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Details:

(FORM UPDATED: 08/11/2010)

WISCONSIN STATE LEGISLATURE ...
PUBLIC HEARING - COMMITTEE RECORDS

2009-10

(session year)

Senate

(Assembly, Senate or Joint)

Committee on ... Commerce, Utilities, Energy, & Rail (SC-CUER)

COMMITTEE NOTICES ...

- Committee Reports ... **CR**
- Executive Sessions ... **ES**
- Public Hearings ... **PH**

INFORMATION COLLECTED BY COMMITTEE FOR AND AGAINST PROPOSAL

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

* Contents organized for archiving by: Gigi Godwin (LRB) (July/2011)

Town of Wyoming
Iowa County, WI

Building Siting Ordinance

1.0 PURPOSE

The purpose of this ordinance is to regulate the siting of buildings within the Town of Wyoming in order to protect the health, safety and welfare of the town residents, preserve property values in the town, and preserve the town's productive agricultural land and rural character. It is designed to enforce the goals and policies set forth in the Town of Wyoming Land Use Policy Plan.

1.1 JURISDICTION

This ordinance shall regulate the location of new structures on land in the Town of Wyoming.

1.2 AUTHORITY

These regulations are adopted under the statutory authority granted pursuant to its adoption of village powers under sec. 60.10(2)(c), 60.22(3), 61.34 and 62.23 of the Wisconsin Statutes.

1.3 DEFINITIONS

(a) Accessory Building. Any building, structure, or use of land customarily incidental to the permitted uses, but only on the same premises with the primary permitted uses.

(b) Building. Any structure having a roof supported by columns or walls, used or intended to be used for the shelter or enclosure of persons, animals, equipment, machinery or materials.

(c) Commission. Town of Wyoming Plan Commission

(d) Farmland. Lands having a history of farming activity (including cropland and rotational pastureland) or lands containing soils defined as Class I, II, or III soils as designated in the Soil Survey Report for Iowa County prepared by the U.S. Natural Resources Conservation Service.

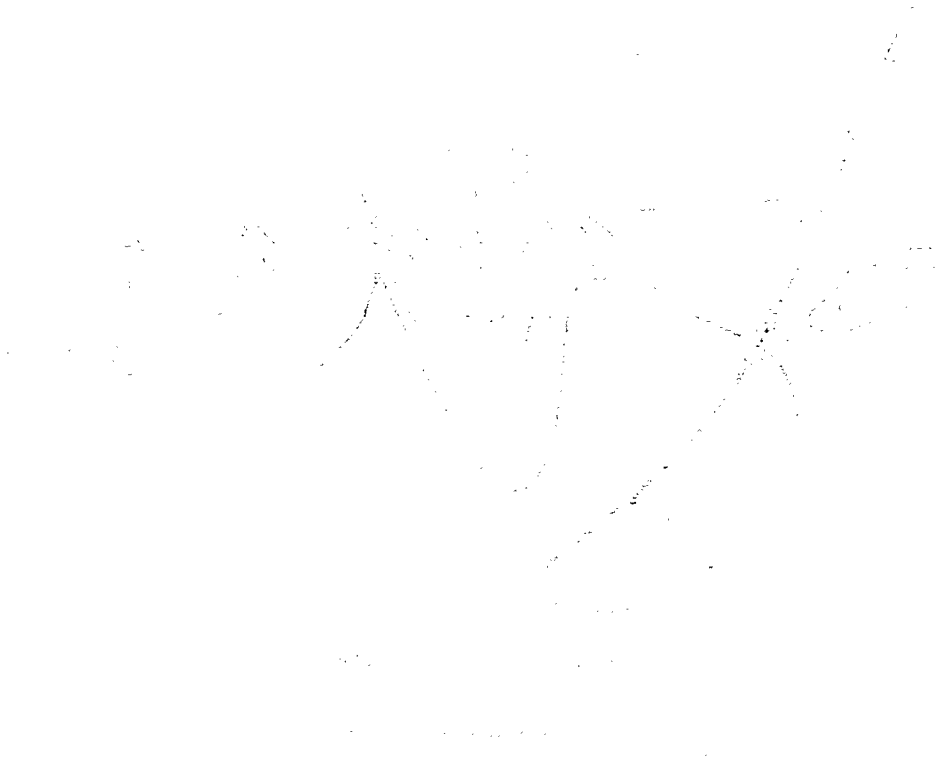
(e) Ridgeline. A line of high ground, as shown below, with changes in elevation along its top and low ground on all sides, from which 10 natural terrain features, as illustrated on page 2, are derived.

Figure 10.1b. Ridgeline

(f) Ridge. Is part of a Ridgeline, which is a sloping line of high ground. If you are standing on the centerline of the ridge, you will have normally have low ground in three directions and high ground in one direction.

(g) Hill. Is part of a Ridgeline, which is, an area of high ground – the ground slopes down in all directions

(h) Saddle. Is a dip or low point between two areas of high ground. It is simply a dip or break along a level ridge crest.



(i) Steep Slopes. Slopes in excess of 12%.

(j) Town. The Town of Wyoming, Wisconsin

(k) Town Board. The Town of Wyoming Board of Supervisors

1.4 APPLICATION REQUIREMENTS AND PROCEDURES

(a) Applicability. Any person or entity proposing to construct a building or install a manufactured building shall submit an application with the appropriate fee to the Planning and Landmark Commission and obtain building site approval from the Town Board.

(b) Application Forms. Application forms are to be approved by the Town Board and made part of the submittal package used by the Commission and shall contain the following:

1. Information for Administration
   - (A) Name, address and phone number of applicant.
   - (B) Name, address and phone number of landowner (if different from (A)).

2. Information for Evaluation

6. Conform development to the natural limitations of the site, which may include the topography, soils, vegetation, and the presence of natural features such as woodlands, ridgelines, and waterways.
7. Minimize the impact of buildings on important wildlife habitat.

(b) Standards. The Town will use the following standards when considering the Building Site Application, in order to further the goals of the Town's Land Use Policy Plan. Does the applicant do the following?

1. Build away from elevations whether a ridge line, ridge, saddle, hill, etc. to prevent impact on the natural skyline.
2. Build away from the center of meadows and/or fields.
3. Avoid building on Class I, II, and III soils whenever possible.
4. Set back new structure from adjacent, existing farm operations and/or create a buffer between the new structure and the adjacent, existing farm operation.
5. Build away from wetlands, floodplains, and steep sloped areas of the Town, pursuant to applicable county and state regulations.
6. Build into woodland edges in order to reduce visual prominence.
7. Maintain wooded buffers along roads. Methods to meet this standard may include but are not limited to: limiting tree removal along the road to only those trees necessary for the driveway, sharing driveways where appropriate, or setting structures so that they are buffered from the road by existing vegetation.
8. When building on grassy hillsides, use existing vegetation, rock outcroppings, or depressions in topography- to screen the building from road viewing, or plant new vegetation when necessary

1.9 ENFORCEMENT

The Town of Wyoming reserves the right to cancel or suspend any or all permits issued for a project until compliance with the Building Site Approval is achieved.

1.10 PENALTIES

Any person or entity that violates this Ordinance shall, upon conviction, pay a forfeiture of $100.00 plus applicable surcharges and court costs per violation. Each day that the violation continues to exist shall constitute a separate offense. This Ordinance may be enforced by a civil action. A violation of this Ordinance is deemed a public nuisance and may be enjoined.

1.11 SEVERABILITY

The provisions of the Ordinance shall be deemed severable. It is expressly declared that the Town Board would have passed the other provisions of this Ordinance irrespective of whether or not one or more provisions may be declared invalid. If any provision of this Ordinance is held invalid, the remainder of the Ordinance and the application of such provisions to other persons or circumstances shall not be affected thereby.

1.12 DISCLAIMER

The Town of Wyoming issuance of a Building Site Approval does not constitute a warranty or assurance of any kind whatsoever as to whether the building which is the subject of the permit is safe, suitable for its intended purpose, merchantable, or in compliance with any applicable codes or regulations.

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.

OK (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. (Our company does not use lattice type towers or guidewire 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. Excepting the tower - its height should be sufficient at 1.2x

(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. Same here at 1.2x

(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. should be 1.2 x unpaved

(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. Absurd - cuts out all property owners from access to the federal tax credit!

(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. Should not be required on owned farmland less than 100' in height

(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. 1.2 would be sufficient

(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. excessive + unreasonable unrelated to public health + safety

(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.

health hazards of flicker/shadow must be addressed

(k) There shall be a two (2) mile Setback from any recognized U.S. Fish and Wildlife Refuge located in Trempealeau County. unreasonable - devalues real estate property because it no longer would be eligible for federal tax credit

(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.

Applicant should be required to demonstrate that the number of exhibits is known to cause hearing loss or other health effects

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 results 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.

grants waives impact not 'scientifically verified'

Cost ?

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.

Precludes many of the models we offer w/ 40-80' towers.

(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

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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 existing 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.)
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    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.

---

[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.


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WHITE PAPER

WIND FARMS AND THEIR EFFECTS ON PUBLIC SAFETY RADIO SYSTEMS

Revised February 24, 2005

SUMMARY OF WHITE PAPER:

In many parts of the country, wind farms are being installed to alleviate the need to build more electrical generating plants. These wind farms can have a profound effect on your public safety, utility, and governmental microwave systems by chopping and reflecting the microwave beam. .

WHAT YOU SHOULD DO:

Notify your city and county zoning authority that any application for a wind farm can profoundly affect your emergency communications system and a design review focused on the wind farm's effects on critical communication systems.

BACK GROUND:

As a source for renewable energy, wind farms are being installed throughout the upper Midwest. Being subsidized by the US Government heightens the interest of entrepreneurs in building these for profit. Some wind farms contain hundreds of windmills. One of the biggest is on Buffalo Ridge between Marshall and Pipestone, Minnesota. Other large farms are northwest of Mason City, Iowa near Joice and northwest of Algoma, WI. The largest of the windmills and farms are in the western US.

The zoning laws of each state vary based on the generating size of the group of windmills, called a wind farm. Below a certain size in generating capacity, local city and county planning and zoning regulate these farms. Above a megawatt threshold, the state enters the picture especially in Minnesota.

