AWEA Model Zoning Ordinance:

Permitted Use Regulation for Small Wind Turbines

Section 1 Purpose: It is the purpose of this regulation to promote the safe, effective and efficient use of small wind energy systems installed to reduce the on-site consumption of utility supplied electricity.

Section 2 Findings: The [city or county] finds that wind energy is an abundant, renewable, and nonpolluting energy resource and that its conversion to electricity will reduce our dependence on nonrenewable energy resources and decrease the air and water pollution that results from the use of conventional energy sources. Distributed small wind energy systems will also enhance the reliability and power quality of the power grid, reduce peak power demands, and help diversify the State's energy supply portfolio. Small wind systems also make the electricity supply market more competitive by promoting customer choice.

The State of ___________ has enacted a number of laws and programs to encourage the use of small-scale renewable energy systems including rebates, net metering, property tax exemptions, and solar easements. [as appropriate] However, many existing zoning ordinances contain restrictions, which while not intended to discourage the installation of small wind turbines, that can substantially increase the time and costs required to obtain necessary construction permits.

Therefore, we find that it is necessary to standardize and streamline the proper issuance of building permits for small wind energy systems so that this clean, renewable energy resource can be utilized in a cost-effective and timely manner.

Section 3 Definitions:

Small Wind Energy System: A wind energy conversion system consisting of a wind turbine, a tower, and associated control or conversion electronics, which has a rated capacity of not more than 100 kW and which is intended to primarily reduce on-site consumption of utility power.

Tower Height: The height above grade of the fixed portion of the tower, excluding the wind turbine itself.

Section 4 Permitted Use: Small wind energy systems shall be a permitted use in all zoning classifications where structures of any sort are allowed; subject to certain requirements as set forth below:

4.1 Tower Height: For property sizes between ½ acre and one acre the tower height shall be limited to 80 ft. For property sizes of one acre or more, there is no limitation on tower height, except as imposed by FAA regulations.

4.2 Set-back: No part of the wind system structure, including guy wire anchors, may extend closer than ten (10) feet to the property boundaries of the installation site.

4.3 Noise: Small wind energy systems shall not exceed 60 dBA, as measured at the closest neighboring inhabited dwelling. The level, however, may be exceeded during short-term events such as utility outages and/or severe wind storms.

4.4 Approved Wind Turbines: Small wind turbines must have been approved under the Emerging Technologies program of the California Energy Commission or any other small wind certification program recognized by the American Wind Energy Association.

4.5 Compliance with Uniform Building Code: Building permit applications for small wind energy systems shall be accompanied by standard drawings of the wind turbine structure, including the tower, base, and footings. An engineering analysis of the tower showing compliance with the Uniform Building Code and certified by a licensed professional engineer shall also be submitted. This analysis is frequently supplied by the manufacturer. Wet stamps shall not be required.

4.6 Compliance with FAA Regulations: Small wind energy systems must comply with applicable FAA regulations, including any necessary approvals for installations close to airports.

4.7 Compliance with National Electric Code: Building permit applications for small wind energy systems shall be accompanied by a line drawing of the electrical components in sufficient detail to allow for a determination that the manner of installation conforms to the National Electrical Code. This information is frequently supplied by the manufacturer.

4.8 Utility Notification: No small wind energy system shall be installed until evidence has been given that the utility company has been informed of the customer's intent to install an interconnected customer-owned generator. Off-grid systems shall be exempt from this requirement.

