82); NEG Micon in Champaign (NM82); Camp Grove (GE77m and V82m); Blackstone (VI00 or V90) and Loran, in Stephenson County and Baileyville, hi Ogle County (G80); Arrowsmith, Ellsworth and Saybrook in McLean County, Illinois (V82) which at the time was the largest land-based wind project in the U.S. and Earl Park (GE77) in Benton County, Indiana.

He represented the Ameren Energy Generating Company, as Ameren's Illinois Noise Expert, when testifying before the Illinois Pollution Control Board's hearings captioned "Proposed Site Specific Regulation Applicable to Ameren Energy Generating Company, Elgin, Illinois, Amending 35 ILL. ADM. Code 901", PCB R04-11, January 22, 2004. This regulation was subsequently adopted by the Board.

As a private noise consultant, Greg Zak has appeared numerous tunes before the Illinois Pollution Control Board recognized as an expert witness. Prior to establishing his own firm, he acted as the Illinois Environmental Protection Agency's noise expert in nearly all enforcement and regulatory hearings before the Illinois Pollution Control Board, and in several Illinois Circuit Court hearings related to noise zoning and nuisance (1974-2001). His experience includes industrial, commercial, residential, urban, rural and construction noise.

He has been a member of a Society of Automotive Engineering Committee, and served as a member of the American National Standards Institute Working Group on the Measurement and Evaluation of Outdoor

Community Noise. He was selected by Governor Edgar to sit on the Blasting Task Force mandated by House Joint Resolution 133 and chaired by the Illinois Department of Natural Resources.

Noise issues dealt with for the Agency frequently involved the technical practicability and economic reasonableness of reducing or eliminating the noise emissions from the source. The ability to work with the public, elected and appointed officials, and consultants was an integral part of Greg Zak's noise program at IEPA. The needs of both the Agency and the public were carefully balanced. Thousands of Illinois residents with noise complaints were assisted through his self-help program.

As a national and international author in the area of environmental noise, Greg Zak has presented papers on controlling noise at national and international noise conferences. He served as a member of the working group for the American National Standards Institute's American National Standard for "Quantities and Procedures for Description and Measurement of Environmental Sound -- Part 5: Sound Level Descriptors For Determination of Compatible Land Use". ANSI S12.9-1998/Part 5.

Greg Zak has passed the required written examination, and has been elected a member in good standing by the Officers and Board of Directors of the Institute of Noise Control Engineering (INCE).

CHRONOLOGY OF EXPERIENCE

IEPA Noise Advisor 14+ years

Responsible for the I.E.P.A. Noise Program. Responsibilities included:
1) noise control efforts in the solid waste area and assisting citizens with noise complaints. Technical assistance for federal, state, and local governments to establish the degree of (or lack of) compliance with Illinois Noise Regulations;
2) making noise control engineering recommendations for abating noise emissions for federal, state, and local governments;
3) working with both solid waste sites, and manufacturers of acoustical materials and devices, to insure system compatibility and obtain the desired noise reduction;
4) assisting the public with a self-help procedure to obtain relief from various noise pollution sources (1000 to 2000 phone calls annually);
5) Advising counties and cities in the process of developing noise ordinances and noise measurement standards (provided classroom instruction for the Will County Sheriffs Department hi July '99, and for the Taylorville Police Dept. in Jan. '98);
6) Answering questions from industry, consultants, and legislators, as to how the various noise regulations apply in different situations;
7) Advising the State Police Crime Lab on measuring noise from guns equipped with silencers and taking the measurements for the lab;
8) Testifying under subpoena as an expert, numerous times, in environmental noise in enforcement cases, variance hearings, and regulatory hearings before the Illinois Pollution Control Board. Testifying under subpoena as an expert, numerous tunes, hi environmental noise in enforcement and zoning cases before an Illinois Circuit Court. Addressed environmental noise issues in zoning cases before county zoning boards at their request.

Below is a partial list of noise hearings in which Greg Zak qualified as an **expert witness:**

Pollution Control Board(ENFORCEMENT)

PCB 04-036, Petrosius v. The Illinois State Toll Highway Authority, December 6, 2005.

PCB 02-164, Stuart v. Fisher, March 9,2004.
PCB 02-41, Kamholz v. Sporleder, November 19, 2002.
PCB 00-140, Knox v. Turns Coal Company, June 11, 2002.
PCB 00-163, McDonough v. Robke (car wash), November 13, 2001.
PCB 00-219, Brill v. Latoria d/b/a TL Trucking Foodliner, September 26, 2001.
PCB 00-221, Glasgow, et al. v. Granite City Steel, July 10 & 11, 2001.
PCB 00-90, Young v. Gilster-Mary Lee Corporation, April 10, 2001.
PCB 99-19, Roti, et. al. v. LTD Commodities, Inc., November 2,1999.
PCB 98-81, Cohen, et. al. v. Overland Trucking, May 13, 1998.
PCB 96-110, Sara Scarpino & Margaret Scarpino v. Henry Pratt Company, October 11, & July 19, 1996.
PCB 96-53, David and Susi Shelton v. Steven and Nancy Crown, August 21, & July 3,1996.
PCB 93-15, Dorothy & Michael Furlan v. University of Illinois School of Medicine, July 29,1996.
PCB 96-22, Lew & Patricia D'Souza v. Richard & Joanne Marraccini, December 12, 1995.
PCB 94-146, Dorothy Hoffman v. City of Columbia, Illinois, December 11, 1995.
PCB 90-146, Village of Matteson v. World Music Theatre et al., July 27, 1992.
PCB 91-195, Thomas v. Carry Companies of Illinois, Inc., July 22, 1992.
PCB 91-50, Christ v. Compost Enterprises, Inc., June 2, 1992.
PCB 90-182, Tex v. Coggeshall, et al., January 9, 1992.
PCB 91-30, Curtis, Diesing, Vil. Crystal Lake v. Material Service Corp., Vil. of Lake in the Hills, December 17 & 18, 1991.
PCB 90-149, Moody & Madoux v. Strader's Logging & Lumber, 6-27-91.
PCB 90-148, Moody & Madoux v. B & M Steel Service, June 26, 1991.
PCB 90-59, Christianson v. American Milling Company, 6-27 & 9-6-90.
PCB 90-108, Stratton v. Little Caesar's Pizza, August 30, 1990.
PCB 89-169, Zarlenga v. Partnerships Concepts, et al., July 7 & 24, 1990.
PCB 89-205, Zivoli v. Prospect Dive and Sport Shop, June 14, 1990.
PCB 89-179, Martin v. Oak Valley Wood Products, Inc., 2-2 & 4-6-90.
PCB 88-171, Hagan v. Brainard, January 17, 1989.
PCB 87-171, Moore v. Archer Daniels Midland, August 5 & 29,1988.
PCB 87-139, Annino v. Browning Ferris Industries, Jan. 13, 1988.
PCB 74-50, Environmental Protection Agency v. Consolidation Coal Company, October 4, 1974.

U.S. Bankruptcy Court (ENFORCEMENT)

Northern Dist. I11., East. Div., Case #91 B 11678, (re. One Bloomingdale Place, PCB 92-178)
Testimony, January 3, 4, & 28, 1994; Deposition, January 20 & 21, 1994.
Deposition, January 5,1993; Testimony, June 29,1993.

Pollution Control Board (RULEMAKING);

R04-11, Proposed Site Specific Regulation Applicable to Ameren Energy Generating Company, Elgin, Illinois, Amending 35 ILL. ADM. Code 901, January 22, 2004.
R91-25, Amendments to 35 I.A.C. Subtitle H: Noise - Pertaining to Definitions, Measurement Procedures, and Sound Emission Standards Relating to Certain Noise Sources.— November 25 & 26, 1991.

Pollution Control Board (VARIANCE);

PCB 88-188, Shell Oil, September 18, 1990.

Circuit Court (ENFORCEMENT);

98-CH-16, People v. Bobby-T's, Inc., Mason County, October 13, 1999. (Roadhouse-music)
91-CH-242, People v. Watts (Sangamon Valley Landfill), Sangamon County. Deposition, October 15, 1993
; Testimony, December 19,1993.
93-CH-230, People v. Metro Ice Company, Inc., St. Clair County, October 14, 1993.
88-L-35, Lang v. Rangemasters Pistol Club, Williamson County, December 4, 6, & 12, 1990.
79-CH-48, Coffman et al v. Gehring et al, Knox County, October 16, 1979. (Propane Cannon)

Circuit Court (ZONING);
89-L-95, Brown v. White, Adams County, Re. Factory noise, June 4 & 5, 1990.
89-CH-23, Lambrecht v. Will County, Re. Limestone quarry development, February 22, 1990.
86-CH-22, Anderson v. City of Effingham, Effingham County, Re. Truck stop, July 25, 1988.

County Zoning Board (ZONING)
At the request of local authorities, Greg Zak testified regarding deficiencies in the noise study and report prepared by INDECK for Petition No. 99-04, Public Hearing, McHenry County Zoning Board of Appeals, INDECK Request for a Conditional Use Permit to Allow the Construction and Operation of an Electrical Generating Facility (gas turbine), April 16, 1999.
Petition No. 96-61, Construction & Operation of a Gravel Pit in McHenry County, March 27, & April 8, 1997.
City Planning Commission (ZONING);
Hoffman Estates, residents v. Tyre Works, Inc., July 7, 1999.
Hoffman Estates, residents v. Tyre Works, Inc., June 19, 1996.
Effingham, Anderson v. Petro, Re. truck stop, April 6, 1989.

Below is a partial list of **Pollution Control Board** noise hearings in which Greg Zak was involved as a **consultant** in resolving the conflict:

PCB 03-38, Gabel et al v. The Wealshire, Inc., June 22, 2004
PCB 03-96, Geber v. Carrie Scharf Trucking and Materials et al, January 22, 2004.
PCB 00-133, Giertych v. 4T's Management, L.L.C., December 19, 2002.
PCB 98-18, Metz, et. al. v. U.S. Postal Service and Bradley Real Estate, Springfield, September 1, 2000.
PCB 98-84, Behrmann v. Okawville Farmers Elevator-St. Libory, February 4, 1999.
PCB 96-20, Norman, et. al. v. U.S. Postal Service, Barrington, January 2, 1997.
PCB 96-69, Corning v. Hegji, June 20,1996.
PCB 92-38, Howard v. Caterpillar, Inc., September 3, 1992.
PCB 90-146, Village of Matteson v. World Music Theatre et al., July 27, 1992.
PCB 90-201, Dravis v. M & D AG, April 29, 1992.
PCB 91-128, Druen v. Leonard, January 30, 1992.
PCB 89-44, Western v. Moline Corporation, October, 1991.
PCB 90-145, Comer v. Gallatin National Balefill, September 3, 1991.
PCB 91-51, Collins v. Roberts Fish & Food, June 14,1991.
PCB 89-168, Daidone et al. v. Lexington Square, January 19, 1990.
PCB 88-199, People of the State of Illinois v. Seegers Grain, Inc., March/April, 1989.

NOISE CONTROL ENGINEERING

Below is a partial list of Illinois facilities that Greg Zak assisted in complying with Illinois Noise Regulations through advice based on noise control engineering:

January 21, 2004, Ameren. Prepared a report on field measurements taken of four gas turbine driven electric generators.

October 15, 2003, ComEd. Prepared two reports describing in detail the use of barriers and distance (inverse square law) to comply with the noise regulations for two commonly utilized types of transformers.

November13, 2002, Mascoutah Car Wash. Based on on-site observations, the noise emissions from the car wash property are best addressed by a 12-foot high noise barrier of sufficient length to break line-of-sight to the complainant's house and garden.

September 4, 2001, Double D Gun Club. Based on measurements and recommendations contained in the report, the Club reoriented several shooting stations from firing hi a northerly direction (toward the nearest complainant) to firing hi a southerly direction. Numerous hay bale barriers were constructed to deflect gunfire noise away from one of the complainant's residences.

August 2, 2001, Jackson Farms. Suggested noise barriers on the east and west sides of the facility, at least 14 feet high. This recommendation was based on the fact that the noise levels from reefers were 2-4 decibels above the allowable Illinois Daytime Noise Limits, and would be at least 12-14 decibels above nighttime limits. .

October 2, 1998, ComEd in downtown Chicago. Transformer measurements were performed for including a verbal report of findings and recommendations.

January 2, 1997, U.S. Postal Service, Barrington. Detailed noise measurements were taken. Based on the data gathered, specific recommendations were made to enclose the loading dock area and reschedule some loading operations. Recommendations were made and follow-up measurements indicated compliance. Complainants were satisfied with outcome.

August, 1993, IEPA HVAC. After considering costs of $50,000 for in-place silencing versus considerable less cost to relocate 7 problem units. Building owner followed and implemented recommendations of moving air conditioner compressors and fans away from the residential area. Cost was $18,000 to bring facility into compliance with Illinois Noise Regulations.

July, 1993, M & D Ag., grain aeration fan noise. Company followed and implemented recommendations of 28 plywood tortuous path fiberglass lined silencers at a cost of approximately $14,000, bringing facility into compliance with Illinois Noise Regulations.

October, 1991, Compost Enterprises, Inc., diesel engine noise from construction type equipment. Company followed and implemented muffler recommendations for 7 Nelson mufflers for $4,000 bringing facility into compliance with Illinois Noise Regulations.