Wind farms have their down side that is often overlooked by champions looking for clean renewable energy and profits.

1. Windmills have aviation hazard flashing beacons displaying a flashing light display. Some are set in a sequence to flash together or individually as a marquee across the farm. Because most windmills are above 201 feet, the Federal Aviation Administration dictates they be marked as an aviation hazard. The hazard beacon can be red at nighttime, medium intensity white strobe lights used in daytime (sometimes at night), or a combination of both.
2. The metallic blades chop and reflect certain types of radio signals ruining the continuity of the communications circuit. This is the subject of this paper.

The attached drawing, WIND-01 Figure 1 shows the drawing of a typical windmill. They consist of a metal pole, a wind generator mounted atop the pole, and a 100 foot tri-blade. Because the installation is all-metal, radio signals passing through the windmill are reflected or blocked. Worse yet, the moving blades cause the signal to be chopped. Think of trying to shine a flashlight through an oscillating fan. The once steady light passing blades becomes pulsed on the wall behind the fan.

On television sets of homeowners in or near the wind farm, the viewer will see their TV picture as a high-speed flicker as the blades pass through the signals. This is especially bad where the homeowner is trying to pull TV signals from 30-60 miles away. This will worsen as the country switches to high definition television (HDTV) because that signal is a synchronized computer bit stream not the present and much more forgiving analog signal.

With microwave, similar fading takes place. Microwave is a digital computer bit stream synchronized (timed precisely) between both ends of the circuit. As the blade passes through the beam or its companion first Fresnel zone, it causes the microwave receiver at the other end to lose signal or synchronization with the other end. While the blade rotates, the microwave system struggles to resynchronize itself only to have the next blade chop the signal. In the end, the microwave never resynchronizes unless the blades stop turning.

Public safety microwave is built to telephone company standards and the signal is framed into blocks of channels. Communications must take place in a real time (no delays) state. On the other hand, microwave links used for computer networks are not necessarily real time. If a circuit fails due to an encounter with a windmill's blade, the computer system will simply retry repeatedly to pass the message. If a synchronized public safety signal fails, the ambulance or fire truck may not come to someone's door!

A reasonable analogy might be a motion picture of an airplane propeller or a car tire turning. There are times that the moving device appears to slow, stop, and then reverse itself in the film. It is the strobe light effect as the pulsing interval of the film begins to match the rotating speed of the propeller or wheel and then leaves synchronization. It is possible and depending on the speed of the windmill's blades for the microwave beam to come in synchronization with the moving blades.

A microwave beam or a TV signal for that matter is not like a laser beam. Per the attached drawing WIND-02 Figure 1, as the beam leaves the antenna at either end, it fattens just like if you point a flash light at a wall and walk backwards. The main power of the radio beam lies in the main beam or the red area in the drawing. The first Fresnel (pronounced Fra'-nel) zone lies in the blue area. In Figure 2 of WIND-02, the white zones are higher Fresnel zones and contain little power. The main beam and the first Fresnel zone must pass through the wind farm and not be reflected or chopped by any metallic members of the wind farm. Depending where the microwave terminal points are and the frequency of the microwave signal, the Fresnel zone can be hundreds of feet wide. A complex mathematical formula can calculate the size of the Fresnel zone for any frequency passing through the farm.

Some but not all of the problem can be alleviated by the windmill designer using non metallic blades. However, I have been told a metal blade is part of the lightning protection for the facility and thus there is a resistance to using non-metallic blades. Even if they did, you still have the metal pole and generator units to block and reflect radio waves,

The wind farms do not seem to bother regular two-way radio transmissions. As the mobile communications industry switches from analog signals to synchronized digital signals (APCO-25 Standard), problems could develop because of the same mechanisms exist as with microwave.

I would not want a user to build a critical communications tower in a wind farm unless the windmills were at least ½ mile away—better yet a mile. As the electrical energy is generated, signals from high electric fields and degrading generating equipment can radiate noise that will degrade two-way radio system receivers in the range of 25-200 Megahertz.

WHAT SHOULD BE DONE IF SOMEONE WANTS TO BUILD A WIND FARM?

All is not lost if an application for a wind farm is submitted to a zoning authority. If one is received:

1. The applicant should employ a microwave search firm such as Micronet in Plano, Texas or Comsearch in Ashburn, Virginia to identify which FCC licensed microwave paths will pass through the proposed wind farm.
2. The zoning authority should alert City and County public safety, utility, pipeline company, and your school district to provide their licensed and unlicensed microwave point to point routing to the applicant. The wind farm can especially effect:
    a. Point to point microwave.
    b. Wireless computer networks- 802.11 systems, WAN.
    c. Instructional TV for schools
    d. DTN Weather used by farmers and construction companies.
    e. Intercity wired telephone via microwave
    f. Cellular cell-site interconnection via microwave
    g. The real problem is the unlicensed data links. They are not in any database. You must seek out potential critical use owners.
3. The applicant should retain a Registered Professional Engineer with radio experience to be part of the design team for the wind farm to allow for microwaves to pass unaffected through the farm as shown in the attached drawing WIND-01 Figure 2. This may be as simple as leaving aisles open in the wind farm windmill-grid.
4. A wind farm advocate has suggested to me that some form of registration system of windmills and critical wireless communications circuits by the state might be reasonable to the work above.
    a. Critical communications circuits,
        i. Whether FCC licensed or not,
        ii. Planned or existing,
        iii. Can be registered in a GIS file along with the precise location of the planned and existing windmills
    b. Then, as new critical communications circuits are designed, engineers can consult the GIS system and be advised of the presence of a proposed or existing wind farm. They can register funded but not yet build circuits.
    c. The same is true with the planner of a wind farm.
    d. This sounds reasonable but the big issue would be keeping the data current and informing the planners and installers in both industries.

The Federal Communications Commission, when licensing a microwave system, offers no protection from new man-made objects obstructing a microwave system. Critical infrastructure communications systems are expensive and usually in planning for a long time. The very owners of most critical infrastructure systems are the approvers of wind farms. Therefore, the governmental entity should protect their interests otherwise, the fire department may be signaled by the 911 center and never show up at the fire. A signal may go out from a pipe line to shut the valves on a leaking line and the valve never close.

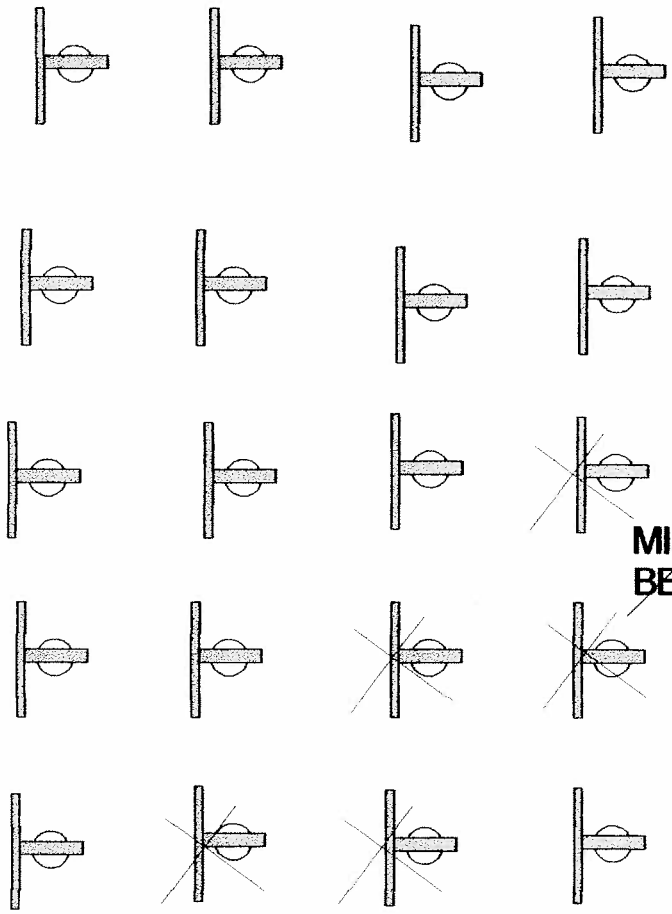
Leonard J. Koehnen, PE
Consulting Engineer-Wireless Telecommunications Systems and Facilities
Registered Professional Engineer (Electrical)
Saint Paul, MN

We have written many other White Papers that may be of interest to you. They are freely distributed to clients and other interested parties at no charge. Please write for a copy.

<table>
<tr><td>Spectrum Re-Farming</td><td>Tower Ordinances</td><td>Over Renting of Community Water Tanks</td></tr>
<tr><td rowspan="2">FCC Licensing Issues with Channels Adjacent to New Mutual Aid Channels</td><td rowspan="2">Installation of Minneapolis/Saint Paul Metro 800 control stations</td><td>Consulting Services</td></tr>
<tr><td>Utility Data Systems</td></tr>
</table>