Small Wind Page | AWEA Home Page

Thinking about a wind generator? Monitoring & production incentives

"To monitor or not to monitor"
-a good title for a passion play

Mick Sagrillo

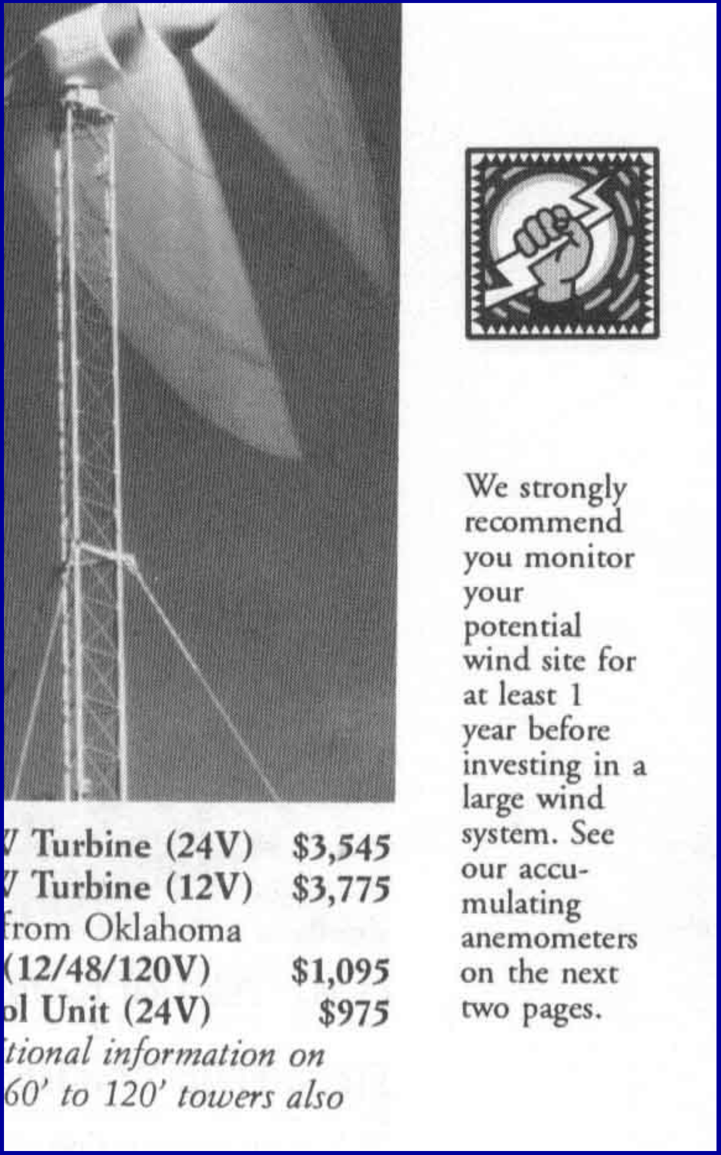
May 11, 2007

Legends and folklore

- “It’s constantly windy here”

Legends and folklore

- “Wind is site specific, therefore you NEED to monitor your potential wind site FOR AT LEAST 1 YEAR”



Legends and folklore

- “It’s constantly windy here”

- “Wind is site specific, therefore you NEED to monitor your potential wind site FOR AT LEAST A YEAR”

← the TRUTH →

The need to monitor…

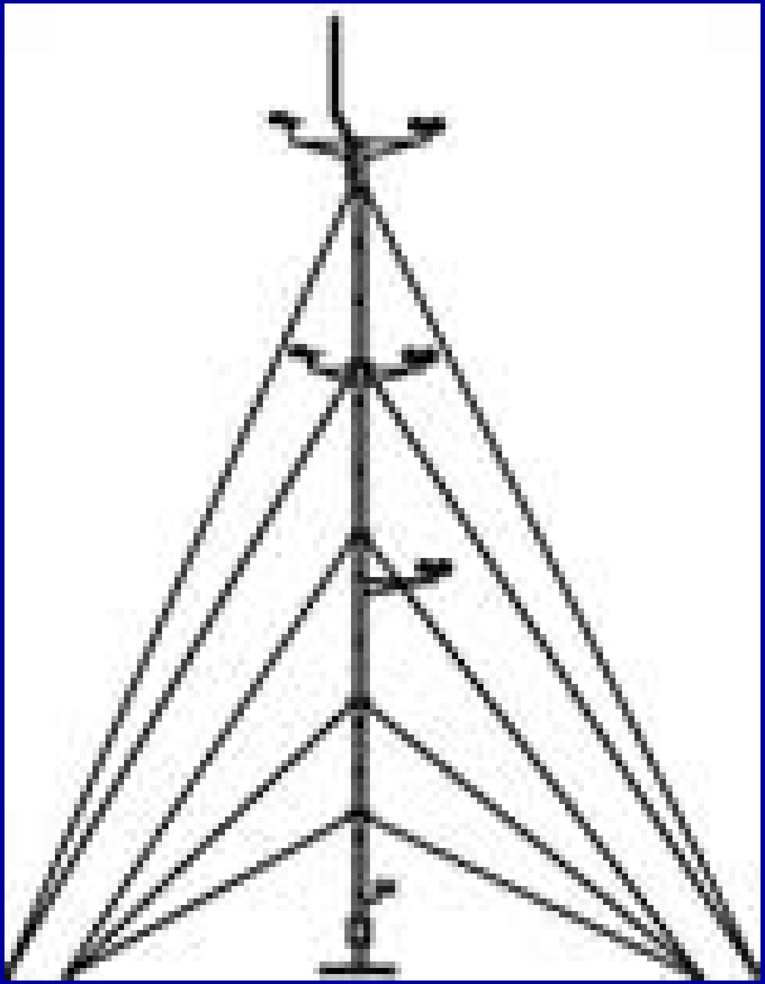
- Comes from a time when we did not have good wind resource data (70s & 80s)