May, 1991, Naperville Area Recycling Center can crusher. The crusher was retrofitted with acoustic treatments in a two phase process. Noise was reduced by 99% at a cost of less than $100. Company followed and implemented recommendations bringing facility into compliance with Illinois Noise Regulations.

March 1991, Oak Valley Wood Products Company, saws and hammering used in construction of furniture. Recommended lining plant with drywall and fiberglass, eliminating windows, keeping door closed, and improving ventilation. Company followed and implemented recommendations for $5,000 bringing facility into compliance with Illinois Noise Regulations.

February, 1991, Leonard Farm grain bin aeration fans & grain dryer. Recommended IAC and "homemade" silencers and acoustic enclosure for grain dryer. Farm followed and implemented $12,000 recommendations bringing facility into compliance with Illinois Noise Regulations.

January, 1991, ThermoCor in LaSalle, hazardous waste incinerator. Company followed and implemented recommendations for United McGill stack silencer, algorithm for computer control of air flow modified to prevent cavitation of induced draft fan with resulting 16 Hz. tone impacting residential area, an INC silencer for the combustion air blower, and acoustic enclosures at a cost of less than $14,000. Implementation of recommendations brought facility into compliance with Illinois Noise Regulations.

October, 1990, American Milling, pounding on metal and engine noise. Designed acoustic enclosures for semi-truck trailer and railcar unloading of gluten. Muffler specifications for stationary industrial diesel engine. Company followed and implemented recommendations for $105,000 bringing facility into compliance with Illinois Noise Regulations.

September, 1990, **Shell Oil Refinery** (Variance). Provided oversight, review, and acceptance or rejection of noise control engineering and measurements performed by Kamperman & Associates. This multi-phased project involved most noise sources in the refinery, costs ran between 5 **and** 7 **million dollars,** and required over a year to complete. These efforts ultimately brought the facility into compliance with all Illinois Noise Regulations.

May, 1990, Lexington Square (retirement home). Company followed and implemented recommendations to move cooling tower for $15,000, bringing facility into compliance with Illinois Noise Regulations.

February, 1990, Moline Company (foundry). Provided specifications for silencer for blower. Acoustic enclosures for scrap bay and tortuous path air intake for plant. Company followed and implemented recommendations for $27,000, bringing facility into compliance with Illinois Noise Regulations.

December, 1989, Westinghouse Environmental Services in LaSalle, hazardous waste incinerator. Company followed and implemented recommendations for United McGill stack silencer, Helmholtz resonator provided by Digisonix to abate pure tone hi stack, a Stoddard silencer for the combustion air blower, and acoustic enclosures at a cost of less than $20,000. Implementation of recommendations brought facility into compliance with Illinois Noise Regulations.

September, 1989, Brainard v. Hagan PCB 88-171. Company followed and implemented recommendations of plywood tortuous path lined silencers at a cost of less than $1,000, bringing facility into compliance with Illinois Noise Regulations.

August, 1989, Roy F. Weston, Inc. hi Beardstown, hazardous waste incinerator. Company followed and implemented recommendations for United McGill stack silencer, and fiberglass packing for baghouse air jets at a cost of less than $3,000. Implementation of recommendations brought facility into compliance with Illinois Noise Regulations.

April, 1989, Seegers. Recommended 120 silencers of homemade tortuous path design. Company followed and implemented recommendations for $36,000 bringing facility into compliance with Illinois Noise Regulations.

April, 1988, Environmental Systems Company (ENSCO) in Lemont, hazardous waste incinerator. Company followed and implemented recommendations for United McGill stack silencer, vibration dampers, lined chutes, and acoustic enclosures at a cost of less than $5,000. Implementation of recommendations brought facility into compliance with Illinois Noise Regulations.

January, 1988, Browning-Farris-Industries in Barrington, repairing & maintenance on garbage trucks. Company followed and implemented recommendations for $8,000, bringing facility into compliance with Illinois Noise Regulations.

April, 1981, Monticello Grain facility in Lodge, aeration fans. Company followed and implemented recommendations of plywood tortuous path fiberglass lined silencers and acoustic enclosures at a cost of less than $1,000, and implemented recommendations bringing facility into compliance with Illinois Noise Regulations.

September, 1978, Farm Services Lewistown Elevator, dryer & aeration fans. Company followed and implemented recommendations of "homemade" plywood tortuous path fiberglass lined silencers and acoustic enclosures at a cost of less than $2,000, bringing facility into compliance with Illinois Noise Regulations.

July, 1978, recommended and provided specifications for IAC silencers for Gilster-Mary Lee cake mix plant. The noise source was rooftop air pollution control baghouse fans. Company followed and implemented recommendations for $1,250 bringing facility into compliance with Illinois Noise Regulations.

July, 1977, Huey Forest Products. Recommended an acoustic enclosure for the saw mill consisting of drywall, plywood, and fiberglass for approximately $800. Company followed and implemented recommendations bringing facility into compliance with Illinois Noise Regulations.

April, 1977, recommended and provided specifications for LAC silencers and acoustic lined machine room for Lauhoff Grain. Company followed and implemented recommendations for $2,000 bringing facility into compliance with Illinois Noise Regulations.

August, 1976, Terminal Railroad Association of St. Louis hi Venice, wheel squeal from retarders hi humpyard. Recommended 12 concrete noise barriers lined with fiberglass. Company implemented recommendations. Ten were 100' long by 14' high, and two were 120' long by 14' high. The cost was $50,000, and reduced the noise levels by 27 dB at 2KHz.

December, 1975, Illinois Central Gulf Railroad hi Clinton, idling a locomotive at night hi a residential area. Recommended use of a diesel fired engine block heater. Company implemented recommendations for approximately $200, bringing company into compliance with Illinois Noise Regulations.

September, 1975, Norge in Herrin, air compressor noise. This appliance manufacturing company followed and implemented recommendations of closing windows & doors at a cost of a few thousand dollars to upgrade plant ventilation. This brought the facility into compliance with Illinois Noise Regulations.

ACOUSTICAL SOCIETY OF AMERICA

Served as a member of the Model Ordinance Working Group, charged with developing procedures for regulating community noise.

ANSI COMMITTEE

Served as a member on the American National Standards Institute Working Group on the Measurement and Evaluation of Outdoor Community Noise (SI2-15).

Greg Zak Resume' 12-6-07

SAE COMMITTEE

Served as a member of the Society of Automotive Engineers Construction Site Sound Level Committee, S.A.E. ConAg Committee (10-7-92 to 2-25-93).

INTERGOVERNMENTAL PROJECTS

City of Taylorville, Illinois, in 1997-8, input was provided to the City Attorney regarding how to simplify the state noise regulations for inclusion into a local ordinance. Noise monitoring equipment recommendations were given to the Chief of Police. A seminar was given to the patrolmen based on the newly adopted ordinance, equipment purchased, and measurement procedures used by the Illinois EPA. A written exam was prepared and administered to all attendees.

Illinois State Police, in 1997, noise measurements of gunfire were taken at the Chicago lab. These measurements established that abatement recommendations totaling approximately $30,000 were successfully implemented at the Chicago lab after plans for 3 shooting rooms hi the Lab under construction were reviewed and recommendations were made to minimize gunfire noise impact for areas not originally designed as a shooting area (1996). Noise abatement recommendations totaling approximately $10,000 were successfully implemented at the Springfield lab (1993), and $8,000 at the Morton lab (1995). Measured gunfire noise at the forensic labs in Springfield, Metro-East, Morton, Joliet, Carbondale, and Rockford for potential hearing damage (1992-95).

Illinois Department of Conservation, Reviewed plans for shooting range (Des Plaines Range) in Will County and met with design engineers to suggest noise abatement strategy (3-4-93). Conducted a one day seminar for Conservation Police Officers on how to use a sound level meter to measure boat noise to enforce the newly enacted noise regulations for watercraft (7-2-92).

Illinois Department of Nuclear Safety, Low Level Nuclear Waste Sites, reviewed, suggested changes, and met with developers regarding needed modifications to comply with Noise Regulations, 11-1-90.

Illinois Department of Agriculture, measured noise emission levels from HVAC and emergency generator at headquarters, submitted detailed noise control engineering plans to mitigate complaints from neighbors. Attended several meetings and assisted the **Capital Development Board** with technical details of solution. Noise problems were solved, 6-1-90.

Illinois Department of Commerce and Community Affairs, reviewed and suggested changes for plans to comply with Noise Regulations for: 1. proposed Toyo Koki plant, 5-26-89; and 2. proposed UPS facility in Willow Springs, 5-4-89.

Illinois Attorney General. Visited **K-5 Asphalt Plant** hi DuPage county at invitation of, and with representatives of AG to make recommendations to mitigate noise problems (6-22-92). Written opinion for Howard Chinn, Chief Engineer, on measuring **gunfire** noise on Fast meter response versus L_{eq} (5-20-89). Reviewed detailed 1987-8 blasting noise and vibration study at **Columbia Quarry** hi Columbia. Suggested procedural changes in blasting protocol to minimize complaints from neighbors (4-7-89). Noise measurements at **Mervis Industries** in Danville with a representative of the Attorney General's Office, along with consultant and attorney for Mervis regarding a pending enforcement action (7-15-88).

CHRONOLOGY OF PUBLISHED WRITINGS

"*Noise* in Illinois: The Human Factor", NOISE-CON 2003, Cleveland, Ohio, June 23,2003.

"The Role of State and Local Government Agencies in Noise Abatement and Control with a National Noise Policy". INTER-NOISE 2002, Dearborn, Michigan, August 22, 2002.

"State of Illinois Noise Regulations in 2001", Acoustical Society of America, Chicago, IL., June 7,2001.

Acknowledged for assistance and input, as a member of the Blasting Task Force in the publication entitled, "Blasting Task Force Final Report. House Joint Resolution 133. May, 1997."

Acknowledged for assistance and input, as a member of the Working Group, into ANSI S12.9-199x/Part 5 by Dr. Paul D. Schomer, Chairman of the Accredited Standards Committee entitled, "Quantities and Procedures for Description and Measurement of Environmental Sound - Part 5: Sound Level Descriptors For Determination of Compatible Land Use. March. 1997."

Acknowledged for assistance and input into; an article prepared for the Construction Safety Council of Chicago by Don Garvey, CIH, CSP, entitled, "Community Noise Regulations. 1997."

Acknowledged for assistance and input, as a member of the Working Group, into ANSI S12.9-1996/Part 4 by Dr. Paul D. Schomer, Vice Chairman of the Accredited Standards Committee entitled, "Quantities and Procedures for Description and Measurement of Environmental Sound - Part 4. Assessment Methods, January. 1996."

Acknowledged for assistance and input into; two reports/studies prepared for the Illinois Pollution Control Board by Dr. Paul Schomer entitled, "Impulse Noise Study. December 1990," and "Proposed Revisions to Property-Line-Noise-Source Measurement Procedures, June 1991."

NOISE CONTROL AT THREE HAZARDOUS/TOXIC WASTE CLEANUP AND INCINERATION SITES IN ILLINOIS USA. Presented at INTER-NOISE 89 (International Noise Conference) in Newport Beach, Calif. December 5,1989. Published in the INTER-NOISE 89 PROCEEDINGS.

Co-author of; "Illinois' Experience in Tracking Hazardous Waste Activities Through Manifests and Annual Reports" presented at the HAZPRO PROFESSIONAL SYMPOSIUM in Baltimore, Maryland on May 16, 1985.

ESTABLISHMENT OF A CALIBRATION LABORATORY FOR THE ILLINOIS ENVIRONMENTAL PROTECTION AGENCY. DIVISION OF NOISE POLLUTION CONTROL, presented at the National Noise and Vibration Control Conference and Exhibition, April 1979, and published in the 1979 NOISEXPO PROCEEDINGS.

Contributing author of Insertion Loss (or Gain) of Windscreens presented at 1978 Society of Automotive Engineers Conference and published in Society of Automotive Engineers Proceedings.

Acknowledged for assistance and input into; The Transfer Function of Quarry Blast Noise and Vibration into Typical Residential Structures, February 1977, prepared by Kamperman & Associates, Inc. under Contract 68-

01-4134 for the U.S. Environmental Protection Agency Office of Noise Abatement and Control, Washington D.C., 20460.

Performed the function of Technical Reviewer for the U.S. Department of the Interior, Bureau of Mines, manuscript titled; "Blast Noise Annoys." (1976)

Co-author of; "Quarry Blasting and the Neighbors" presented at Inter-Noise 76 in Washington D.C. on April 6, 1976.

Acknowledged for assistance and input into; "Quarry Blast Noise Study" by Kamperman & Associates, Inc. for the Illinois Institute for Environmental Quality, December, 1975.

Acknowledged for assistance and input into; Blast Noise Standards and Instrumentation, Bureau of Mines Environmental Research Program Technical Progress Report 78, May 1974, U.S. Department of the Interior.

Co-author of; Comparison of Noise Levels and Citizen Complaints presented at Inter-Noise 74 in Washington D.C., 1974.

SEMINARS & WORKSHOPS

Sat for INCE Membership Exam on December 14, 1995. Received letter of notification of acceptance for membership from the President of INCE dated January 12,1996.