WIND-01

DELETE WINDMILLS IN GRID TO PROVIDE AN AISLE FOR THE MICROWAVE BEAM



MICROWAVE BEAM PATH

WIND-01

MICROWAVE BEAM PATH

FIGURE 2: WIND FARM INSTALLATION GRID

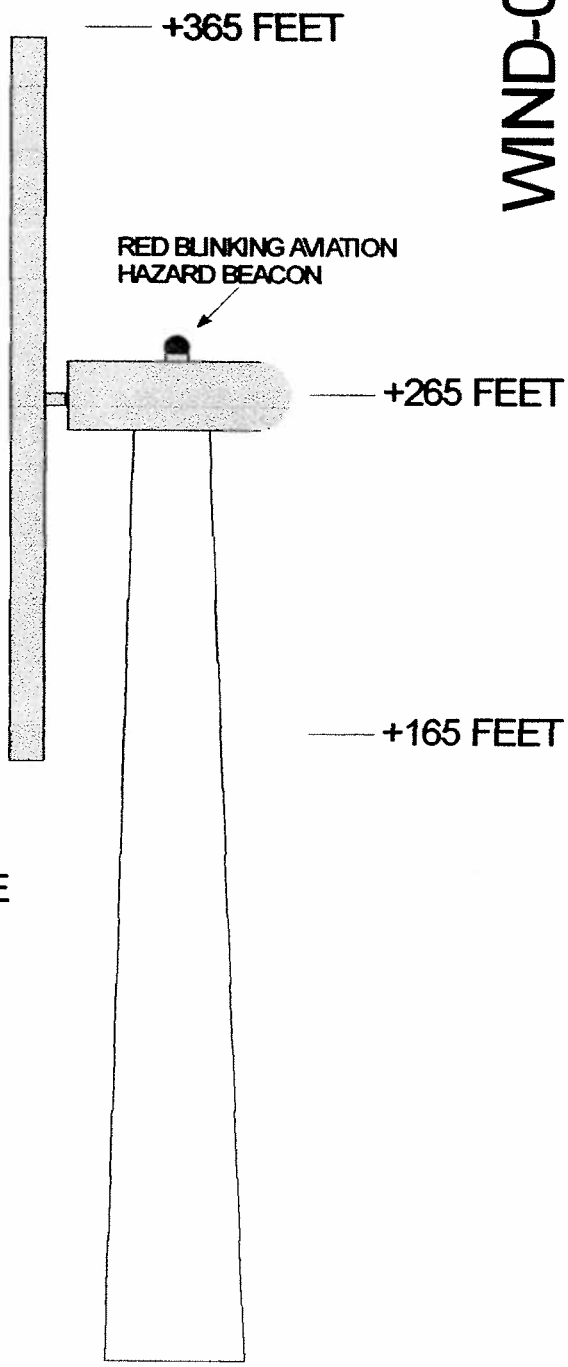


FIG 1: TYPICAL WINDMILL

REVISION HISTORY:	THIS DRAWING WAS PREPARED BY ME AND THAT I AM A REGISTERED PROFESSIONAL ENGINEER IN MINNESOTA LEONARD J. KOEHNEN, PE MINNESOTA 9298	WIND FARM EFFECTS ON MICROWAVE STANDARD SPECIFICATIONS	
		Leonard J. Koehnen, PE Consulting Engineer Leonard J. Koehnen & Assoc., Inc. 9348 Jonathan Road Woodbury, MN 55125 651-739-1614	DATE: 12-20-04 REVISION: ORIG DWG: WIND-01

WIND-02

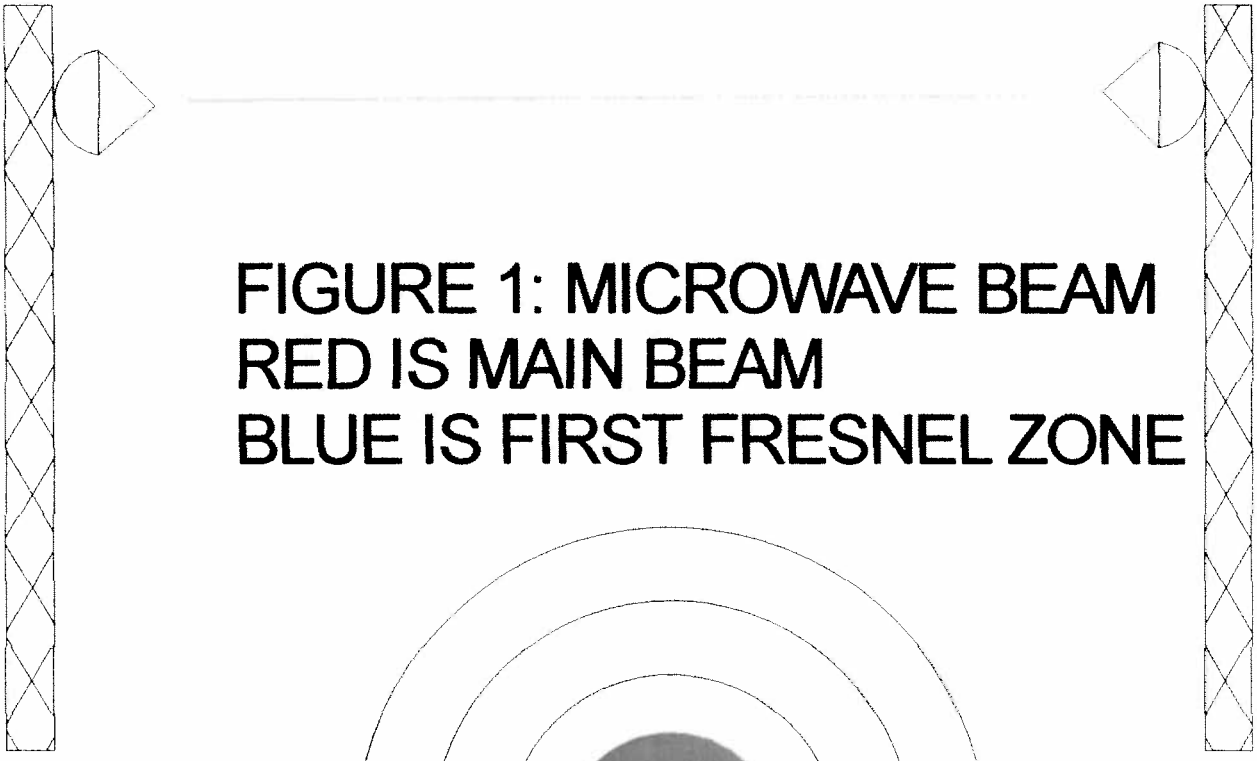
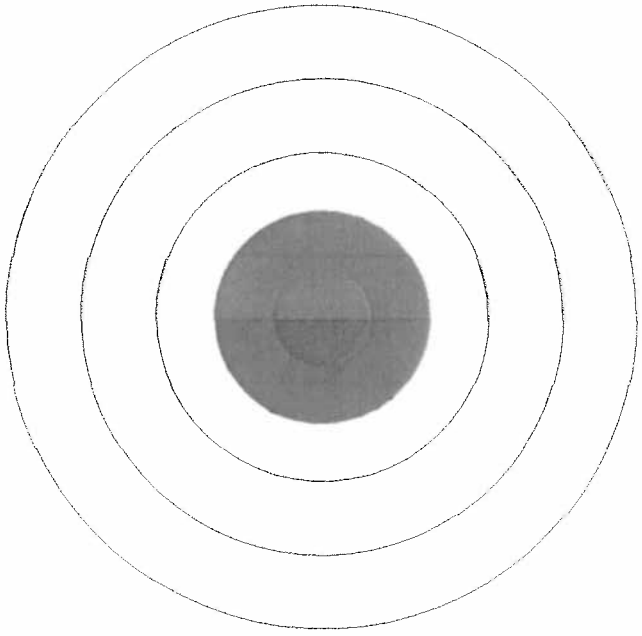


FIGURE 1: MICROWAVE BEAM
RED IS MAIN BEAM
BLUE IS FIRST FRESNEL ZONE



WIND-02

FIGURE 2: CROSS SECTION OF A MICROWAVE BEAM
RED IS THE PRIMARY BEAM
BLUE IS THE FIRST FRESNEL ZONE
WHITE ARE THE SECOND-THIRD ETC FRESNEL ZONES

REVISION HISTORY:	*THIS DRAWING WAS PREPARED BY ME AND THAT I AM A REGISTERED PROFESSIONAL ENGINEER IN MINNESOTA*	**MICROWAVE BEAM**	
		STANDARD SPECIFICATIONS	
	LEONARD J. KOEHNEN, PE	*Leonard J. Koehnen, PE* *Consulting Engineer* *Leonard J. Koehnen & Assoc., Inc.* *9348 Jonathan Road* *Woodbury, MN 55125 651-739-1614*	DATE: 12-23-04 REVISION: ORIG DWG: WIND-02
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Lions Club
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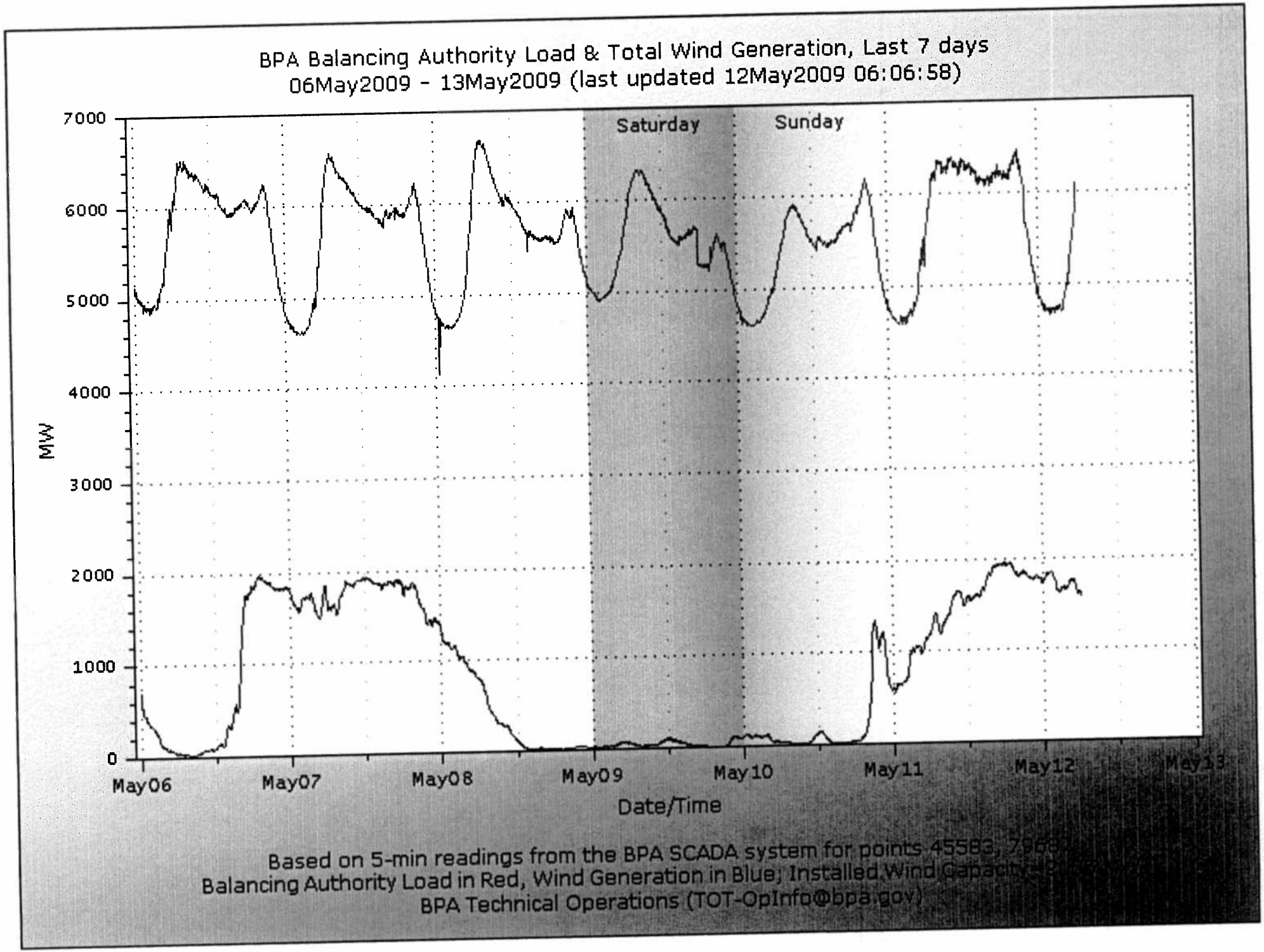
BPA Balancing Authority Load & Total Wind Generation, Last 7 days
06May2009 - 13May2009 (last updated 12May2009 06:06:58)
Saturday
Sunday
7000
6000
5000
4000
3000
2000
1000
0
MW
May06
May07
May08
May09
May10
May11
May12
May13
Date/Time
Based on 5-min readings from the BPA SCADA system for points 45583, 7968
Balancing Authority Load in Red, Wind Generation in Blue; Installed Wind Capacity=3
BPA Technical Operations (TOT-OpInfo@bpa.gov)