- Required for big wind
  - Strong competition in the utility industry
  - Required by lenders
  - ROI

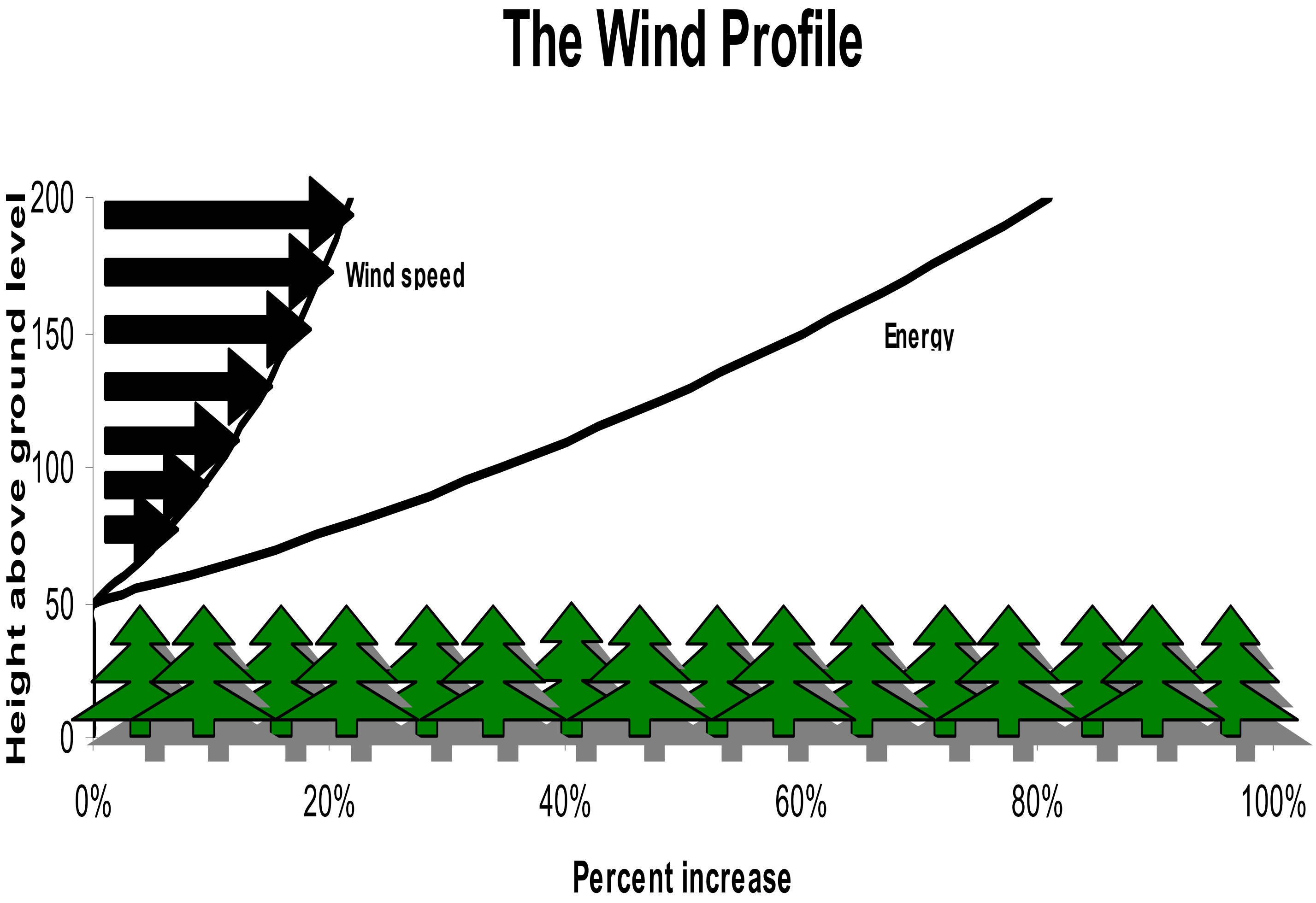
How to monitor correctly

- How to monitor correctly?
  - At hub height

    or
  - Shear study-3 anemometers & logger on 30m to 40m + towers
    - Determining change in wind speed with height above the ground