One day seminar on Vibration Monitoring for Predictive Maintenance by Computational Systems Inc. (April 3, 1990).

Forty hour course in "Basic Level Training" (basic training in use of protective gear and detecting chemical hazards at a potential hazardous waste site) (March 21-25, 1988).

Two day workshop on "AIRPORT NOISE: RESOLVING THE CONFLICT" presented by the National Organization to Insure a Sound-Controlled Environment (N.O.I.S.E.) and cosponsored by the National League of Cities (May 1-2, 1987).

One day seminar by the U.S. Bureau of Mines on: SURFACE MINE BLASTING (April 15, 1987).

One and half day seminar by the HAZPRO PROFESSIONAL SYMPOSIUM on: "Certification Preparation Workshop" (May 16&17, 1985).

Half day seminar by the HAZPRO PROFESSIONAL SYMPOSIUM on: "Facility Siting and Remediation Seminar" (May 15,1985).

Half day seminar by the HAZPRO PROFESSIONAL SYMPOSIUM on: "When Should You Computerize Seminar" (May 15, 1985).

Two day seminar by the Illinois Data Processing Training Center on: MICRO-COMPUTER APPLICATIONS FOR MANAGEMENT PERSONNEL (April 5&6, 1984).

Three day seminar by the U.S.E.P.A. on: HYDROGEOLOGY/TNJECTION WELL TECHNOLOGY (May 24-26, 1983).

Participated in ENVIRONMENTAL CHEMISTRY by Sangamon State'University (February 15 to May 10, 1983).

Two day seminar and workshop by CECOS INTERNATIONAL on: AN ASSESSMENT OF INDUSTRIAL WASTE MANAGEMENT STRATEGIES (September 8&9, 1982).

One day seminar by the American Society of Mechanical Engineers on FAN SELECTION AND APPLICATION (November 19,1980).

One day seminar by Practical Management Associates on LEADERSHIP (October 16,1980).

Three day seminar by Practical Management Associates on COMMUNICATING THROUGH OBJECTIVES; SUPERVISION; MOTIVATION AND DISCIPLINE (February, 1980).

Three day seminar by the Illinois Department of Personnel on: TECHNICAL REPORT WRITING (October 9-11,1979).

Four day seminar by Bruel & Kjaer on DESIGN AND TESTING OF ACOUSTICAL MATERIALS (November 14-17,1977).

Two day seminar by Bruel & Kjaer on MICROPHONES AND ACCELEROMETERS: THEIR CALIBRATION AND USE (April 27, & 28, 1977).

One day seminar by Bruel & Kjaer on MICROPHONE AND ACCELEROMETER CALIBRATION (March 23, 1977).

Two day workshop by USEPA, Region 5, NOISE WORKSHOP (January 15, & 16, 1975).

Two day seminar at the University of Wisconsin titled, BLASTING CONSIDERATIONS AND TECHNIQUES FOR CONSTRUCTION (October 9, & 10, 1974).

One day seminar by Bruel & Kjaer on VIBRATION MEASUREMENT (November, 1973).

One day seminar by General Radio on SOUND MEASUREMENT INSTRUMENTATION (November, 1973).

Three day seminar on the FIELD USE OF SOUND MEASUREMENT INSTRUMENTATION by George Kamperman of Kamperman Associates, Inc. (September, 1973).

IEPA **Compliance Assurance Unit Manager 5 years**

Responsible for the supervision of sub-unit managers (2). The scope of responsibility covered insuring compliance by all facilities required to: 1) report ground water monitoring data; 2) report on underground injection control wells; 3) submit copies of manifests for individual shipments of special waste (300,000 per year); 4) issue hauling permits to transporters of special waste; 5) submit annual reports (10,000) on hazardous waste activity; 6) insure collection of all fees due the State for disposal, treatment, injection, or hauling hazardous (special) waste; and 6) insure computer tracking of items 1 through 5.

IEPA Noise Regional Manager 3 years

Responsible for the supervision of four Environmental Protection Specialists and all noise field operation activities in central and southern Illinois. Responsible for the calibration, programming, and systems development for all electronic systems and transducers.

IEPA Environmental Protection Specialist I through III 6 years

Responsible for investigating noise complaints. Investigation included in field interviews of complainants and alleged violators, along with sound level data gathering using precision sound level meters and tape-recorders. Detailed analysis was performed by Greg Zak in the laboratory. Noise control engineering solutions were drawn up to demonstrate the economic and technical practicability solving noise problems in cases before the Illinois Pollution Control Board (Board).

Meetings were held with alleged violators to arrive at an agreeable program of voluntary compliance with the Illinois Noise Regulations. Technical data was prepared and submitted to the Illinois Attorney General for use in litigation.

Acted as the primary Agency representative during the last 3 years in various studies of air blast and ground vibration peculiar to quarrying and surface mining. In addition to appearing as an expert witness for the Agency before the Board, Greg Zak drew up interim blasting noise and vibration regulations and presented these to the Mining Industry Task Force on Impulsive Noise and Vibration to which he was a member.

Greg Zak has appeared as an expert witness for the Agency at the request of the Board as to the acoustic effectiveness of the noise barriers he designed for the Terminal Railroad Association of St. Louis in their Venice, Illinois Classification Yard.

Greg Zak established a Calibration Laboratory for the Division of Noise Pollution Control along with the laboratory procedures for insuring traceability of calibration work to the National Bureau of Standards. In addition, he was responsible for electronic checks to insure proper functioning of field and laboratory instrumentation.

USMC Military Electronics Instructor 1 year

Responsible for discipline and instruction of 30 marine students in basic electronics.

USMC Radar Technician 2 years

Responsible for maintenance and repair of several military radar systems.

CERTIFICATIONS

He has passed the required written examination, and in December, 1995 was elected a member hi good standing by the Officers and Board of Directors of the Institute of Noise Control Engineering (INCE).

Sat for the examination for certification by the BOARD OF HAZARD CONTROL MANAGEMENT as a CERTIFIED HAZARDOUS MATERIALS MANAGER on May 17, 1985. Received certification as a CERTIFIED HAZARDOUS MATERIALS MANAGER at the MASTERS LEVEL **(CHMM).**

EDUCATION

B.S., Biology, San Diego State University, 1971.
M.A., Public Administration, University of Illinois at Springfield, 1974.

VETERAN

U.S.M.C., 1963-1966, Radar Technician, Electronics Instructor. Honorably discharged as a Sergeant. Served in DaNang, Vietnam, 1965.

PRIVATE SECTOR

Noise Solutions by Greg Zak, Inc. — current.

Licensed Private Pesticide Applicator — 19 yrs.

Hardwood Tree Farm, owner and operator — 20 yrs.


FORWARD
E PLURIBUS UNUM

TRYING TO SITE A WIND FARM IN THE TOWN OF STOCKBRIDGE

As Viewed by Marilyn Propson

Hello - My name is Marilyn Propson. I live in the Town Stockbridge, in Calumet County. My address is W4342 Quinney Rd., Chilton 53014. I hope to be the voice representing hundreds of landowners and thousands of acres of land in Wisconsin ready and willing to be part of the effort to move forward with wind energy projects. I hope the State of Wisconsin will take note that there is no shortage of landowners willing to sign on to host wind turbines.

I'd like to share a little history of the Town of Stockbridge with you today. I obtained the information before 2006 from a neighbor, Marvin Ecker, Jr.

Attempt #1 – In the spring of 1998, Madison Gas & Electric (MGE) came into the Town of Stockbridge and approached landowners to see if there was interest in siting a wind project. Three families signed lease options. Stockbridge then enacted a 24-month moratorium. The Public Service Commission approved MGE's application, but, as a result of the moratorium, MGE had to walk away from Stockbridge. Lawsuits were filed. The result – no turbines.

Attempt #2 – In June 2004, Marvin Ecker, Jr. obtained permission to build a single small turbine on his land. In May 2005, Marvin put up the turbine now standing on Quinney Hill. Stockbridge enacted another moratorium. The result – one farm-sized turbine.

Attempt #3 – In April 2005, shortly before Marvin's small turbine was erected, he applied for another permit to host four large turbines. In his words, while seeking the necessary permits, he was given the run-around. This triggered more legal action. The result – no turbines.

Attempt #4 – In early 2006, Midwest Wind Energy approached landowners in the Towns of Stockbridge and Brothertown for yet another try at a wind energy project. By November 2006, 33 families controlling 5,000 acres had signed on. In May 2007, the Town of Stockbridge adopted a 90-day moratorium. Later that month, Midwest Wind Energy sent a memo to Stockbridge landowners stating that development activities would be suspended due to the moratorium. In September 2007, Stockbridge enacted a Wind Energy Systems Licensing Ordinance, which was so restrictive that Midwest Wind Energy's project was no longer viable. In January 2008, the Town of Stockbridge received two Notices of Claim. The result – no turbines.

I risk sounding repetitive by chronicling the turbine siting history of the Town of Stockbridge, but we have such a vivid history of failure that old actions paint a more revealing picture than new words could ever convey. In the past, the Stockbridge Town Board has shown a total disregard for turbine siting recommendations made by either

Calumet County or the State of Wisconsin. The Board is familiar with litigation and does not fear it. As participating landowner in this wind project, we are part of the majority of citizens who are ready to embrace the prospect of alternative energy fueling our futures.

But there is a core group in Stockbridge that remains opposed to wind development, and they are relentless in their zeal to take the reins and steer the Stockbridge Town Board—and now the Calumet County Board—toward their goal, which is no turbines in Stockbridge. They were instrumental in the recall election of County Board Supervisor Jerry Criter, whose district includes all of Brothertown, and parts of Stockbridge and Chilton townships. They were unsuccessful in removing him from his position, but their defamatory allegations will not be forgotten any time soon. Nor will the taxpayers soon forget the unnecessary financial burden caused by a bogus sense of urgency created by the recall effort, as Jerry's term would have expired 49 days later.

I believe that this Township and this County, along with many others across the state, have exhausted their resources trying to resolve this conflict. We appear to be too polarized to make any further progress. It is time for the State to take up the laboring oar in this effort, to find a common ground workable to settle our differences and move forward toward achieving our goals. Please adopt legislation to establish uniform standards for local review of wind projects.

Thank you for your time.


FORWARD
E PLURIBUS UNUM

Dear Senator Plale and Members of the Commerce, Utilities and Rail Committee,

Please do not support bill SB-544.

I oppose this bill for many reasons, but here are some key issues:

- Responsible wind siting has been a heated issue for years in this state yet the public and community groups have been shut out of this bill authoring process.
- The bill takes away the power from the local communities to rightly decide what visual impact industrial wind turbines will have with irresponsible installations in the area that they live in.
- The bill gives the Public Service Commission the power to decide the proper setbacks to fulfill their personal agenda without regard for Public Health and Safety. If one looks at the Public Records from the Public Service Commission pertaining to the authoring of the WI Model Wind Ordinance Draft, you will see that there isn't any medical, scientific or other documented support in regard to 1000 foot setbacks from a residence, or a 50 dBA decibel limit being healthy for adults and especially children 24/7.
- In spite of what each of us has been told, an industrial wind turbine may have an ½ acre footprint, but they need 60 to 80 acres each to maximize their performance as per their design. So to compare this to a landfill or animal siting is not appropriate. The state is giving the Public Service Commission control of potentially millions of acres. Is this really what the citizens of Wisconsin want?
- The burden of control and compliance will be left in the hands of the local governments. How will they be equipped to handle potential complaints and problems? They are volunteers and they don't have the funds to adequately manage the situations they will be forced to address.
- Lastly, Wisconsin has a Class 2 Wind Source? In the latest report by the Governor's Global Warming Task Force dated 02-19-07, here is the link for your convenience, http://dnr.wi.gov/environmentprotect/gtfgw/documents/interim_report.pdf

  it states:

  "The Task Force believes that the most important first step Wisconsin can take to achieve early GHG reductions is to dramatically increase energy conservation and efficiency. This is essential because Wisconsin must import almost all of the fuel it depends upon today, **new power generation is likely to be very costly and Wisconsin lacks the wind resources of states to the west** and the geologic carbon sequestration potential of states to the south. While the state's future renewable resource potential appears to be substantial through the development of bio-energy resources and Great Lakes wind, these resources will take time to become commercial. In the meantime, efficiency must be our top priority".

"The Task Force recommends that the state, through the relevant state agencies, convene a study group to look at the technical and economic potential for developing wind energy on Lake Michigan and Lake Superior. The group, where appropriate, should work with other Great Lakes states. While terrestrial wind resources continue to provide the majority of renewable energy to Wisconsin, **this state does not have land-based wind of the same quality as its neighbors to the west**. As states increase their renewable portfolio standards, thus increasing the costs and decreasing the availability of terrestrial wind megawatts, Wisconsin should examine the potential that may lie only a few miles off its shores. This study should be completed by December 31, 2008".

Thank You for listening,

Cathy Bembinster

Evansville, WI


FORWARD
E PLURIBUS UNUM

Representative Montgomery, Senator Plale, and the Senate Committee Hearing public input on AB 899 – SB 544

Thank you for taking the time to listen to our concerns at the AB899 hearing session yesterday. My input came towards the end which is sad, because I would like to challenge all the wind lobbyists, so-called environmentalists, the PSC, and especially the Task Force on Global Warming who think there is a need for AB 899. There is none, and to pass it would do a great disservice to all of Wisconsin.