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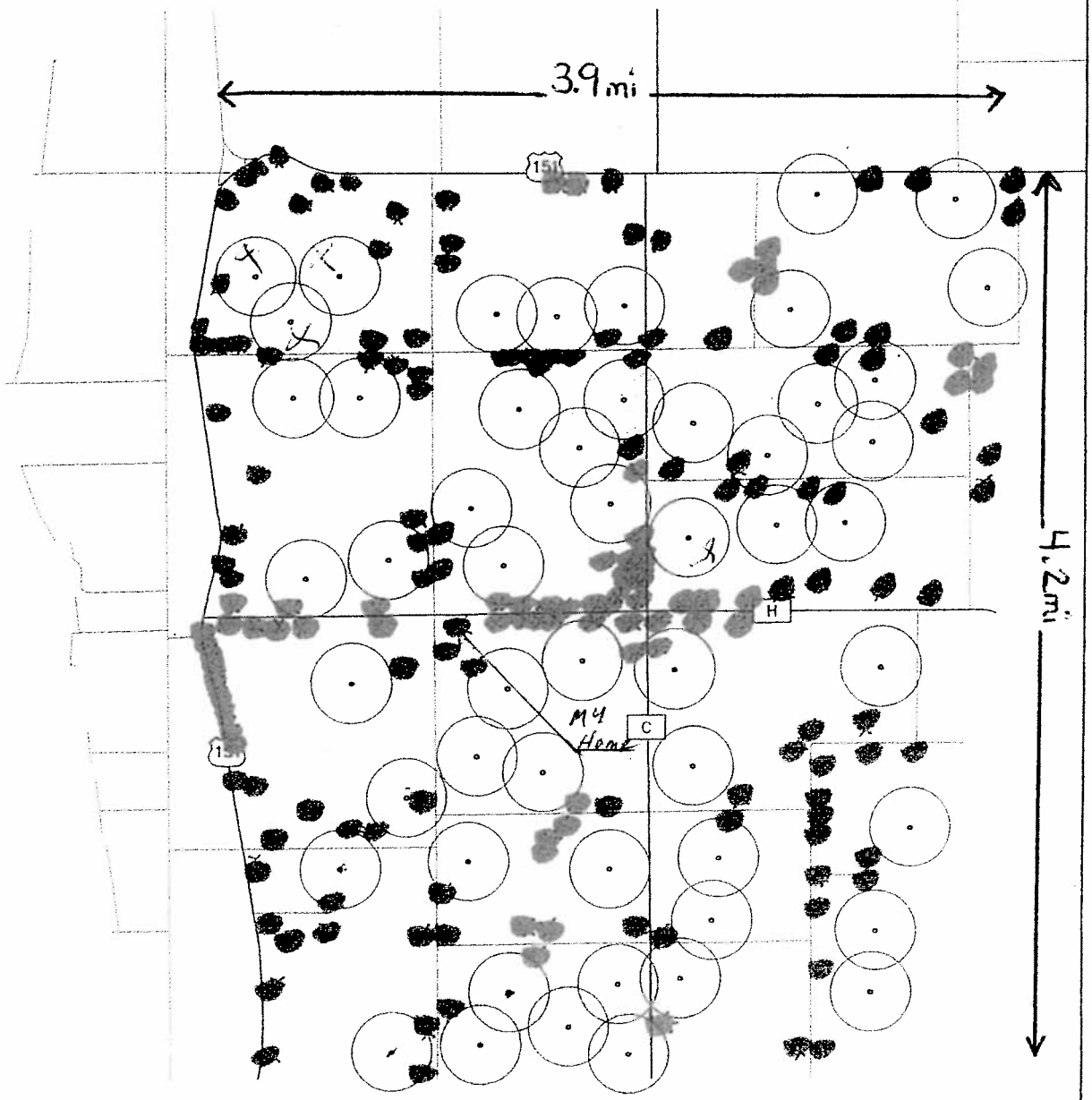
52 turbines
190 residences

Average of 3.7 residences per turbine

How Can This Be Safe?

Proposed Brothertown, WI Industrial Wind Factory Layout
Locations From FAA Website
Circles are 2000 feet in diameter



Disclaimer: to the best of our knowledge these proposed turbines are accurate.
They are mapped according to the latitude and longitude locations from the FAA website.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Every "green job" created with government money in Spain over the last eight years came at the cost of 2.2 regular jobs, and only one in 10 of the newly created green jobs became a permanent job, says a new study released this month. The study draws parallels with the green jobs programs of the Obama administration.

President Obama, in fact, has used Spain's green initiative as a blueprint for how the United States should use federal funds to stimulate the economy. Obama's economic stimulus package,which Congress passed in February, allocates billions of dollars to the green jobs industry.

But the author of the study, Dr. Gabriel Calzada, an economics professor at Juan Carlos University in Madrid, said the United States should expect results similar to those in Spain:

"Spain's experience (cited by President Obama as a model) reveals with high confidence, by two different methods, that the U.S. should expect a loss of at least 2.2 jobs on average, or about 9 jobs lost for every 4 created, to which we have to add those jobs that non-subsidized investments with the same resources would have created," wrote Calzada in his report: Study of the Effects on Employment of Public Aid to Renewable Energy Sources.


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Energy Efficiency Standards Benefits -- 2009 Model Bill

Wisconsin

Summary of Benefits by Product

#	Products	Effective Date	Annual Savings per Unit	Incre-mental Cost per Unit	Annual Energy Savings from One Year's Sales	2020 Energy Savings	2020 Summer Peak Capacity Reduction	2020 Direct and Indirect Natural Gas Savings[1]	2020 Value of Bill Savings[2]	2030 Energy Savings	2030 Summer Peak Capacity Reduction	2030 Value of Bill Savings[2]	Pay Back Period	Net Present Value[3]
		Year	kWh or [therms]	$	GWh [Billion CF]	GWh [Billion CF]	MW	Billion CF	$Million	GWh [Billion CF]	MW	$Million	Years	$Million (2005$)
32	Furnaces[4]	2013	[99.9]	$ 520	[0.49]	[3.7]	NA	1.83	$ 44	[8.5]	NA	$ 102	4.5	$ 378
46	Furnace Fans	2013	655	$ 100	39.7	297	55.7	1.51	$ 34	694	125	$ 77	1.3	$ 418
51	Compact Audio Equipment	2010	53	$ 1	6.9	35	4.8	0.18	$ 4	35	5	$ 4	0.2	$ 39
52	DVD players and recorders	2010	11	$ 1	1.0	5	0.7	0.03	$ 0.6	5	1	$ 0.6	0.8	$ 5
53	Portable electric spas (hot tubs)	2010	250	$ 100	0.2	2	0.5	0.01	$ 0	2	1	$ 0.3	3.5	$ 1
54	Water Dispensers	2010	266	$ 12	0.6	5	0.7	0.03	$ 0	5	1	$ 0.4	0.5	$ 4
55	Hot Food Holding Cabinets	2010	1,815	$ 453	0.6	6	2.1	0.03	$ 1	9	3	$ 1	2.7	$ 5
56	Pool Pumps	2010	390	$ 452	4.2	42	9.7	0.21	$ 4	42	9	$ 4	10.1	$ (13)
57	TVs (CA Title 20 Tier II)	2013	59	$ 20	35.7	268	3.6	1.36	$ 25	357	6	$ 32	3.0	$ 180
58	Portable Lighting Fixtures	2010	22	$ 16	8.1	77	11.5	0.39	$ 7	77	11	$ 7	6.2	$ 14
	Total				97	738	89	5.6	$ 87	1,227	160	$ 227		$ 1,032
	[natural gas]				[0.49]	[3.7]				[8.5]				

	37	38	39	43	44	45
	Emissions Reductions 2020			Emissions Reductions 2030[6]		
Product	CO2	NOx	SO2	CO2	NOx	SO2
	1000 MT	Tons	Tons	1000 MT	Tons	Tons
Furnaces[4]	0.20	157.3	1.0	0.476	367.1	2.3
Furnace Fans	246.91	173.6	800.4	669.0	405.2	1,867.7
Compact Audio Equipment	28.74	20.2	93.2	33.4	20.2	93.2
DVD players and recorders	4.16	2.9	13.5	4.8	2.9	13.5
Portable electric spas (hot tubs)	1.96	1.4	6.4	2.3	1.4	6.4
Water Dispensers	4.17	2.9	13.5	4.8	2.9	13.5
Hot Food Holding Cabinets	5.24	3.7	17.0	8.7	5.3	24.3
Pool Pumps	34.97	24.6	113.4	40.6	24.6	113.4
TVs (CA Title 20 Tier II)	222.52	156.5	721.4	344.6	208.7	961.8
Portable Light Fixtures	64.22	45.2	208.2	74.6	45.2	208.2
Total	613	588	1,988	1,183	1,083	3,304

Notes:

[1] Direct natural gas savings are savings from use of more efficient natural gas appliances. Indirect natural gas savings are reductions in natural gas at power plants due to use of more efficient electric appliances. Indirect gas savings assume that half the power saved at power plants would be generated with natural gas.

[2] Value of energy savings is based on energy savings and average state energy prices. This value does not take account of the incremental cost of more efficient products.

[3] Net present value is the total monetary value of bill savings achieved by products sold under the standards between now and 2030 minus the total incremental product cost incurred by purchasers as a result of the standards over the same period expressed in current dollars. Both costs and savings are discounted using a 5% real discount rate.

[4] Furnaces save natural gas. Gas savings are expressed in cubic feet and enclosed in brackets to distinguish from electricity savings.

[5] Residential furnaces include both natural gas and oil furnaces as well as furnace fans. Annual savings per unit, incremental cost per unit and pay back period shown here are just for furnaces, gas furnaces and furnace fans, which are the most common of these products. For these calculations, gas furnace values are enclosed in brackets and listed below furnace fan values.

[6] 2030 emissions reductions for NOx and SO2 are calculated using 2020 emission factors.


FORWARD
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REABE SPRAYING SERVICE, INC.

P.O. BOX 112

WAUPUN, WISCONSIN 53963-0112

WAUPUN 920-324-3510; PLAINFIELD 715-335-6810; PLOVER 715-341-9393

Below is information regarding symbiotic sighting of Large Wind Energy Facilities and the protection of Wisconsin potato and vegetable production:

- Wisconsin aerial applicators are refusing to apply plant health products in or near Large Wind Energy Facilities for the following reasons:
  1. Large wind generators visually distract aerial application pilots exponentially increasing the likelihood of a life threatening error
  2. Due to the significant height of large wind generators, aerial applicators never reach a safe altitude clear of obstructions further increasing the likelihood of a life threatening error
  3. Large wind generators produce turbulence downwind that is invisible to an aerial application pilot further increasing the likelihood of a life threatening error.
  4. Large wind energy facilities utilize meteorological testing towers that can be invisible to pilots in certain lighting conditions
- The economic impact of Wisconsin potato and vegetable crops is over $760 million annually.
  1. Wisconsin is number 2 in the U.S. in the production of potatoes
  2. Wisconsin is in the top 3 in the U.S. in the production of sweet corn, snap beans, and peas.
- The Wisconsin Potato & Vegetable Association and Midwest Food Processors Association are adamant that aerial application is critical to the health of the Wisconsin potato & vegetable industry.

We can provide a solution to this problem that will protect the valuable potato and vegetable industry without interrupting the development of wind energy. This can be done by amending SB-185 in a manner that prohibits the sighting of large wind energy facilities in or near intensive potato and vegetable production areas.

- These production areas are relatively small and can be identified with the help of the associations that represent growers.
- In some cases these areas may not provide wind resources intense enough for development.
- This can save the wind energy companies large volumes of expense if they are informed ahead of time that there are areas not compatible with development of wind energy.

Wisconsin's agricultural resources are extremely valuable. We have an opportunity to expeditiously develop wind energy in Wisconsin without jeopardizing an industry worth three quarter of a billion dollars.

REABE SPRAYING SERVICE, INC.
P.O. BOX 112
WAUPUN, WISCONSIN 53963-0112

WAUPUN 920-324-3510; PLAINFIELD 715-335-6810; PLOVER 715-341-9393

May 12, 2009

State of Wisconsin
2009 – 2010 Legislature
State Capitol
Madison, WI 53707-7882

Committee on Commerce, Utilities, Energy, and Rail:

This letter is intended to inform you that Reabe Spraying Service has a policy prohibiting aerial application operations within a commercial wind farm. Additionally, this letter is an amendment request of SB-185 which will protect Wisconsin potato, processing vegetable, and fresh vegetable production during the development and production of Wisconsin wind energy.

Modern wind turbines are very large structures, measuring approximately 400 feet high with a blade diameter of up to 270 feet. When you combine the physical size of these structures with blade rotation, the result is a visual distraction. Aerial applicators must divide their attention between aircraft systems, treatment volumes, swath spacing, aircraft performance, weather, and obstruction avoidance. When operating within a wind farm, the visual distraction created by the wind turbines further divides the pilot's attention, exponentially increasing the likelihood of a life threatening error.

In a typical commercial wind farm there are approximately five turbines per square mile. In any given aerial application operation, a radius of one half mile from the target site is utilized for maneuvering between swath runs, equating to an operations area of approximately two square miles (including the target site). This results in approximately ten turbines within the operations area. Unlike other obstructions that aerial applicators must avoid, wind turbines are taller than the maximum height achieved during the turnaround. This means that a pilot never reaches a safe altitude allowing the pilot to check aircraft systems, treatment volumes, etc. Simply said, the number and height of wind turbines within an aerial application area, exponentially increases the likelihood of a life threatening error.

Finally we come to the hazard of wake turbulence. This hazard is the most dangerous because it is invisible. All airfoils in motion create wake turbulence. The turbulence created is proportional to the weight and angle of attack of the airfoil; the heavier the weight and greater the angle of attack, the greater the wake turbulence. A commercial wind turbine's three blades can weigh as much as 40,000 pounds and operate at a very high angle of attack. The result is turbulence severe enough to induce loss of control to an aerial application aircraft. Again, this hazard is invisible and difficult to avoid while performing all of the other tasks necessary to perform an aerial application safely.

REABE SPRAYING SERVICE, INC.

P.O. BOX 112

WAUPUN, WISCONSIN 53963-0112

WAUPUN 920-324-3510; PLAINFIELD 715-335-6810; PLOVER 715-341-9393

Attached are letters from Walter Stevenson, Professor Emeritus of Plant Pathology, University of Wisconsin - Madison and the Wisconsin Potato and Vegetable Grower's Association, illustrating the critical role aerial application plays in environmentally safely and cost effectively controlling pests. We understand Wisconsin's needs for renewable energy are urgent and that SB-185 will facilitate more expeditious development of wind energy. Due to the unacceptable level of personal and property risk associated with making timely aerial applications in or near a wind energy facility and considering the additional cost and pesticide use associated with placing wind energy facilities in or near potato, processing vegetable, and fresh vegetable production fields, we are asking you to amend SB-185 in a manner that would prohibit the construction of wind energy facilities in, or within one mile of these areas. Additionally, we would appreciate the opportunity to review and assist in the development of this amendment to SB-185. Thank you for your time and attention to this matter.

Sincerely,

Damon Reabe
President
Reabe Spraying Service

Enclosed:
Letter from Professor Walter Stevenson
Letter from Wisconsin Potato and Vegetable Growers Association
WAAA Wind Generator Resolution

WAAA WIND GENERATOR RESOLUTION
5/11/09

WHERE AS; we acknowledge the need for affordable electric power and the efficient distribution of that power to the point of its consumption:

WHERE AS; we acknowledge the environmental benefits of wind generated electrical power:

WHERE AS; the wind generator tower and blade structures are too tall for a loaded ag-aircraft to climb over, forcing the ag-aircraft to fly around them increasing the danger:

WHERE AS; the wind generator's rotating blades generate turbulence which makes controlling a loaded ag-aircraft much more difficult if not dangerous:

WHERE AS; the wind generator's rotating blades create an optical illusion which distracts and often disorients the ag-pilot, increasing the danger:

WHERE AS; the grouping of these wind generators, increases the danger to the ag-pilot and forces the ag-pilot to "Run the Gauntlet" in amongst the wind generators while still maintaining management of the cockpit instruments and staying alert for changes to the on going and ever changing situation in and around the field while still maintaining concentration on the many other factors needed to safely make an application:

WHERE AS; the summing and compounding of all these added hazards and distractions makes the risk of aerial crop protection amongst wind generators unacceptably high and dangerous:

WE HEREBY RESOLVE; to refuse any aerial crop protection applications inside a grouping of wind generators.

We also resolve to refuse an aerial crop protection application, which the pilot deems dangerous, due to its proximity to a wind generator.

Jim Kazmierczak, Executive Director WAAA

319 MILLSTON AVE • LODI, WISCONSIN 53555 • 608-592-5809 • FAX SAME# • kazair1@aol.com

COLLEGE OF
AGRICULTURAL
& LIFE SCIENCES
UNIVERSITY OF WISCONSIN-MADISON

Department of Plant Pathology

(608) 262-6291

April 9, 2009

Town of Green Lake
N4454 Horner Rd
Green Lake, WI 54941

To Whom It May Concern:

It was recently brought to my attention that there is interest in locating wind turbines in your area of Wisconsin for the purpose of generating electric power. Without entering into the pro's and con's surrounding the use of wind turbines for this purpose, I wish to comment on an area of pest and crop management that would likely be indirectly affected by the positioning of the turbine towers in an actively farmed area.

Since 1979, I served the State of Wisconsin as Professor of Plant Pathology and Extension Plant Pathologist at the University of Wisconsin-Madison. I retired in January 2008, but have continued to work part time for the University to bridge the gap in coverage between my departure and the hiring of my replacement. My duties focused on the management of plant diseases affecting the production of potatoes and vegetable crops in Wisconsin. I conducted research and extension programs throughout Wisconsin, but because of the intensive production areas in central Wisconsin, I spent a significant part of my career working with potato and vegetable growers in that geographical area. By working directly with growers, extension agents and agribusiness, we were able to greatly improve the management of plant diseases, to reduce the use of pesticides through the adoption of effective Integrated Pest Management Programs, reduce grower losses related to plant disease and to improve the profitability of production.