There needs to be local control over such important issues that will have impacts on a community for decades

The attached article shows the potential for our state in using our existing biomass as an alternative energy resource, and all of that biomass revenue would stay in state. Just think a 10% co-firing of Wisconsin biomass to replace coal would save the state 1.2 billion in coal costs. And, we would meet our 2015 goals early. No 400-foot tall machines required.

If AB 899/SB 544 becomes state law, and all of the health and safety concerns are then proven true regarding industrial scale wind turbines, what happens then? To whom do we turn? Not the PSC, because they have no health and safety professionals on staff that I can find.

Nobody wants to be the wind industry's "tradeoff" for lofty claims that can't seem to account for.

Please protect all of the residents of Wisconsin, and table AB 899/ SB544, especially since there is no need, and it will cause misery throughout even more of rural Wisconsin.

Kevin Kawula, 13133 W. Dorner Rd. Brodhead WI 53520 - 608·876·4255

p.s. Brett Hulsey of Better Environmental Solutions wrote the attached article. He is in Madison, and I sure he could tell you more. Brett@BetterEnvironmentalSolution.com 608-238-6070

Biomass: A Convenient Solution to the Inconvenient Truth of Global Warming

There is widespread consensus that global warming impacts are real and actions are needed. These facts have been highlighted by the International Panel on Climate Change and former Vice President Al Gore's Nobel Prize and Oscar winning movie and book, "An Inconvenient Truth."

Burning biomass is a convenient, cost-effective solution to reduce global warming and extreme climate changes. The U.S. EPA identified three main sources of U.S. greenhouse gases: burning fossil fuels for electricity, burning petroleum fuels for transportation, and other sources like agricultural fertilizer and tillage.

Three near term, proven solutions are:

1. Use energy more efficiently to save money;
2. Burn biomass with or instead of coal for more renewable electricity, and
3. Burn low carbon biofuels with or instead of gasoline and diesel in vehicles.

I addressed the transportation fuels global warming challenge in depth in *Ethanol: A Convenient Solution to an Inconvenient Truth* which showed that ethanol, especially moderate blends like 20 and 30% ethanol (E20 and E 30), can quickly reduce greenhouse gas emissions from vehicles on the road today and help stabilize CO2 from transportation, the largest and fastest growing sector.

Biomass: A Convenient Solution to the Inconvenient Truth of Global Warming, shows that co-firing 10-20% biomass blends with coal can reduce greenhouse gases, air pollution and save consumers money in many coal power plants in America today. Burning moderate biomass blends in existing power plants is one of the most cost-effective ways to reduce CO2 and other greenhouse gases (GHG). A peer reviewed study in *Environmental Science and Technology* found biomass is practical in the near term, compared to carbon sequestration, **"The 2-3 year time horizon for deployment-compared with 10-20 years for other CO2 mitigation options-makes co-firing particularly attractive."**

The U.S. Department of Energy reports that biomass is actually our leading non-hydro renewable electricity sources today. It produces 10 times more than wind and solar combined in Wisconsin, Biomass lowers CO2 emissions now, making it one of our most effective greenhouse gas (GHG) reduction programs.

The U.S. has an estimated available excess recoverable biomass reserve of 466 million tons per year. This converts to 233-308 million tons of coal-equivalent which could displace at least 20% of the nation's coal use, lowering coal greenhouse gases by 20%.

Moderate biomass blends are an easy way to reduce CO2 emissions from current coal plants and can be a convenient solution to the 'Inconvenient Truth' of global warming and extreme climate change. Biomass today produces 1.5% of our electricity and could reduce 460-900 million tons GHG annually with widespread biomass co-firing, compared to burning 100% coal.

By excess recoverable biomass we mean excess agricultural waste like corn cobs and stover, prairie grasses like switchgrass, urban and forest wood wastes, and manure. These fuels can be harvested sustainably to enhance soil health, water quality, restore habitat for native and threatened wildlife species, while lowering fire danger and flood risks. These fuels reduce CO2 because the plants take up CO2 that is released in the burning. Burning fossil fuels releases fossil CO2 that raises current CO2 levels, leading to global warming and radical climate change.

The biomass co-firing strategy can also save lives by reducing air pollutants like soot particulate matter (PM), nitrogen oxides (NOx) and carbon monoxide (CO), and mercury. NOx emissions can lead to higher ozone concentrations and asthma attacks. PM causes heart attacks, strokes and premature deaths. Co-firing biomass can be a cost effective way to help reduce pollution levels needed to meet EPA's current and proposed National Ambient Air Quality Standards for ozone, PM and urban air toxics. This is especially important for state air regulators since many parts of the nation will be out of attainment under the proposed EPA PM and ozone standards.

State and national leaders are now considering CO2 cap and trade programs and expanding the Renewable Portfolio Standard for renewable electricity. Increasing biomass co-firing offers one cost-effective way for power companies to reduce CO2 emissions for the current coal-fired power fleet with reasonable modifications and investments. Moderate biomass blends of 5-20% could also immediately reduce CO2 and can save electricity customers money compared to other CO2 control measures. This is needed while we wait for cleaner technologies to reduce fleet emissions.

One company, Alliant Energy, is leading efforts to co-fire switchgrass with coal with a 5% test burn at their Ottumwa Power Station in Iowa. They are also designing hybrid biomass plants to burn a significant amount of biomass at a plant expansion at Cassville, Wisconsin and a new power plant in Marshalltown, Iowa. These projects are important to show the power industry that biomass co-firing is a cost-effective solution to reducing GHG emission rates from electricity production.

Recommended next steps to promote this convenient solution to global warming include:

1. Approve plans to build more biomass co-firing at existing and all new power plants;
2. Government policies that promote renewable biomass blends in coal plants and facilities such as expanding the producer tax credit to all biomass burning.
3. Enact a national Renewable Portfolio Standard that requires all producers to provide more renewable electricity.

These simple steps can give us cleaner air, more energy security and save us money.

For more information, go to www.BetterEnviro.Com, call 608-238-6070, or email Brett@BetterEnviromentalSolution.Com.

energy center

Report

231-1

A Study of Wind Energy Development in Wisconsin

A Collaborative Report

July 1, 2004

ENERGY CENTER
OF WISCONSIN
We show you how

231-1

A Study of Wind Energy Development in Wisconsin

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This report is available for download at www.ecw.org.

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Ingrid Kelley

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Northwest Power & Conservation Council

BIENNIAL REVIEW OF THE COST OF WIND POWER

July 13, 2006

The Northwest Power and Conservation Council, in its 5th Power Plan estimated the levelized cost of new utility-scale windpower to range from $42 to $53/MWh[1]. The assumptions upon which these costs are based, developed with the assistance of an advisory group comprised of industry and utility representatives, are shown in the following table[2]. The assumptions date from 2002, a time of moderate wind development activity and were thought to be representative of equilibrium market conditions, suitable for the long-term nature of the Council's Plan. Conditions through late 2004, when the 5th Plan was adopted, did not appear to deviate significantly from these assumptions.

	Year 2000 (2006) dollars
Project Size (MW)	100
Capital ($/kW)	$1010 ($1160)
Fixed O&M ($/kW/yr)	$20[3] ($23)
Variable O&M ($/MWh)	$1 ($1.15)
Capacity Factor (%)	28 - 30%[4]
Shaping & Integration ($/MWh)	$4.55 - $9.75 ($5.23 - $11.20
Wheeling ($/kW/yr)	$20 ($23)
Transmission Losses	1.9%
Project life	20 years
Learning effects (on real cost)	-2.2 %/yr

The cost of new wind projects has risen substantially in real terms over the past two years. Bids for shaped and delivered energy from projects entering service in 2006 or 2007 range from about $45 to over $100/MWh. The principal element leading to the increase in delivered energy cost is an average real increase in project construction cost of about 40 to 50% over the assumption of the 5th Plan. Offsetting this cost increase has been an improvement in energy capture and conversion efficiency of about 7%.

Factors contributing to recent cost increases

Factors at play include the following:

Weakening dollar: Major components of many of the wind turbine generators used in U.S. wind farms are manufactured overseas. A weakening U.S. dollar has increased the cost of these machines. For example, the value of the Euro against the dollar has increased from $0.98 in July 2002 to $1.21 in March 2006.

---

[1] 2006 dollars, 2005 service, shaped and delivered, inclusive of the federal production tax credit for private financing.

[2] Costs are expressed in year 2000 dollars in the 5th Power Plan. Values in parenthesis are the year 2006 dollar equivalents to facilitate comparison to current market conditions.

[3] Excluding property tax and insurance.

[4] Eastern Washington, Oregon and Idaho sites. MT - 36%.

Increased commodity and energy costs: Commodities used in the manufacture and installation of wind turbines and ancillary equipment, including cement, copper, steel and resin (for blades) have increased in cost in recent years. Drivers have included general economic recovery, disaster recovery and increased demand from developing Asian economies. NYMEX copper increased from $0.72/lb in July 2002 to $2.32/lb in March 2006. Rebar has increased about 45% over the same period. Structural concrete is forecast to increase to about $580/cy in 2006, up 50% from 2002. Likewise, the cost of energy needed to fabricate, transport and erect wind turbine generators and related components has also increased. The average U.S. retail price of No. 2 diesel has increased from $0.85/gallon in July 2002 to $2.07/gallon in March 2006. Some believe that commodity prices are leveling off as new supply is developed or demand weakening. Copper futures, for example are declining.

Market demand for windpower: High natural gas costs, pending expiration of the federal production tax credit at the end of 2007, adoption of state renewable portfolio standards and increasing utility recognition of the risk of future CO_2 control costs have increased demand for new windpower. Increased demand has created shortages of turbines, specialized transportation and erection equipment, and experienced construction workers and operations and maintenance personnel. The buyer's market may have encouraged increased profit taking where possible among players in an industry that has experienced many lean years, though margins are said to remain thin. Turbines are generally not available from established vendors through 2007, last year of the current PTC extension, but are available for 2008 delivery.

Financing: Changes in the structure and terms of project financing have occurred, motivated by a maturing industry, the federal production tax credit and accelerated depreciation rates. Financing trends include (1) increasing investor-owned utility ownership of projects; (2) lower debt fractions including unlevered (pure equity) financing for non-utility projects; (3) lower equity return among investors in non-utility projects and (4) emergence of complex financial structures for the purpose of transferring PTC and accelerated depreciation tax benefits to third party investors able to use these benefits.

Performance improvements: Increases in swept area and hub heights, improved reliability and improved project and turbine siting have lead to improvement in turbine performance. Though not a completely reliable indicator of improved performance, the energy capture and conversion efficiency of recent and proposed wind projects appear to be about 7 percent above the 5th Plan base assumption. In absolute terms, the typical capacity factor of a project located in eastern Washington or Oregon has improved from 30% to about 32%. The current generation of terrestrial utility-scale machines is approaching transportation and erection size and weight limits for prefabricated nacelles, blades and tower sections. This may reduce the historical rate of performance improvement.

Project size: Increasing project size has produced economics of procurement, construction and operation. Average project size in the Northwest increased from about 20 MW for projects constructed from 1997 to 2000 to over 175 MW for projects currently under construction. Total project size continues to increase with the latest announced Northwest project being 750 MW. This and other very large projects are likely to be developed in phases, however.


FORWARD
E PLURIBUS UNUM

3.3 United Kingdom

The UK Noise Association has extensively studied turbine noise issues. From Location, Location, Location, An investigation into wind farms and noise by the Noise Association, by John Stewart (Ref. 8):

> Wind Farm Noise – the impact on areas of low background noise:
> Mid Wales -a land of hills and valleys. A place where the wind blows frequently and the population tends to be thinly spread. Ideal for wind farms. And, not surprisingly, many are planned. The **best place very often for the turbines to catch the wind is close to the top of a hill**. It means that the wind turbines can be at their most productive. But it also means that the **noise may cascade down the surrounding valleys**. To makes matters worse, many of the scattered hamlets within the valleys snuggle into corners protected by the hills and the mountains where the background noise level is very low indeed. **You only need to visit these areas to hear the 'swish, swish, swish' of the turbines – particularly downwind – over a mile away from the wind farm.**
>
> (emphasis added)

The description of Mid Wales above describes much of the scenic Pendleton County. The prevailing (urban) UK national guidelines for noise limits are (from Stewart)

> • Daytime noise levels outside the properties nearest the turbines should not exceed 35-40dB(A) or 5dB(A) above the prevailing background, whichever is the greater.
> • Night noise limits outside the nearest property should not exceed 43dB(A) or 5dB(A) above the prevailing background, whichever is the greater.

+5 over L90

35 dBA for Quiet areas

But in areas like Mid Wales, the guidelines are deemed by the UK Noise Association to give noise levels **too high**. Likewise, a lower noise threshold in the 35 dBA range is to be anticipated for Pendleton County.