Potatoes and processing vegetable crops are prone to infection by several plant pathogens. One of the important disease control tactics used by growers is to treat with safe and effective fungicides which can be applied by ground and aerial equipment. While most growers have ground-based sprayers on their farm, a significant acreage in central Wisconsin is routinely treated with aerial equipment – fixed wing and helicopters. Treatment of potato fields is done on 5-10 day intervals depending on pest pressure, weather factors and the equipment used. Treatment of processing crops is timed according to pest pressure and economic threshold levels of pests using data collected by processor field personnel and independent crop consultants. In times of wet soils due to excessive rainfall, aerial application allows growers to treat large acreages quickly and in a timely manner to insure that economically important diseases are managed at their inception, rather than after they've reached epidemic proportions. In the case of potato late blight, growers who have difficulty in treating their fields in a timely manner run the

1630 Linden Dr. Madison, Wisconsin 53706-1598 (608) 262-1410
Fax: (608) 263-2626 http://www.plantpath.wisc.edu

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Department of Plant Pathology

risk of the development of this disease on their property and the risk is elevated for the entire region to suffer the consequences of a region-wide epidemic. In years when late blight is active and control is insufficient to contain this disease at the earliest stages, it is estimated that this costs the Wisconsin potato industry an additional $12 million in extra fungicide applications and losses in storage. By working closely with the growers, we now have every grower on the same page and closely following university recommendations. The results are seen in the fact that we have not seen an outbreak of potato late blight in our state since 2002, an estimated savings of over $72 million during this period and significant reductions in pesticide use. These results are in stark contrast to the situation in neighboring states where late blight has continued to be a significant problem. I could discuss other diseases and pests affecting potato and processing vegetable crops where the timeliness of control is critical to management and to minimizing the use of pesticides, but I think the late blight situation clearly illustrates the need for the combined efforts of growers, the university, ground and aerial applicators and agribusiness in crop and pest management activities. This partnership is critical to successful crop production in an environmentally safe manner.

The concern I have with the site selection for wind turbine towers is the effect this will have on disease and insect management on a wide range of crops grown in your area. When towers are positioned in or near production fields where aerial application of pesticides is currently used for pest management, aerial applicators are refusing to treat these fields with pesticides due to the enhanced potential for personal, property and environmental risk. This potentially leaves significant production areas with one less tool that can be used for timely and safe pest and crop management activities. In short, this increases the risk for pest outbreaks, increased use of pesticides and reduced farm profitability for an industry that is key to the economic success of this region. I hope that these comments help you in your discussions as you consider if and where wind turbines will be located in your area. If you have questions related to what I've discussed above, please feel free to contact me at 608-231-3163 or wrs@plantpath.wisc.edu.

Sincerely,

Walter R. Stevenson

Walter R. Stevenson
Professor Emeritus of Plant Pathology
University of Wisconsin - Madison

WRS

1630 Linden Dr. Madison, Wisconsin 53706-1598 (608) 262-1410
Fax: (608) 263-2626 http://www.plantpath.wisc.edu

YAHOO! MAIL Classic

Economic Impact of Vegetable Industry

Monday, May 11, 2009 11:19 AM

From: "Tamas Houlihan" <thoulihan@wisconsinpotatoes.com>
To: dpreabe@yahoo.com

Dear Damon:

The following are the estimated values of Wisconsin 's major vegetable crops (based on 2007-2008 statistics):

The potato industry in Wisconsin is valued at over $250 million per year at the farm gate.
The sweet corn industry for canning in Wisconsin is valued at $50,612,000 for canning, and $13,965,000 for the fresh market.
The snap bean industry for canning in Wisconsin is valued at $31,297,000.
The pea industry for canning in Wisconsin is valued at $18,739,000.
Cucumbers for pickles in Wisconsin are valued at $9,217,000.
The onion industry is valued at $6,258,000 in Wisconsin .
The carrot industry is valued at $5,140,000 in Wisconsin .

All told, the value of Wisconsin 's potato-vegetable crops is over $380 million each year. When a modest 2-time economic impact multiplier is used, the impact on Wisconsin 's economy is over $760 million annually.

The Wisconsin Potato & Vegetable Growers Association is adamant that aerial application is critical to the health of the potato and vegetable industry in our state.

Sincerely,

Tamas Houlihan
Communications Director
WPVGA


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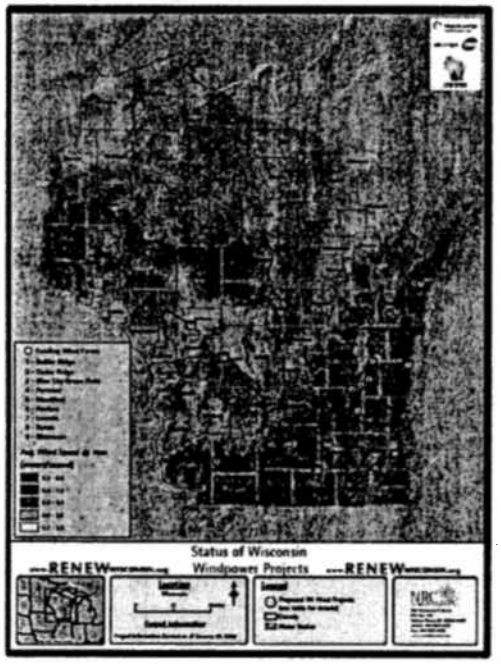
Windpower in Wisconsin: The Permitting Crisis

Michael Vickerman

May 12, 2009

Committee on Commerce, Utilities, Energy & Rail

www.RENEWWISCONSIN.org



Q. Where are the wind projects in Wisconsin located?

A. The majority are located near the load centers of eastern Wisconsin, in Fond du Lac and Dodge counties

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Wind Projects - Class of 2008/2009

Project	MW/WTG	Owner	Utilities Served
Blue Sky Green Field	145/88	We Energies	We Energies
Forward	129/86	Invenergy	WPS, WPPI, MGE, WPL
Cedar Ridge	68/41	Alliant-WPL	Alliant-WPL
Butler Ridge	54/36	Babcock & Brown	WPPI
Total	**396/251**		

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Revenues to Local Economy - Governments

Project	Towns	Counties	Annual Payments
Blue Sky Green Field	Marshfield, Calumet	Fond du Lac	$ 580,000
Forward	Byron, Oakfield, Leroy, Lomira	Fond du Lac, Dodge	$ 516,000
Cedar Ridge	Eden, Empire	Fond du Lac	$ 272,000
Butler Ridge	Herman	Dodge	$ 216,000
Total			**$1,584,000**

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Revenues to Local Economy - Landowners

Projects	Turbines	Annual Payments to Landowners
Blue Sky Green Field	88	$ 440,000
Forward	86	$ 430,000
Cedar Ridge	41	$ 205,000
Butler Ridge	36	$ 180,000
Total	**251**	**$1,255,000**

Assumes $5,000 per turbine per year

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Revenues to Local Economy - Total

Project	Governments	Landowners	Combined Payments
Blue Sky Green Field	$580,000	$440,000	$1,020,000
Forward	$516,000	$430,000	$ 946,000
Cedar Ridge	$272,000	$205,000	$ 477,000
Butler Ridge	$216,000	$180,000	$ 396,000
Total	**$1,584,000**	**$1,255,000**	**$2,839,000**

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Other States Are Benefiting from Wisconsin's RES

By 2010, more than one-half of the wind energy serving Wisconsin utilities will come from neighboring states.

Projects	*Year*	*MW*	*WI Utilities*
Top of Iowa 2	'08	80	WPPI, MGE
Top of Iowa 3*	'08	30	MGE
Endeavor 2 (IA)	'08	50	MGE
Crystal Lake (IA)	'08	100	WP&L
Barton (IA)	'09	30	WPPI
Crane Creek* (IA)	'09	99	WPS
Bent Tree* (MN)	'10	200	WP&L

* Utility-owned

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A Tale of Two Projects

Crane Creek, a 99 MW project located in Iowa that Green Bay-based WPS will own, was permitted in 2008 and will be operating by 12/31/09.

Twin Creeks, a 98 MW project located in Manitowoc County in WPS territory, received a permit in 2005. Due to a combination of litigation and ordinance changes, ground was never broken. Under the current ordinance, it is highly unlikely that the Twin Creeks project will be built, even though it has a permit.

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If Twin Creeks Is Not Built ...

Consequences

Local governments lose $392,000/year in future revenues.

Local landowners lose $294,000/year in future rents.

A local component manufacturer loses a 98 MW order to build towers

Construction jobs are outsourced to Iowa.

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Projects Blocked by Local Opposition

Projects	MW	County
Twin Creeks	98	Manitowoc
Mishicot	19	Manitowoc
Stony Brook	80	Calumet
Ecomet	80	Calumet
New Holstein	6	Calumet
Summit Ridge	75	Monroe
White Oak	99	Grant
Evansville	5	Rock

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Question

When was the last time a local government approved a permit application to build commercial wind turbines?

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Answer: March 26, 2007

On that date, the Town of Glenmore in Brown County approved Emerging Energy's application to build and operate eight turbines.

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What Are a Developer's Current Options?

1) Get Big – Expand project to >100 MW and obtain a CPCN from the PSC
   - Rely on agency's pre-emptive authority
   - Expensive and time-consuming
   - Reasonable probability of success
   - Only a handful of locations can accommodate 60 turbines

2) Get Out of Wisconsin

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If the Status Quo Persists

1. For a time, developers/utilities will go through the CPCN process to obtain permits in WI.

2. Development activity in WI falls off after 2012 (due to IPP's migrating to other, more hospitable states).

3. Regional transmission constraints tighten after 2012, reducing the availability of out-of-state wind projects for several years.

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Conclusion

1. Without uniform permitting standards in place, it will be difficult for utilities to comply with an increased Renewable Energy Standard at any level above current law.