Further corroboration pertaining to Scotland siting comes from Dick Bowdler, "a noise and acoustic consultant for more than 30 years and most of my current work is dealing with the assessment of environmental noise as it affects residential properties. I work equally for those potentially creating noise and those affected by it. I have been a supporter of wind energy and other forms of renewable energy for some 35 years." (Ref. 9) Continuing, he says:

> In practice, in most rural areas, my rule of thumb is that the nearest turbine needs to be at least 1¼ miles from any house. However, these are areas where the background noise level can be 20dBA at night. You suggest that your background noise level could be 30-32dB. This seems a likely figure if you have 350 houses in the area, though I suspect it could be a bit lower than this. On this basis, noise from the wind farm should not exceed 35dBA. If the developers are suggesting that 55 decibels is acceptable, this is quite outrageous. 55dBA is more than four times as loud as your background noise.

55 dBA not acceptable

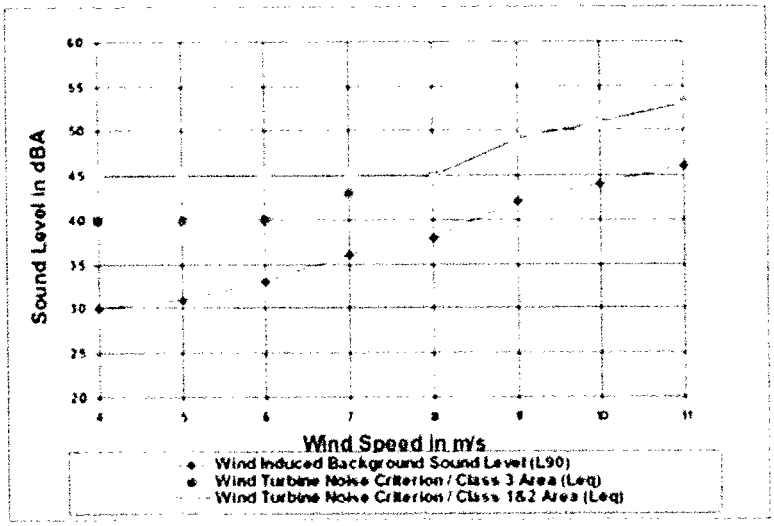
> Most of the Scottish wind farms that have recently been approved have no housing closer than about 1 mile, except where the house belongs to the landowner of the wind farm site. There are a few applications with houses as close as about 2000 feet but these have all either been turned down or withdrawn by the developer.

> I am not familiar with the GE turbines, but I suspect that they have a sound power level of about 105dBA. In this case, the noise level would be between 45 and 50dBA at 1400 feet in neutral weather conditions and if the nearest turbines were in full view. (emphasis added)

45 to 50 dBA Expected at 1400 feet

3.4 Sweden

The Swedish Environmental Protection Agency (SEPA) published a report "Noise Annoyance from Wind Turbines – a review" (Ref. 10). This report "reviews the present knowledge on perception and annoyance of noise from wind turbines in residential areas as well as in recreational areas."



"Class 3 Area" means a rural area with an acoustical environment that is dominated by natural sounds having little or no road traffic, such as the following:

i. a small community with less than 1000 population;

ii. agricultural area;

iii. a rural recreational area such as a cottage or a resort area; or a wilderness area.

Fig. 8: Ontario Canada Turbine Noise Acceptance Chart

The study relates information useful for two criteria: perception and objection. Each receptor location, turbine location, vegetation and terrain may have a marked impact on turbine noise perception. This is particularly important in geographies having many undulating hills. From the study:

> Topographical conditions at site have importance for the degrees to which the noises from wind turbines are masked by the wind. **Dwellings that are positioned within deep valleys or are sheltered from the wind in other ways may be exposed to low levels of background noise, even though the wind is strong at the position of the wind turbine** [Hayes 1996]. The noise from the turbine may on these conditions be perceived at lower sound pressure levels then expected. Current recommendation state that measures and sound propagation calculations should be based on a wind speed of 8 m/s at 10 meter above the ground, down wind conditions, creating a "worst case" scenario. This recommendation does not consider the case described above.

Also the objection to noise was categorized by a well composed, statistically valid survey of a variety of residents near a moderate-power (600 KW/unit) wind turbine installation. The study setup parameters are given below, followed by Fig. 9, a "chart of annoyance" from the report summarizing the results.

> The Swedish study was performed in Laholm during May-June 2000. The areas chosen comprised in total 16 wind turbines thereof 14 had a power of 600 kW. The study base comprised one randomly

selected subject between the ages of 18 and 75 in each household living within a calculated wind turbine sound pressure level of 25 to 40 dBA (n=518).
The annoyance was measured using a questionnaire. The purpose of the study was masked and among questions on living conditions in the countryside, questions directly related to wind turbines were included. Annoyance from several outdoor sources was asked for regarding the degree of annoyance both outdoor and indoor. Annoyance was measured with a 5-graded verbal scale ranging from "do not notice" to "very annoyed". The same scale was used for measuring annoyance from wind turbines specifically (noise, shadows, reflections, changed view and psycho-acoustical characters). The respondents' attitude of the impact of wind turbines on the landscape scenery and the attitude to wind power in general were also measured with a 5-graded verbal scale, ranging from "very positive" to "very negative". Questions regarding living conditions, health, sensitivity to noise and employment were also included. A total of 356 respondents answered the questionnaire, which gave a total response-rate of 69%.
For each respondent calculated A-weighted sound pressure level as well as distance and direction to the nearest wind turbine were obtained. Sound pressure levels (dBA) were calculated at 2.5-decibel intervals for each household. The calculations were done in accordance with [Naturvårdsverket 2001] and reflect downwind conditions. Data of distance between the dwelling of the respondent and the nearest wind turbine, as well as the direction, was obtained from maps.
The correlation between noise annoyance from wind turbines and sound pressure level was statistically significant (r_s=0.399; n=341; p<0.001). **The annoyance increased with increasing sound pressure level at sound pressure levels exceeding 35 dBA**. No respondent stated themselves very annoyed at sound pressure levels below 32.5 dBA (Fig. 1). **At sound pressure levels in the range of 37.5 to 40.0 dBA, 20% were very annoyed and above 40 dBA 36%.** The confidence intervals were though wide; see Figure 1.

(emphasis added)

Annoyance occurs When sound exceeds 35 dBA.

Note that about 40% of the participants find turbine sounds above 40 dBA "very objectionable". Even 32.5-35 dBA are "very objectionable" to 10 % of respondents. This study should serve as a direct warning that residents will strongly object to the Liberty Gap project if sited as planned. After turbine farms are operational, with finality and permanence, resident "receptors" will have no recourse for any mitigation other than to physically move away. What price will they receive for their real estate when prospective buyers find that the seller is moving because they can't stand the noise?

Also of interest from the Swedish EPA study are comments relating to wilderness areas pertaining to much of Pendleton County.

"3.3 Perception of noise from wind turbines in wilderness recreational areas

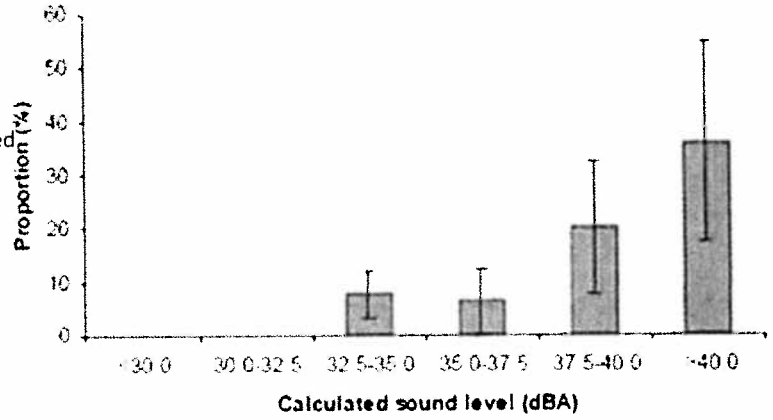
The special soundscape of wilderness recreational areas has been described by a number of authors, e.g. [Miller 2001, Dickinson 2002]. **The soundscape differs from site to site and can be very quiet in remote areas, especially when vegetation is sparse** (as in the Swedish bare mountain region). In a comparison between different outdoor settings in USA, it was found that the sound pressure level in a suburban area at nighttime was above 40 **dBA**, along a river in Grand Canyon 30-40 dBA and **at a remote trail in the same park 10-20 dBA** [Miller, 2002]. **The effect of intruding sound should be judged in relation to the natural ambient soundscape. The sound pressure level of the intruding sound must be compared to the sound pressure levels of the background noise**. The durability of audibility is another variable of importance for understanding visitors' reactions to noise [Miller 2001].

No studies on noise from wind turbines in wilderness areas have to my knowledge been carried out, but the effect of noise from other sources has been discussed in a few articles. A larger study on noise annoyance from aircraft over-flights on wilderness recreationists was performed in three wilderness areas in USA [Fidell et al 1996].

(emphasis added)

Intruding sound must Be judged against Natural background Sounds.

30% very annoyed
With turbines
Over 40 dBA



The proportions very annoyed by noise outdoors from wind turbines (95%CI) at different A-weighted sound pressure levels [Pedersen and Persson Waye 2002]

Fig. 9: Chart of Very Annoyed Respondents

3.5 NASA

Noises carry greater distances from elevated noise sources like wind turbines and this has been reported by NASA in a study *Wind Turbine Acoustic* by Hubbard and Shepherd (Ref. 11) From the Introduction:

> Wind turbine generators... are producing electricity both singly and in wind power stations that encompass hundreds of machines. Many installations are in uninhabited areas far from established residences, and therefore there are no apparent environmental impacts in terms of noise. There is, however, **the potential for situations in which the radiated noise can be heard by residents of adjacent neighborhoods, particularly those neighborhoods with low ambient noise levels**. ... (emphasis added)

This report contains detailed noise analyses of various wind turbine styles – upwind rotors vs. downwind rotors, blade shape, rotational speed etc. And it includes a detailed sound propagation analysis. Sound "bends" (refracts) in the atmosphere much like light refracts in striking a lens. A graph of the effect, from the report, is shown in Fig. 10 below.

The "Shadow" zone in the figure may explain the observed "quietness" experienced by observers when taken to stand near wind farm turbines such as the Fenner wind farm. The noises are masked unless the observer is 4x the tower height distance. And it underscores the necessity of comprehensive and accurate engineering studies of complex phenomena. Merely relying on anecdotal "I don't hear anything" knee jerk responses to a turbine visit is misleading and hardly equivalent to living year round as a saturated "receptor".

Recall from the Mid Wales description above that turbine sounds carry one mile. This is shown in the NASA study as well, Fig. 11 below, for a single "point source" turbine. The sounds carry further for a "line" of turbines such as with the Liberty Gap Wind Farm adding 6 dB or more.

From Fig. 11 it can be seen that the sound drops about 30 dB (for 1000 Hz, the most sensitive to human hearing) at 1,000 meters (about 3,000 ft). All megawatt scale wind turbines, regardless of manufacturer emit at 100-105 dBA and therefore at 3,000 ft the noise is 100-30 = 70 dB. At one mile (5280 ft = 1609 meter) the chart, which has a logarithmic scale, gives about a 60 dB drop, or 40 dB remaining (100-60= 40). The 40 dB figure is about what the Europeans use for their noise boundary, with a 1 mile setback too. Notice that for low-frequency sounds, such as the blade-support tower induced "whosh" (250 Hz on the graph), that the sound carries much further, out to 2 miles.

Wind direction and
Temperature boundaries
Can raise turbine
Sound levels by
15 dBA or more over
Levels predicted
By computer
models.

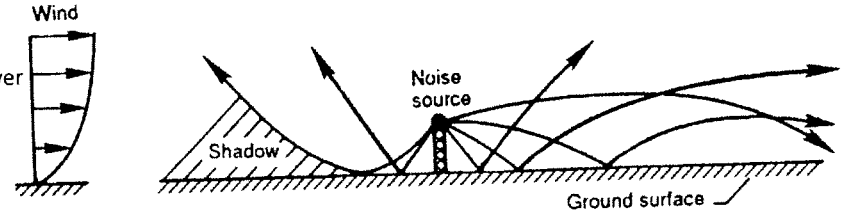


Figure 7-20. Effects of wind-induced refraction on acoustic rays radiating from an elevated point source [Shepherd and Hubbard 1985]

Fig. 10: Sound Refraction Effects (NASA Fig 7-20)

Fig. 12 gives a graph comparing the Acentech noise attenuation from its Cadna/A generated contour map with that from NASA, as well as from a New York DEC table (Ref. 2) of sound propagation for construction equipment. Its easy to see there is strong disagreement between the attenuation curves given by NASA and NYSDEC and the Acentech data. Acentech shows the turbine noise attenuating 30 dB more than NASA and construction noises about 20 dBA more than the NYSDEC. Clearly there is a serious flaw in the Cadna/A software itself or the input variables were not set correctly.

3.6 W.H.O. Sound Levels for Night Sleeping

The World Health Organization (Ref. 11) has begun conducting comprehensive analysis of the health impairment due to night time noises and disturbance to sleep. Though targeting the effects from aircraft and highway noises the conclusions can be associated with wind turbines since those studies are as yet not started.

The WHO conclusions to date should serve as a guide and warning.

Conclusions:

8. **There was unanimous agreement that disturbed sleep had serious health** effects – solid evidence existed in sleep medicine, the insomnia model would be used as a proxy and its causes and effects described on the final document.

Outdoor Levels greater Than 42 dBA at Night Induced sleep disturbances.

9. The analysis of the evidence suggested **that Lnight outdoor>42 dB(A) induced sleep disturbances.**

18. The NOAEL for Myocardial Infarction was Lday = 60–65 dB outdoors **and Lnight outdoors = 50 – 55 dB** for road traffic. (see footnote 1)[1]

(emphasis added)

4.0 Conclusion

The massive scale of the proposed Liberty Gap Wind Farm, occupying the entire ridgeline along Jack Mountain with 40 or more wind turbines has the potential to cause strong noise pollution for at least the 20 year turbine lifetime. Mitigation of wind farm noise is not possible other than to curtail operation, which would be contrary to the purpose of the farm and is highly unlikely. A careful, accurate analysis of the noise potential is essential. Acentech claims their analysis shows the wind farm will not create noises above the community average and that the noises are within EPA and other agency guidelines. As shown in this report however the Acentech report is far from adequate and suffers serious flaws:

---

[1] As the report discusses there is an association between long term noise exposure and heart attack (myocardial infraction or MI):

> **Sufficient evidence existed for an association between community noise and ischaemic heart diseases;** limited/sufficient evidence existed for an association between community noise and hypertension. Most information came from road traffic noise studies but there was normally little information regarding night noise in particular. But **night time values could be extrapolated from day time results.**
> Below 60 dB(A) for Lday there was no noticeable increase in MI risk to be detected. Therefore for the time-being, Lday = 60 dB(A) could be set as the NOAEL ("no observed adverse effect level") for road traffic noise and myocardial infarction (Babisch, 2002). For noise levels greater than 60 dB(A), the MI risk increased continuously, and was greater than 1.2 for noise levels of 70 dB(A).
> *Discussion*
> **Normally CVD effects manifested themselves after 10 years living in a noisy area.**
> (emphasis added)


FORWARD
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<ghanselwi@sbcglobal.net>
01/09/2008 05:01 PM

To "a gmhwi" <gmhwi-1@yahoo.com>, <Dan.Hedrich@thrivent.com>
cc
bcc
Subject Re: 1,800 foot explained.

History: This message has been replied to and forwarded.

Here is Gary's caculations, the sections that are in yellow give the DB level at the nacelle (generator Housing) of a Vistas Wind Turbine they were the only company that had this information avialble to the public. It is based on a 1.5 Mega Watt Turbine. This information was from 11-28-2007 see top of page top of page 3.

Also on page 3 it is high lighted that to achieve a 50.2 DB level from the turbine nacelle (generating housing) which is creating 105 db (inforamtion given by Vistas) at the genreator housing it would require a distance of 1,800 feet. Gary said his numbers could be off by 3 db in either direction.

That is why if the State of WI in the model ordiance and Calumet County in our current ordiance require a max sound level of 50 db at a residence it would require a setback of at least 1,800 feet to achieve this level. It is not that this is the prefered sound level (50db) but it is what the State reccomended Maximum is. If we were to go to the level of 40 db you can see, it would require a setback of 5,000 to 6,000 feet which is about 1mile to achieve this sound level at a Sensative Receptor (residence). The Ad Hoc committee is not asking for the maximum safe limits in the 1,800 feet. We are asking for the minimum limit that people may be able to tolerate the noise. From my conversation with Rick James the sound expert, he said that "a person could tolerate it but they may not like it at 1,800 feet".

As noted these numbers do not take into account Weather inversions, refelection of sound off the ground, sound from more than on turbine creating a increased beat frequentcy, ETC. All of these variable would increase the sound DB level. Vegatation may provide some absorption of the sound which may lower the level some.

Why was1,800 feet chosen? THE NUMBERS DO NOT LIE! This is the minimum safe distance required for a 50 db limit at a Sensative Receptor (residence).

This attachment is in Microsoft Excel 97/2000/XP (.xls) format. If this doesn't work I will have to try a different spreadsheet format.

Vistas 105 db 080109x.xls

11-28-07 105 decibel source — Sphere spreading

PAGE 1

Distance Feet	Conversion AREA 4XPI (R^2) Meters^2	Intensity Vibration of air Watts/square Meter	Intensity comparison To 1,000 ft Value	Intensity comparison To 10,000 ft Value
3.28	12.6	0.0316000000	92950.62	9295062.5
30	1050.7	0.0003777394	1111.11	111111.1
100	11674.6	0.0000339965	100.00	10000.0
200	46698.4	0.0000084991	25.00	2500.0
300	105071.4	0.0000037774	11.11	1111.1
400	186793.6	0.0000021248	6.25	625.0
500	291865.0	0.0000013599	4.00	400.0
600	420285.5	0.0000009443	2.78	277.8
700	572055.3	0.0000006938	2.04	204.1
800	747174.3	0.0000005312	1.56	156.3
900	945642.5	0.0000004197	1.23	123.5
1000	1167459.8	0.0000003400	1.00	100.0
1100	1412626.4	0.0000002810	0.83	82.6
1200	1681142.2	0.0000002361	0.69	69.4
1300	1973007.1	0.0000002012	0.59	59.2
1400	2288221.3	0.0000001735	0.51	51.0
1500	2626784.7	0.0000001511	0.44	44.4
1600	2988697.2	0.0000001328	0.39	39.1
1700	3373959.0	0.0000001176	0.35	34.6
1800	3782569.9	0.0000001049	0.31	30.9
1900	4214530.0	0.0000000942	0.28	27.7
2000	4669839.4	0.0000000850	0.25	25.0
2500	7296624.0	0.0000000544	0.16	16.0
3000	10507138.6	0.0000000378	0.11	11.1
4000	18679357.5	0.0000000212	0.06	6.3
5000	29186496.1	0.0000000136	0.04	4.0
6000	42028554.4	0.0000000094	0.03	2.8
7000	57205532.4	0.0000000069	0.02	2.0
8000	74717430.1	0.0000000053	0.02	1.6
9000	94564247.5	0.0000000042	0.01	1.2
10000	116745984.5	0.0000000034	0.01	1.0

PAGE 2

11-28-07 105 decibel source — Sphere spreading

P= 105 db wind turbine = 0.3969 Watts

The sound source should be in watts but wind turbines use decibels.

Vibration intensity (of the air) = Source / distance squared
Vibration intensity is what travels through the air to the person.
1 meter = 3.28 feet

decibels = 10 log(Vibration Intensity/1E-12 Watts per square Meter)

db = 10 (Log (VI / 1E-12))

The values of decibels and intensity are based on equations and represent an Ideal situation. In an actual situation, these values will be larger or smaller because the sound waves are affected by Reflection, absorption, and other wave interaction.
See page 17 of white paper on Wind Turbine Acoustic Noise.

Sound is sensation that vibration intensity causes.
If the vibration intensity is 10 times greater the sound is 2 times greater.

11-28-07 105 decibel source (nacelle) Sphere spreading

sound PAGE 3 decibels	Loudness Comparison To 10000 ft Value	Distance Feet	x= Log(y) 10^x= y 2 = log (100)
105.0	125.21	3.28	10 ^ 2 = 100
85.8	33.03	30	
75.3	16.00	100	db = 10 log(VI / 1E-12))
69.3	10.54	200	
65.8	8.26	300	105db =10 log(VI / 1E-12)
63.3	6.94	400	
			10.5 =log(VI / 1E-12)
61.3	6.07	500	
59.8	5.44	600	10^10.5= VI / 1E-12
58.4	4.96	700	
57.3	4.58	800	(10^10.5) (1E-12) = VI
56.2	4.26	900	
55.3	4.00	1000	0.031622776602 = VI
54.5	3.78	1100	
53.7	3.58	1200	0.0316 = VI
53.0	3.42	1300	Watts / square meter
52.4	3.27	1400	VI = P / A or P =V I x A
51.8	3.13	1500	IF R = 1 METER
51.2	3.01	1600	P = VI X (4 PI R^2)
50.7	2.91	1700	P = 0.1984 WATTS
50.2	2.81	1800	0.396896
49.7	2.72	1900	
49.3	2.64	2000	
47.4	2.30	2500	
45.8	2.06	3000	
43.3	1.74	4000	
41.3	1.52	5000	
39.8	1.36	6000	
38.4	1.24	7000	
37.3	1.14	8000	
36.2	1.07	9000	
35.3	1.00	10000	


FORWARD
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Chapter 21

21.01 Title: Wind Generator and Wind Generating Facility Ordinance for Trempealeau County

21.02 Purpose: This chapter of County ordinances provides a regulatory framework for the construction and operation of Wind Energy Facilities in Trempealeau County, subject to reasonable restrictions, which will preserve the public health and safety.

21.03 Definitions: As used in this Chapter, the following terms have the meanings indicated:

Affected Property: Property impacted by personal or Commercial Wind Turbine.

Applicant: The person or entity filing an application under this Ordinance.

Commercial Wind Turbine: A wind energy conversion system which converts wind energy into electricity through the use of a wind driven turbine generator when the total height exceeds 150 feet or the nameplate capacity exceeds 100 kilowatts. Such wind turbine includes the turbine, blade, tower, base and pad transformer, if any.

Committee: The Zoning and Planning Committee of the County Board or any successor committee established by the Board for the oversight and supervision of Trempealeau County Zoning.

County: Trempealeau County, Wisconsin.

DNR: Department of Natural Resources

DOT: Department of Transportation

FAA: Federal Aviation Administration.

Farmstead: A farmstead is a place of employment and includes all buildings and structures on a farm that are used primarily for agricultural purposes such as housing animals, or storing supplies, production, or machinery.

Hobbyist Wind Turbine: A wind energy conversion system which converts wind energy into electricity through the use of a wind driven turbine generator when the total height is less than 50 feet and a prop diameter of 12 feet or less.

Hub Height: The distance measured from ground level to the center of the turbine hub.

MET Tower: A meteorological tower used for the measurement of wind speed.

Owner/Operator: The person or entity responsible for the day-to-day operation and maintenance of a wind turbine or Wind Energy Facility.

Personal Wind Turbine: A wind energy conversion system which converts wind energy into electricity through the use of a wind driven turbine generator when the Total Height is 150 feet or less.

Total Height: The distance measured from ground level to the blade of a wind turbine extended at its highest point.

Shadow Flicker: The moving shadows or shaded areas which are cast by rotating turbine blades.

Wind Energy Facility: An electricity generating facility consisting of one or more Wind Turbines under common ownership or operating control, and includes substations, MET Towers, cables/wires and other buildings accessory to such facility, whose main purpose is to supply electricity to off-site customer(s).

Wind Energy Facility Siting Permit or Wind Turbine Permit: A construction and operating permit granted in accordance with the provisions of this Ordinance.

21.04 Regulatory Framework

(1) Zoning

(a) Wind Energy Facilities and commercial wind turbines may only be constructed as Conditional Uses in areas that are zoned Exclusive Agriculture, Exclusive Agriculture – 2 and Primary Agriculture.

(b) Personal Wind Turbines may be constructed as a conditional use in areas that are zoned Exclusive Agriculture, Exclusive Agriculture – 2, Primary Agriculture and Rural Residential. They are limited to one wind turbine per contiguous parcels under common ownership.

(c) Hobbyist Wind Turbines may be constructed as a permitted use in areas that are zoned Exclusive Agriculture, Exclusive Agriculture – 2, Primary Agriculture and Rural Residential.

21.05 Applicability

(1) The requirements of this Ordinance shall apply to all wind turbines for which a permit was not issued prior to the effective date of this Ordinance. Wind turbines for which a required permit has been properly issued, or for which a permit was not required, prior to the effective date of this Ordinance shall not be required to meet the requirements of this Ordinance. However, any such pre-existing wind turbine which does not provide energy for a continuous period of twelve (12) months shall meet the requirements of this Ordinance prior to recommencing production of energy. No modification or alteration to an existing wind turbine shall be allowed without full compliance with this Ordinance.

21.06 General Requirements for Wind Energy Facilities

(1) Wind Turbines shall be painted a non-reflective, non-obtrusive color which shall be pre-approved through the conditional use process.

(2) At Wind Energy Facility sites, the design of the buildings and related structures shall, to the extent reasonably possible, use materials, colors, textures, screening and landscaping that will blend the Wind Energy Facility to the natural setting and then existing environment.

(3) Wind Energy Facilities shall not be artificially lighted, except to the extent required by the FAA or other applicable authority.

(4) Wind Turbines shall not be used for displaying any advertising except for reasonable identification of the manufacturer or operator of the Wind Energy Facility. Any such identification shall not appear on the blades or other moving parts or exceed six square feet per Wind Turbine.

(5) Electrical controls and control wiring and power-lines shall be wireless or not above ground except where wind farm collector wiring is brought together for connection to the transmission or distribution network, adjacent to that network.

(6) Routes of public travel to be used during the construction phase shall be documented by the Owner/Operator, and reviewed and approved by the Trempealeau County Highway Department, Town Chairman and Trempealeau County Zoning prior to construction. At the Committee's request a qualified independent third party, agreed to by the applicable entity(s), and paid for by the applicant, shall be hired to pre-inspect the roadways to be used during construction and an appropriate bond amount set. The public travel route will be re-inspected 30 days after project completion; any and all repairs will be completed within 90 days of end of construction project paid by the developer. The bond can be used by Trempealeau County for any degradation or damage caused by heavy machinery associated with the construction and demolition phases of a Wind Energy Facility.