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Remedy

Pass Senate Bill 185 and
Assembly Bill 256

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For More Information

Michael Vickerman
RENEW Wisconsin
Phone: 608.255.4044
Fax: 608.255.4053
mvickerman@renewwisconsin.org

www.RENEWWISCONSIN.org

Conclusion

1. If we don't initiate a process to establish uniform permitting standards, it will be difficult for utilities to comply with an increased Renewable Energy Standard at any level above current law.

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Remedy

Pass Senate Bill 185 and
Assembly Bill 256

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The Impact of Wind Facilities on Residential Property Values

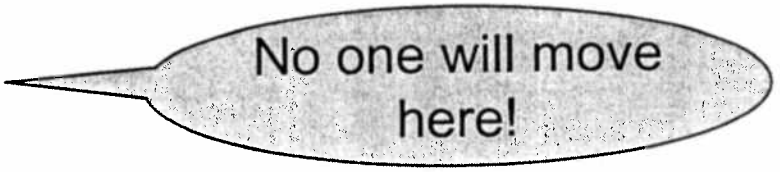
Pre-Review Results

Ben Hoen & Ryan Wiser
Lawrence Berkeley National Laboratory
benhoen2@earthlink.net, rhwiser@lbl.gov

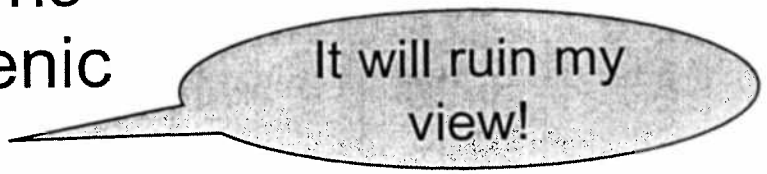
Wind Powering America
Annual Summit
May 8, 2009
Chicago, IL

Property Value Concerns For Wind Fall Into Three Potential Categories

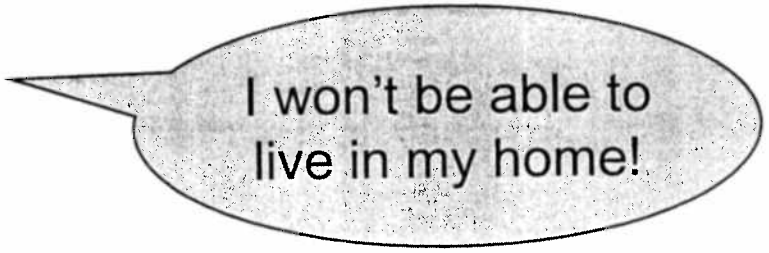
1. **Area Stigma:** Concerns over "industrialization" of area



2. **Scenic Vista Stigma:** Concerns over decrease in quality of scenic vistas from homes



3. **Nuisance Effects:** Potential health/well-being concerns of nearby residents

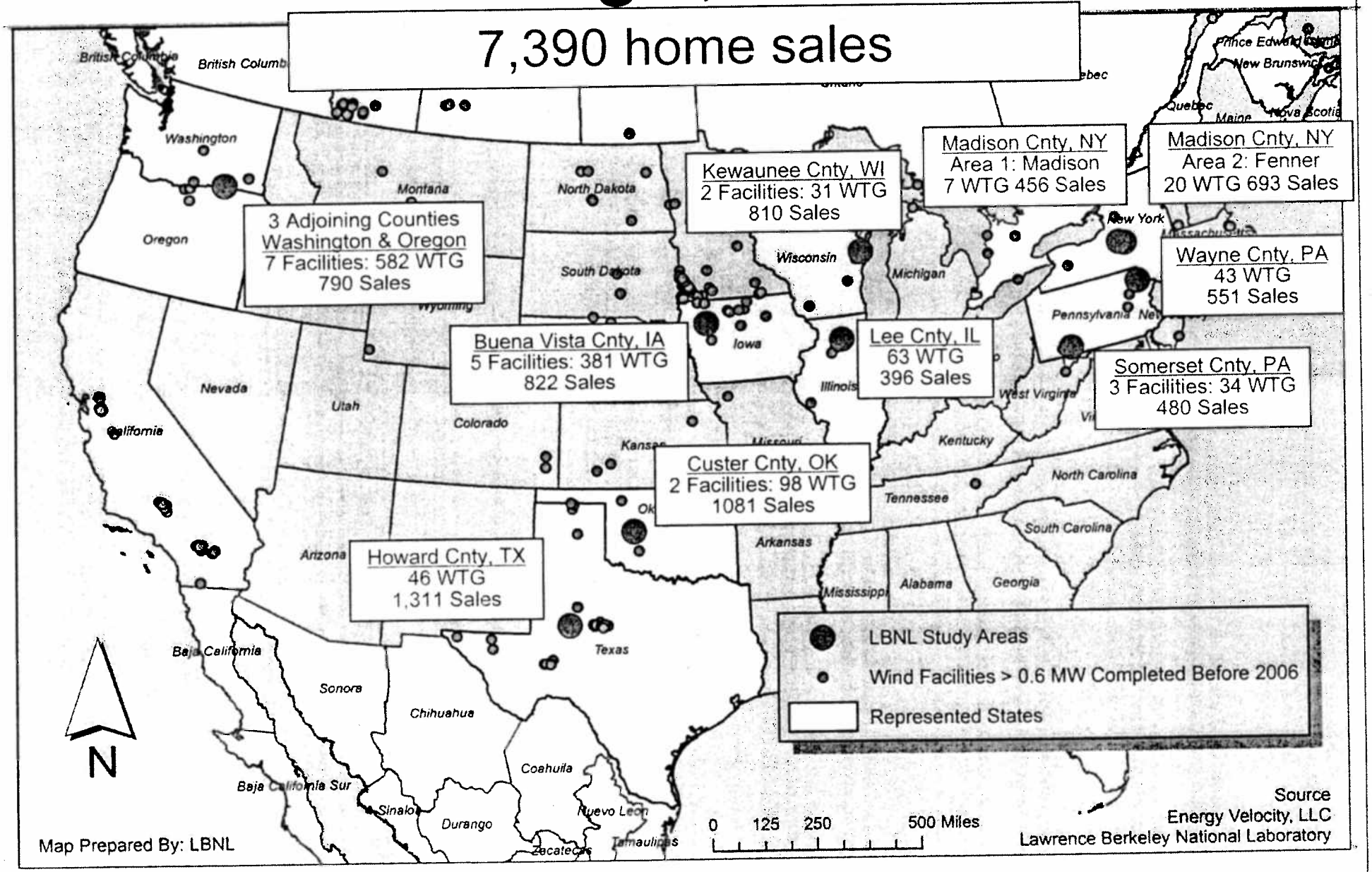


Each of these effects could impact property values; none are mutually exclusive

Approach

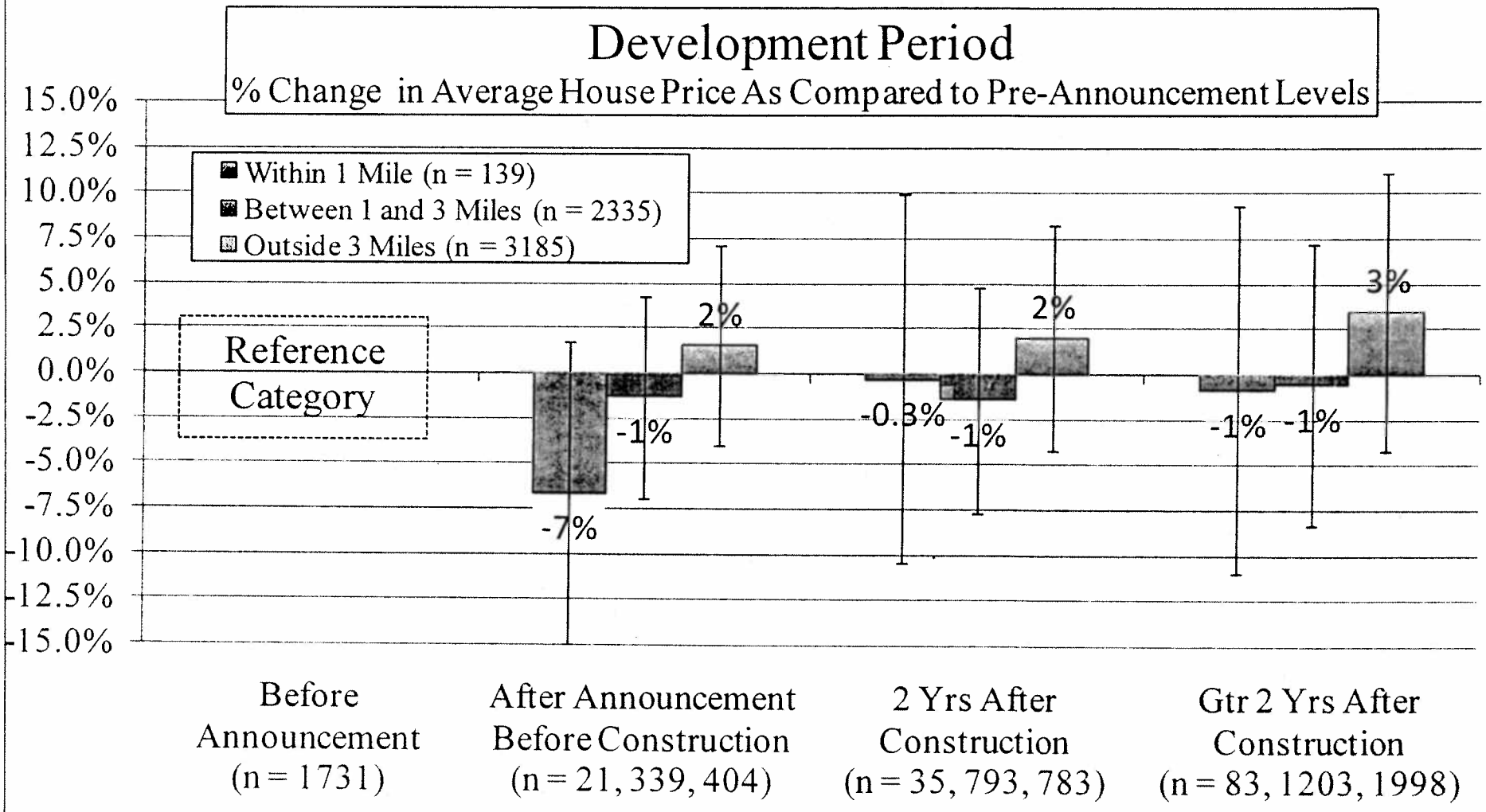
- **Conduct literature review** of previous wind / property value studies and wind facility public acceptance surveys, as well as potentially analogous dis-amenity effects studies (e.g. transmission lines)
- **Collect data** for residential sales transactions surrounding wind facilities pre- and post-construction **at multiple study areas** across the US
- **Visit each home** to measure degree to which turbines are visible, the quality of the scenic vista, and other potentially value-influencing characteristics (e.g. water front, cul-de-sac)
- **Use multiple models** to tease out effects of distance, view, time period, etc. relying on a hedonic pricing model (commonly used for real estate valuation)
- **Test for the presence of the three stigmas**: Area Stigma, Scenic Vista Stigma, and Nuisance Stigma
- **Rigorously analyze and peer review** results culminating in an LBNL report and at least one journal paper

Collected Data From 10 Study Areas Surrounding 1,300 Turbines



Area Stigma: Pre vs. Post Wind Project

There Is No Statistical Evidence That Homes That Sold After Announcement Or Construction Are Significantly Affected



Status and Next Steps

Status: Project team currently reviewing first draft.

Next Steps:

1) **Complete LBNL report:** LBNL report due in late summer/fall 2009.
2) **Write journal article:** Journal submitted paper will be created from parts of LBNL report. Submitted in fall 2009
3) **Present results:** We expect to begin to present final results in fall 2009.
4) **Longer term:** Consider a survey of home purchasers from this project's study areas to investigate and refine results from this report and investigate public acceptance for wind projects in general. Consider revisiting this model in a few years when considerably more data are available (majority of development has occurred in the last 3 years) and use GIS techniques to simplify data collection.

What Conclusions Can Be Drawn From Study Results?

Given our sample …

- **Area Stigma:** We find no statistical evidence that homes sold after announcement or construction of wind facility are affected
- **Scenic Vista Stigma:** We find no statistical evidence that homes with a view of wind turbines have different values or appreciation rates than homes without such views
- **Nuisance:** We find no statistical evidence that homes within 3000 feet of turbines, nor anywhere between 3000 feet and 5 miles, sell or appreciate differently than those outside of 5 miles

Bottom line: Though one cannot rule out isolated cases where property values are negatively impacted, any such impacts within our sample are neither widespread nor statistically identifiable

Wind Energy and Property Values: Moving From Speculation to Understanding

Pre-Review Results from a Nationwide, Multi-Site Analysis

Ben Hoen and Ryan Wiser
Lawrence Berkeley National Laboratory

U.S. Department of Energy
Energy Efficiency and Renewable Energy

Introduction

With many drivers in place, such as 28 states having enacted Renewables Portfolio Standards (RPS) [1], President Obama's 2009 goal of doubling U.S. renewable capacity in three years, and the U.S. Department of Energy's goal of 20% wind by 2030 [2], the United States is poised to continue its dramatic wind capacity growth. One of the major barriers to this growth is the siting and permitting process [3]. Concerns of the community, a major stakeholder in the siting process, can be the difference between success and failure, if unaddressed [4]. One of the top concerns expressed by local communities is wind energy's potential effect on aesthetics and property values [5, 6]. Only a few reports have investigated the degree to which views of and proximity to wind facilities affect surrounding property values [7-13], however, only one has been published in a peer-reviewed journal [9], and only two relied on field visits to potentially affected homes [8, 9]. As a result, stakeholders are left without a definitive basis for answering a broad range of questions, which often turns this issue into a matter of opinions not empirical observations [14]. A clearer understanding of the facts of this issue will allow stakeholders on all sides to discuss these concerns more productively.

Objective

This study addresses community concerns on the impact of wind facilities on aesthetics and property values. Do homes in close proximity to wind facilities experience a decrease in value, while other homes further away do not? Do homes with a prominent view of wind turbines suffer a decrease in property values, while those without a view do not? Do entire communities surrounding wind facilities become stigmatized from the time the project is announced until long after it is operational? Do sales volumes closer to wind turbines differ from those further away?

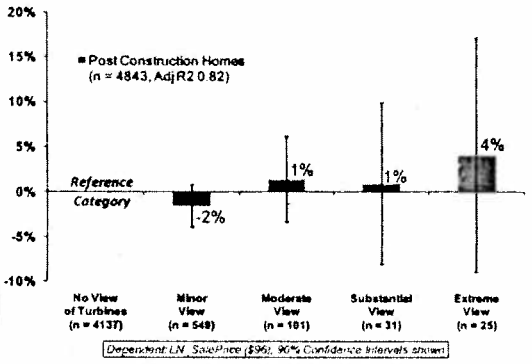
To address all of these questions, the study group analyzed 7,293 home sales transactions in 10 different states and 14 counties.

Twenty-five operational wind facilities, representing 10 distinct study areas, were selected for analysis. Each study area had at least 350 home sales transactions within 10 miles of the nearest wind turbine, spanning the period from before facility announcement to well after construction. Study areas were selected to capture a broad array of online dates, turbine sizes, topographies, house values, socio-economic characteristics, and locations where wind energy development activity is significant.

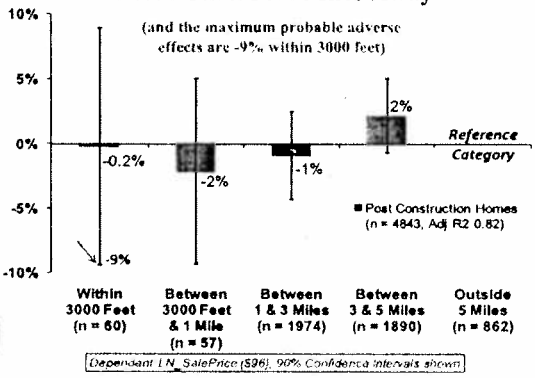
Methods

- Information on all arms-length sales transactions within the study areas of single family residences were collected from the counties, as well as site and structure characteristics (e.g., sqr ft., acres, bathrooms, age and condition of the home, school district).
- Distance to the nearest wind turbine was estimated using a GIS, based on the date of sale and facility configuration at the time of sale. Distance categories were: inside 0.57 miles (3,000 feet), between 0.57 and 1 mile, between 1 and 3 miles, between 3 and 5 miles and outside 5 miles.
- Every home that had sold, in each study area, was visited to determine the degree to which turbines were visible and to assess the quality of the scenic vista and other potential value-influencing characteristics (e.g., if the home was situated in a cul-de-sac).
- View (of turbine) ratings were recorded using both qualitative and quantitative techniques. Qualitative ratings were: None, Minor, Moderate, Substantial, and Extreme. Quantitative measures included number of turbines visible and viewing angle.
- A Scenic Vista rating system, which was used to control for the values of scenic vistas in general, was developed borrowing from landscape and land planning principals [15]. Ratings were: Poor, Below Average, Average, Above Average and Premium.
- All data were pooled in a log-linear hedonic statistical model with the characteristics of homes in each study area each independently estimated (e.g., bathrooms, scenic vista), and with variables of interest (view of turbines, distance from nearest turbine) estimated across all sites in a pooled manner.
- Additionally a repeat sales model and sales volume analysis were conducted.

There Is No Statistical Evidence Of A Difference In Average Homes Prices With "Dominating" Wind Turbines Views As Compared To Those Which Sold Over The Same Period With No View

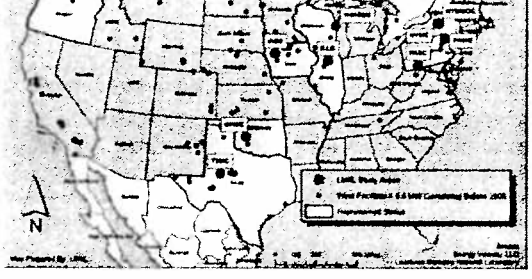


Nor Is There For Homes Near Wind Turbines As Compared To Those More Than Five Miles Away



These Results Held Even When Concentrating On Homes Which Sold Immediately Following Facility Announcement And In The First Two Years Following Construction

Study Area Map



Results

- In the primary analysis using a hedonic pricing model and concentrating on home sales which occurred after wind project construction, no statistical evidence was found that home prices near the wind facilities differed significantly from those outside of 5 miles; nor did the price of homes with prominent views of wind turbines differ significantly from homes without such views.
- Additional analysis found similar "no evidence" results when comparing post-facility-construction home sales prices for those homes near the turbines to pre-facility-announcement sale prices of homes at the same distance.
- A third analysis using a repeat-sales model and appreciation rates of 492 homes which sold once pre-announcement and again post-construction, similarly revealed no significant differences in home appreciation rates near and far from the facility or for homes with and without a view of a facility.
- A sales volume analysis was also conducted comparing rates of homes sold inside of 1 mile to those outside of 5 miles in 3 distinct periods: pre-announcement, post-announcement yet pre-construction and post-announcement; sales volumes did not differ significantly among these periods.

Conclusions

Although one cannot rule out isolated cases of impacts, this analysis finds no evidence of widespread or statistically identifiable systematic reductions in value.

These results are substantiated by three different statistical models, and concur with the sales volume analysis performed separately.

Because of the margin of error inherent in the statistical analysis, there remains some property value risk to analogous communities considering wind energy facilities; based on the analysis presented here, that risk is roughly +/- 9% of home sales values, at its maximum, for homes within 3000 feet of wind facilities.

To reconcile the claims of likely effects with these results, further research is needed to fully understand the motivations of those living within a short distance and with dramatic views of turbines. The authors recommend a public acceptance survey.

Because many new wind facilities have come online in recent years, new home sales data are likely available that could support a follow-up study. As more data become available, it may also be useful to conduct similar studies focused on individual wind projects, rather than pooling all project site data into a single statistical model.

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