(7) An appropriate continuous renewal bond amount will be set for each Wind Turbine for decommissioning should the Owner/Operator fail to comply with the Ordinance requirements or the Wind Turbine does not operate for a period of twelve (12) consecutive months.

(8) A signed statement by the landowner acknowledging that the landowner is financially responsible if the owner/operator fails to reclaim the site as required and that any removal and reclamation costs incurred by the county will become a lien on the property and may be collected from the landowner in the same manner as property taxes.

(9) Proof of continuous liability insurance in the minimum amount of five million dollars ($5,000,000.00) per occurrence shall be submitted to Trempealeau County indicating coverage for potential damages or injury to landowners, occupants, or other third parties.

(10) There shall be a timeline set prior to the construction phase of the project with a starting and ending date when the construction project will be completed.

(11) Evidence of compliance with FAA, DNR, DOT, United States Fish and Wildlife Service requirements and Signal Interference and Microwave Frequency Interference requirements must be submitted by the Applicant to Trempealeau County.

(12) A map shall be provided showing a proposed grid of any future Wind Energy Facilities being developed by the applicant to be located in Trempealeau County and surrounding counties.

(13) A document for each Wind Turbine including an accompanying diagram or maps showing the shadow flicker projection for a calendar year, in relation to affected property, roads and residences shall be submitted with the permit application.

(14) Access to a Facility and construction area shall be constructed and maintained following a detailed Erosion Control Plan in a manner designed to control erosion and provide maneuverability for service and emergency response vehicles.

(15) If a Wind Turbine foundation is proposed in a bedrock area, a baseline of all wells and certified public drinking sources in a ½ mile radius shall be established and permanent remedies shall be the responsibility of the developer if contamination occurs.

(16) If an area where Wind Turbines are planned is identified by the Fish and Wildlife Service to house a significant population of Bald or Golden Eagles a monopole tubular type tower shall be used instead of Lattice type towers.

(17) Setbacks: The following setbacks and separation requirements shall apply to Commercial Wind Turbines.

(a) Public Roads: Each Wind Turbine shall be set back from the nearest public road and its right of way a distance no less than two (2) times its Total Height.

(b) Railroads: Each Wind Turbine shall be set back from all railroads and their right of way a distance of no less than two (2) times its Total Height.

(c) Wind Turbine spacing: Each Wind Turbine shall have a separation distance from other Wind Turbines equal to one and two-tenths (1.2) times the total height of the tallest Wind Turbine.

(d) Communication and electrical lines: Each Wind Turbine shall be set back from the nearest above-ground public electric power line or telephone line a distance no less than two (2) times its Total Height.

(e) Inhabited structures: Each Wind Turbine shall be set back from the nearest structure used as a residence, school, hospital, church, place of employment or public library, a distance no less than one (1) mile, unless mitigation has taken place and agreed by owner/operator and affected property owners involved and recorded in the Trempealeau County Register of Deeds office which describes the benefited and burdened properties and which advises all subsequent owners of the burdened property.

(f) Property lines: Each Wind Turbine shall be set back from the nearest property line a distance no less than one-half (½) mile, unless mitigation has taken place and agreed by owner/operator and affected property owners involved, and recorded in the Trempealeau County Register of Deeds office which describes the benefited and burdened properties and which advises all subsequent owners of the burdened property.

(g) From any wetland, water body, environmental significant or scenic area, each Wind Turbine total height shall have a minimum setback of two (2) times its total height or one thousand (1,000) feet which ever is greater.

(h) From any historical, cultural and archeological resource area, each Wind Turbine shall have a minimum setback of two (2) times its Total Height or one thousand (1,000) feet which ever is greater.

(i) Any new proposed residences, schools, hospitals, churches, public libraries, or place of employment, shall apply for a conditional use permit if they are to be located in the required set back area stated in section 17 (e) Inhabited structures.

(j) Unless owned by the applicant, no parcel of real estate shall be subject to shadow flicker from a Wind Turbine unless mitigation has taken place and agreed by the owner/operator and affected property owners involved and recorded in the Trempealeau County Register of Deeds office which describes the benefited and burdened properties and which advises all subsequent owners of the burdened property that shadow flicker may exist at times on or at the burdened property.

(k) There shall be a two (2) mile Setback from any recognized U.S. Fish and Wildlife Refuge located in Trempealeau County.

(18) Noise: Audible Sound (Audible Noise) emitted during the operation of any Wind Energy Facility or individual Wind Turbine (includes Commercial Wind Turbines, Personal Wind Turbines and Hobbyist Wind Turbines) is limited to the standards set forth in this provision. Testing procedures are provided in Appendix A of this Ordinance.

a) Audible Noise due to Wind Energy Facility or Wind Turbine operations shall not exceed the lesser of five (5) decibels (dBA) increase over the existing background noise level (L_{90}) or exceed forty (40) decibels (dBA) for any period of time, when measured at any structure used as a residence, school, hospital, church, place of employment, or public library existing on the date of approval of any Wind Energy Facility Siting Permit or Wind Turbine permit. All measurements shall be taken using procedures meeting American National Standard Institute Standards including: ANSI S12.18-1994 (R 2004) American National Standard Procedures for Outdoor Measurement of Sound Pressure Level, and (ANSI) S12.9-Parts 1-5:

Part 1: American National Standard Quantities and Procedures for Description and Measurement of Environmental Sound
Part 2: Measurement of Long-Term, Wide-Area Sound
Part 3: Short-Term Measurements with an Observer Present
Part 4: Noise Assessment and Prediction of Long-Term Community Response
Part 5: Sound Level Descriptors for Determination of Compatible Land Use

Measurements must be taken with qualified acoustical testing instruments meeting ANSI Type 1 standards, and Class 1 filters. The windscreen recommended by the instrument's manufacturer must be used and measurements conducted only when wind speeds are ten (10) miles per hour (mph) or less. The microphone must be located at a height of one and two-tenths (1.2) to one and one-half (1.5) meters from the ground.

b) In the event Audible Noise due to Wind Energy Facility or Wind Turbine operations contains a steady Pure Tone, including, but not limited to, a whine, screech, or hum, the standards for audible noise set forth in subparagraph (a) of this subsection shall be reduced by five (5) dBA. A Pure Tone is defined to exist when the one-third (1/3) octave band sound pressure level in the band, including the tone, exceeds the arithmetic average of the sound pressure levels on the two (2) contiguous one-third (1/3) octave bands by five (5) dBA for center frequencies of five hundred (500) Hz and above, and eight (8) dBA for center frequencies between one hundred sixty (160) Hz and four hundred (400) Hz, or by fifteen (15) dBA for center frequencies less than or equal to one hundred twenty-five (125) Hz.

c) In the event the Audible Noise due to Wind Energy Facility or Wind Turbine operations contains Repetitive Impulsive Sounds, the permitted sound pressure level for Audible Noise in 19(a) shall be reduced by five (5) dBA.

d) In the event the Audible Noise due to Wind Energy Facility or Wind Turbine operations contains both a Pure Tone and Repetitive Impulsive Sounds, the permitted sound pressure level for Audible Noise in 19(a) shall be reduced by seven (7) dBA.

e) No low frequency sound or infrasound due to Wind Energy Facilities or Wind Turbine Operations shall be created which causes the sound pressure level at any existing residence, school, hospital, church, place of employment, or public library within a one (1) mile radius from any Wind Turbine to exceed the following limits:

TABLE 19.e.1

Band No.	1/3 Octave Band Center Frequency (HZ)	Limits for 1/3 Octave Bands	Limits for 1/1 Octave Bands
1	1.25 and below	65	
2	1.6	65	
3	2	65	70
4	2.5	65	
5	3.15	65	
6	4	65	70
7	5	65	
8	6.3	65	
9	8	65	70

10	10	65	
11	12.5	61	
12	16	61	65
13	20	61	
14	25	60	
15	31.5	58	63
16	40	58	
17	50	58	
18	63	55	61
19	80	53	
20	100	52	
21	125	50	55

f) A Wind Energy Facility or Wind Turbine operation that emits sound or causes structural or human body vibration with strong low-frequency content where the time-average C-weighted sound level exceeds the A-weighted sound level by at least 20 dB when measured inside a structure and adversely affects the subjective habitability or use of any existing residence, school, hospital, church, place of employment, or public library or other sensitive noise receptor shall be deemed unsafe and shall be shut down immediately. Exceeding any of the limits in Table 19.e.1 shall also be evidence that the Wind Energy Facility or Wind Turbine operation is unsafe and shall be shut down immediately.

g) Prior to approval, developers of a Commercial Wind Turbine operation or Commercial Wind Energy Facility shall submit a Pre-construction Background Noise Survey with measurements for each residence, school, hospital, church, place of employment, or public library within one (1) mile of the proposed development. The Background Noise Survey shall be conducted in accordance with the procedures provided in Appendix A of this Ordinance, showing background sound levels (L_{90}) and 1/1 or 1/3 octave band sound pressure levels (L_{90}) during the quietest periods of the day and night over a reasonable period of time (not less than 10 minutes of sampling). The Pre-construction Background Noise Survey shall be conducted at the Applicant's expense by an independent noise consultant contractor acceptable to the Trempealeau County Zoning Department.

h) Prior to approval, developers of a Commercial Wind Energy Facility or Commercial Wind Turbine operation shall provide additional information regarding the make and model of the turbines, Sound Power Levels (L_W) for each octave band from the Blade Passage Frequency up through 10,000 Hz, and a Sound Impact Study with results reported on a contour map projection showing the predicted sound pressure levels in each of those octave bands for all areas up to one (1) mile from any Commercial Wind Turbine or Commercial Wind Energy Facility for the wind speed and direction that would result in the worst case Wind Energy Facility sound emissions. The Sound Impact Study may be made by a computer modeling, but shall include a description of the assumptions made in the model's construction and algorithms. If the model does not consider the effects of

wind direction, geography of the terrain, and the effects of reinforcement from coherent sounds or tones from the turbines, these shall be identified and other means shall be used to adjust the model's output to account for these factors. The Sound Impact Study re ults shall be displayed as a contour map of the predicted levels, but shall also include a data table showing the predicted levels at any existing residence, school, hospital, church, public library, or place of employment within the model's boundaries. The predicted values shall include dBA values and shall also include the non-weighted octave band levels in the data tables. The Sound Impact Study shall be conducted at the Applicant's expense by an independent noise consultant contractor acceptable to the Trempealeau County Zoning Department.

i) Operators of a Commercial Wind Energy Facility or Commercial Wind Turbine operation shall submit a Post-construction Sound and Vibration Measurement Study conducted for each Commercial Wind Turbine or Commercial Wind Energy Facility according to the procedures provided in Appendix A of this Ordinance within twelve (12) months of the date that the project is fully operational to demonstrate compliance with the noise limitations in Section 19(a). The study shall be conducted at the wind energy facility owner/operator's expense by a noise consultant contractor acceptable to the Trempealeau County Zoning Department.

j) The Committee may impose a noise setback that exceeds the other setbacks set out in this Ordinance or require waivers from affected property owners and persons in legal possession acceptable to the Committee if it deems that greater setbacks are necessary to protect the public health and safety, or if the proposed wind energy facility is anticipated to exceed the levels set forth in Section 19(a) at any existing residence, school, hospital, church, place of employment, or public library.

k) Any noise level falling between two (2) whole decibels shall be deemed the higher of the two.

l) If the noise levels resulting from the Commercial Wind Turbine or Commercial Wind Energy Facility exceed the criteria listed above, a waiver to said levels may be granted by the Committee provided that express written consent from all affected property owners and persons in legal possession has been obtained stating that they are aware of the noise limitations imposed by this Ordinance, and that consent is granted to allow noise levels to exceed the maximum limits otherwise allowed. If the applicant wishes the waiver to apply to succeeding owners of the property, either a permanent noise impact easement or easement for the life of the wind turbine shall be recorded in the Trempealeau County Register of Deeds' office which describes the benefited and burdened properties and which advises all subsequent owners of the burdened property that noise levels in excess of those permitted by this Ordinance may exist at the burdened property.

m) A Noise Study may be conducted at the expense of a Commercial Wind Energy Facility or a Wind Turbine (Commercial, Personal or Hobbyist) Owner/Operator by an independent noise consultant contractor acceptable to the Trempealeau County Zoning Department if two (2) or more complaints are received and documented at a particular site. The study shall be conducted according to the procedures provided in Appendix A of this Ordinance for any sites where the complaints were documented. The Operator shall reimburse the County for the Noise Study expense within ten (10) days of billing. Failing to reimburse may be a basis for revoking a permit.

(19) Minimum Ground Clearance: The blade tip of a Commercial Wind Turbine shall, at its lowest point, have ground clearance of no less than seventy-five (75) feet. The blade tip of a personal and hobbyist Wind Turbine shall, at its lowest point, have ground clearance of no less than fifteen (15) feet.

(20) Signal Interference and Microwave Frequency Interference: The owner/operator shall minimize any interference with electromagnetic communications, such as radio, telephone or television signals caused by any Wind Energy Facility or Turbine. (If the applicant is a public utility, s. PSC 113.0707 also applies).

(a) A one thousand (1,000) feet microwave communication corridor between turbines must be maintained if the turbine facility is located between transmission towers.

(b) Communication tower – Wind turbine setback shall be at least one (1) mile to prevent signal interference.

(c) Emergency communication towers will be located on a Geographical Information System (GIS) map so turbine facilities can be properly planned to avoid conflict with Trempealeau County Emergency Services.

21.07 Setbacks: The following setbacks and separation requirements shall apply to Hobbyist and Personal Wind Turbines.

(a) Public Roads: Each Wind Turbine shall be set back from the nearest public road and its right of way a distance no less than two (2) times its Total Height.

(b) Railroads: Each Wind Turbine shall be set back from all railroads and their right of way a distance of no less than two (2) times its Total Height.

(c) Wind Turbine spacing: Each Wind Turbine shall have a separation distance from other Wind Turbines equal to one and two-tenths (1.2) times the total height of the tallest wind turbine.

(d) Communication and electrical lines: Each Wind Turbine shall be set back from the nearest above-ground public electric power line or telephone line a distance no less than two (2) times its Total Height.

(e) Property lines: Each Wind Turbine shall be set back from the nearest property line a distance no less than three (3) times its Total Height, unless mitigation has taken place and agreed by owner/operator and affected property owners involved and recorded in the Trempealeau County Register of Deeds office which describes the benefited and burdened properties and which advises all subsequent owners of the burdened property.

21.08 Miscellaneous Safety Requirements for Commercial and Personal Wind Turbines

(1) All wiring between Wind Turbines and the Wind Energy Facility substation shall be underground.

(a) All neutral grounding connectors from Commercial Wind Turbines shall be insulated from the earth and shall be sized to accommodate at least twice the peak load of the highest phase conductor, to absolutely prevent transient ground currents, in order to comply with the **National Electric Safety Code** and the **IEEE Standard 519-1992, approved by the American National Standards Institute,** as follows:

Grounding of both the electrical transmission lines and the supply lines to the internal electrical systems of the turbines themselves, shall comply with **Rule 92D, Current in Ground Conductors:** "Ground connector shall be so arranged that under normal circumstances, there will be no objectionable flow of current over the grounding conductor."

Rule 215B: [It is not permissible] "to use the earth as a part of a supply circuit."

Under no circumstances shall any Wind Turbine be connected directly to the grid; connection must be made through a substation or transformer properly grounded and filtered to keep harmonic distortion within recommended limits.

Bare, concentric neutrals are specifically prohibited in buried lines between turbines and in underground transmission lines to substations.

(2) Wind Turbine towers shall not be climbable up to fifteen (15) feet above ground level.

(3) All access doors to Wind Turbine towers and electrical equipment shall be lockable and locked when unattended.

(4) Appropriate warning signage shall be placed on Wind Turbine towers, electrical equipment, and Wind Energy Facility entrances.

21.09 Fee Schedule

(1) The permit application is required for a Hobbyist Wind Turbine. No fee or bond amount is required.

(2) The Conditional Use Permit application fee for a Personal Wind Turbine shall be two hundred twenty-five dollars ($225.00). No bond amount is required.

(3) For a Wind Energy Facility the application fee is five hundred dollars ($500.00) per turbine. The amount of the bond required will be based on the number of turbines and the estimated cost to remove the Wind Turbine, including to a point three (3) feet below grade.

21.10 Validity

Should any section, clause or provision of this chapter be declared by the courts to be invalid, the same shall not affect the validity of the chapter as a whole or any part thereof, other than the part so declared.

Chapter 21 - Appendix A

Trempealeau County Measurement Protocol for Sound and Vibration Assessment of Proposed and Existing Wind Energy Conversion Systems

Introduction

The potential sound and vibration impact associated with the operation of wind powered electric generators, including Wind Energy Facilities and Wind Turbine operations, is a primary concern for citizens living near proposed Wind Energy Conversion Systems ("WECS"). This is especially true of projects located near homes, residential neighborhoods, schools, hospitals, churches, places of employment and public libraries. Determining the likely sound and vibration impacts is a highly technical undertaking and requires a serious effort in order to collect reliable and meaningful data for both the public and decision makers.

This protocol is based in part on criteria published in the Standard Guide for Selection of Environmental Noise Measurements and Criteria.[1] and the Public Service Commission of Wisconsin publication Measurement Protocol for Sound and Vibration Assessment of Proposed and Existing Electric Power Plants (February 2002).[2] The purpose is to first establish a consistent and scientifically sound procedure for estimating existing ambient (background) sound and vibration levels in a project area, and second to determine the likely impact that operation of a new wind energy conversion system project will have on the existing sound and vibration environment.

The characteristics of the proposed WECS project and the features of the surrounding environment will influence the design of the sound and vibration study. Site layout, types of wind energy conversion units ("WECU") selected and the existence of the significant local sound and vibration sources and sensitive receptors shall be taken into consideration when designing a sound and vibration study. An independent, qualified consultant shall be required to conduct the sound and vibration study.

Note: Trempealeau County Zoning Department Administration shall be consulted prior to conducting any sound and vibration measurements. These guidelines may be modified (with express written approval of the County Zoning Department) to accommodate unique site characteristics. Consult with Zoning Department staff assigned to the project for guidance on study design before beginning any sound and vibration study. During consultation, good quality maps or diagrams of the site are necessary. Maps and diagrams shall show the proposed project area layout and boundaries[5], and identify important landscape features as well as significant local sound and vibration sources and sensitive receptors including, but not limited to, a residence, school, hospital, church, place of employment, or public library.

Measurement of the Existing Sound and Vibration Environment

An assessment of the proposed WECS project area's exi ting sound and vibration environment is necessary to predict the likely impact resulting from a proposed project. The following guidelines shall be used in developing a reasonable estimate of an area's existing sound and vibration environment. All testing shall be performed by an independent acoustical testing engineer approved by the Trempealeau County Zoning Department. All measurements shall be conducted with industry certified testing equipment.[4] All test results shall be reported to the Trempealeau County Zoning Department.

Sites with No Existing Wind Energy Conversion Units

Sound level measurements shall be taken as follows:

1. At all properties within the proposed WECS project boundaries[5]

2. At all properties within a one mile radius of the proposed WECS project boundaries[5].

3. One test must be performed during each season of the year.
   a. Spring (March 15 – May 15)
   b. Summer (June 1 – September 1)
   c. Fall (September 15- November 15)
   d. Winter (December 1- March 1)

4. All measurement points (MPs) shall be located in consultation with the property owner(s) and such that no significant obstruction (building, trees, etc.) blocks sound and vibration from the site.

5. Duration of measurements shall be a minimum of ten continuous minutes for each criterion (See Item 9 below) at each location.

6. One set of measurements shall be taken during each of the following four periods:
   a. Morning (6 - 8 a.m.)
   b. Midday (12 noon – 2 p.m.)
   c. Evening (6 – 8 p.m.)
   d. Night (10 p.m. – 12 midnight)

7. Sound level measurements must be made on a weekday of a non-holiday week.

8. Measurements must be taken at 6 feet above the ground and at least 15 feet from any reflective surface[3].

9. For each MP and for each measurement period, provide each of the following measurement criteria:
   a. Unweighted octave-band analysis (16^2, 31.5, 63, 125, 250, 500, 1K, 2K, 4K, and 8K Hz)
   b. L_{ave}, L_{10}, L_{50}, and L_{90}, in dBA
   c. L_{ave}, L_{10}, L_{50}, and L_{90}, in dBC
   d. A narrative description of any intermittent sounds registered during each measurement
   e. Wind speed at time of measurement
   f. Wind direction at time of measurement
   g. Description of the weather conditions during the measurement

10. Provide a map and/or diagram clearly showing:
    a. The layout of the project area, including topography, the project boundary lines[5], and property lines
    b. The locations of the MPs
    c. The minimum and maximum distance between any MPs
    d. The location of significant local sound and vibration sources
    e. The distance between all MPs and significant local sound and vibration sources
    f. The location of all sensitive receptors including but not limited to, a residence, school, hospital, church, place of employment, or public library.

Sites with Existing Wind Energy Conversion Units

Two complete sets of sound level measurements must be taken as defined below:

One set of measurements with the wind generator(s) off.

One set of measurements with the wind generator(s) running.

Sound level measurements shall be taken as follows:

1. At all properties within the proposed WECS project boundaries[5]
2. At all properties within a one mile radius of the proposed WECS project boundaries[5].
3. One test must be performed during each season of the year.
    a. Spring (March 15 – May 15)
    b. Summer (June 1 – September 1)
    c. Fall (September 15- November 15)
    d. Winter (December 1- March 1)

4. All measurement points (MPs) shall be located in consultation with the property owner(s) and such that no significant obstruction (building, trees, etc.) blocks sound and vibration from the site.

5. Duration of measurements shall be a minimum of ten continuous minutes for each criterion (See Item 9 below) at each location.

6. One set of measurements shall be taken during each of the following four periods:
    a. Morning (6 - 8 a.m.)
    b. Midday (12 noon – 2 p.m.)
    c. Evening (6 – 8 p.m.)
    d. Night (10 p.m. – 12 midnight)

7. Sound level measurements must be made on a weekday of a non-holiday week.
8. Measurements must be taken at 6 feet above the ground and at least 15 feet from any reflective surface[3].
9. For each MP and for each measurement period, provide each of the following measurement criteria:
    a. Unweighted octave-band analysis (16^2, 31.5, 63, 125, 250, 500, 1K, 2K, 4K, and 8K Hz)
    b. L_{ave}, L_{10}, L_{50}, and L_{90}, in dBA
    c. L_{ave}, L_{10}, L_{50}, and L_{90}, in dBC
    d. A narrative description of any intermittent sounds registered during each measurement

e. Wind speed at time of measurement
f. Wind direction at time of measurement
g. Description of the weather conditions during the measurement

10. Provide a map and/or diagram clearly showing:
    a. The layout of the project area, including topography, the project boundary lines[5], and property lines
    b. The locations of the MPs
    c. The minimum and maximum distance between any MPs
    d. The location of significant local sound and vibration sources
    e. The distance between all MPs and significant local sound and vibration sources
    f. The location of all sensitive receptors including but not limited to, a residence, school, hospital, church, place of employment, or public library.

Sound Level Estimate for Proposed Wind Energy Conversion System

In order to estimate the sound and vibration impact of the proposed WECS project on the existing environment an estimate of the sound and vibration produced by the proposed WECU(s) must be provided.

1. The manufacturer's sound level characteristics for the proposed WECU(s) operating at full load. Include an unweighted octave-band (16^4, 31.5, 63, 125, 250, 500, 1K, 2K, 4K, and 8K Hz) analysis for the WECU(s) at full operation for distances of 500, 1000, 1500, 2000, 2500 feet from the WECU(s).

2. Estimate the sound levels for the proposed WECU(s) in dBA and dBC at distances of 500, 1000, 1500, 2000, 2500 feet from the WECU(s). For projects with multiple WECU's, the combined sound level impact for all WECU's operating at full load must be estimated.

3. Provide a contour map of the expected sound level from the new WECU(s), using 5dBA increments created by the proposed WECU(s) extending out to a distance of at least 5,280 feet (one mile).

4. Determine the impact of the new sound and vibration source on the existing environment. For each MP used in the ambient study (note the sensitive receptor MPs):
    a. Report expected changes to existing sound levels for L_{ave}, L_{10}, L_{50}, and L_{90}, in dBA
    b. Report expected changes to existing sound levels for L_{ave}, L_{10}, L_{50}, and L_{90}, in dBC
    c. Report all assumptions made in arriving at the estimate of impact and any conclusions reached regarding the potential effects on people living near the project area.

5. Include an estimate of the number of hours of operation expected from the proposed WECU(s) and under what conditions the WECU(s) would be expected to run.

Post-Construction Measurements

1. Within twelve months of the date when the project is fully operational, and within two weeks of the anniversary date of the Pre-construction ambient noise measurements, repeat the existing sound and vibration environment measurements taken before the project approval. Post-construction sound level measurements shall be taken both with all WECU running and generating power, and with all WECU off.
2. Report post-construction measurements to the Trempealeau County Zoning Department (available for public review) using the same format as used for the Pre-approval sound and vibration studies.

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[1] Standard Guide for Selection of Environmental Noise Measurements and Criteria (Designation E 1686-96). July 1996. American Society for Testing and Measurements.

[2] Measurement Protocol for Sound and Vibration Assessment of Proposed and Existing Electric Power Plants. February 2002. Public Service Commission of Wisconsin.

[3] Environmental Noise Guidelines: Wind Farms. (ISBN 1 876562 43 9). February 2003. Environment Protection Authority, Adelaide SA.

[4] The Trempealeau County Zoning staff acknowledges that few sound level meters are capable of measurement of the 16 Hz center frequency octave band. However, because noise complaints from the public most likely involve low frequency noise associate with proposed WECS, we encourage applicants to pursue the collection of this important background noise data. If obtaining the 16 Hz data presents a problem contact Trempealeau County Zoning staff prior to collection of any field ambient measurement data.

[5] Project Boundary: A continuous line encompassing all WECU's and related equipment associated with the WECS project.