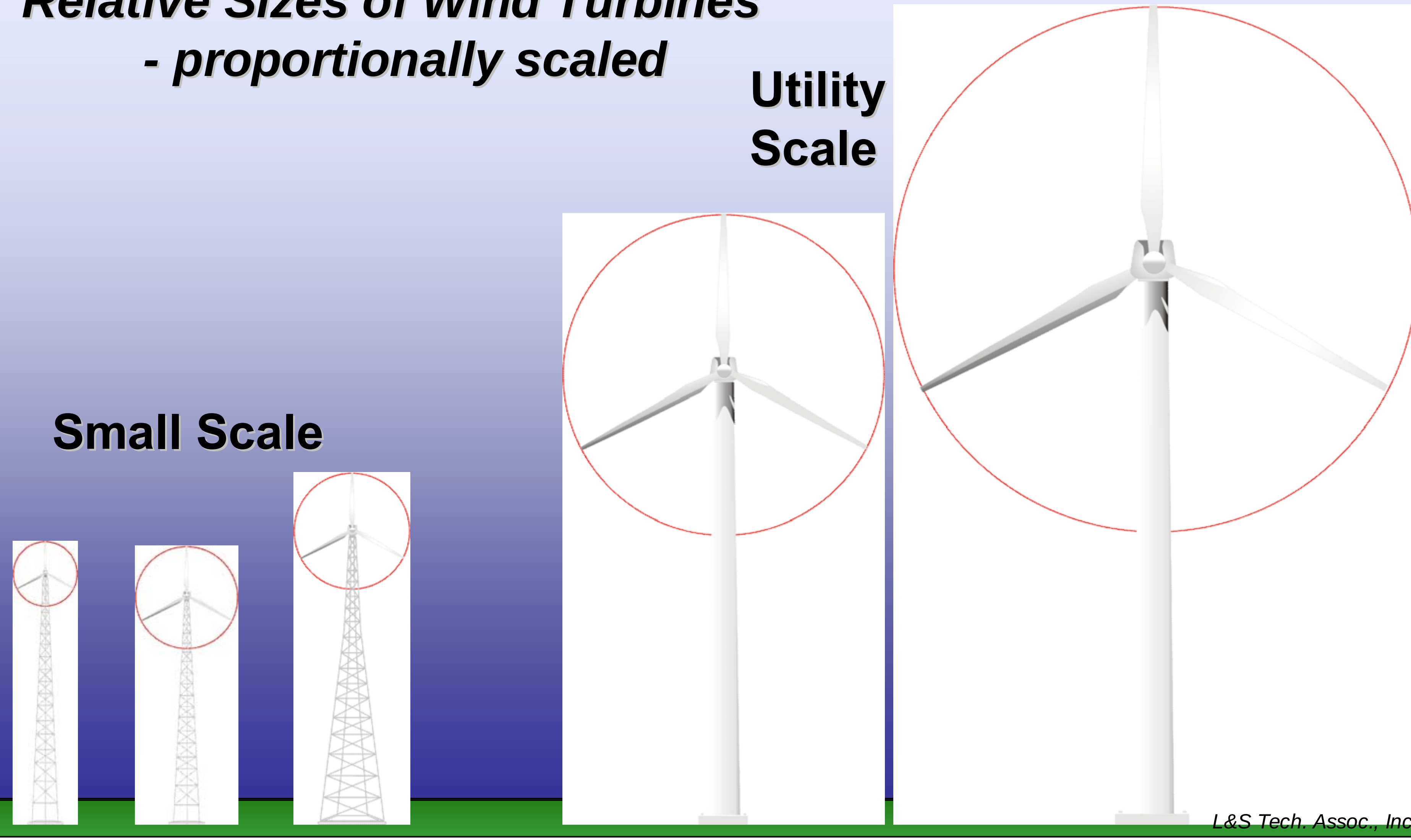
Shear study


The Wind Profile
Height above ground level
200
150
100
50
0
Wind speed
Energy
0%
20%
40%
60%
80%
100%
Percent increase

How to monitor correctly

- Must be at hub height or a shear study
- Requires a TallTower + logger
- $15,000 for equipment and labor
- Then data must be corrected for annual variations—more labor
- Note: PV and hydro don't have to go through this

Relative Sizes of Wind Turbines - proportionally scaled



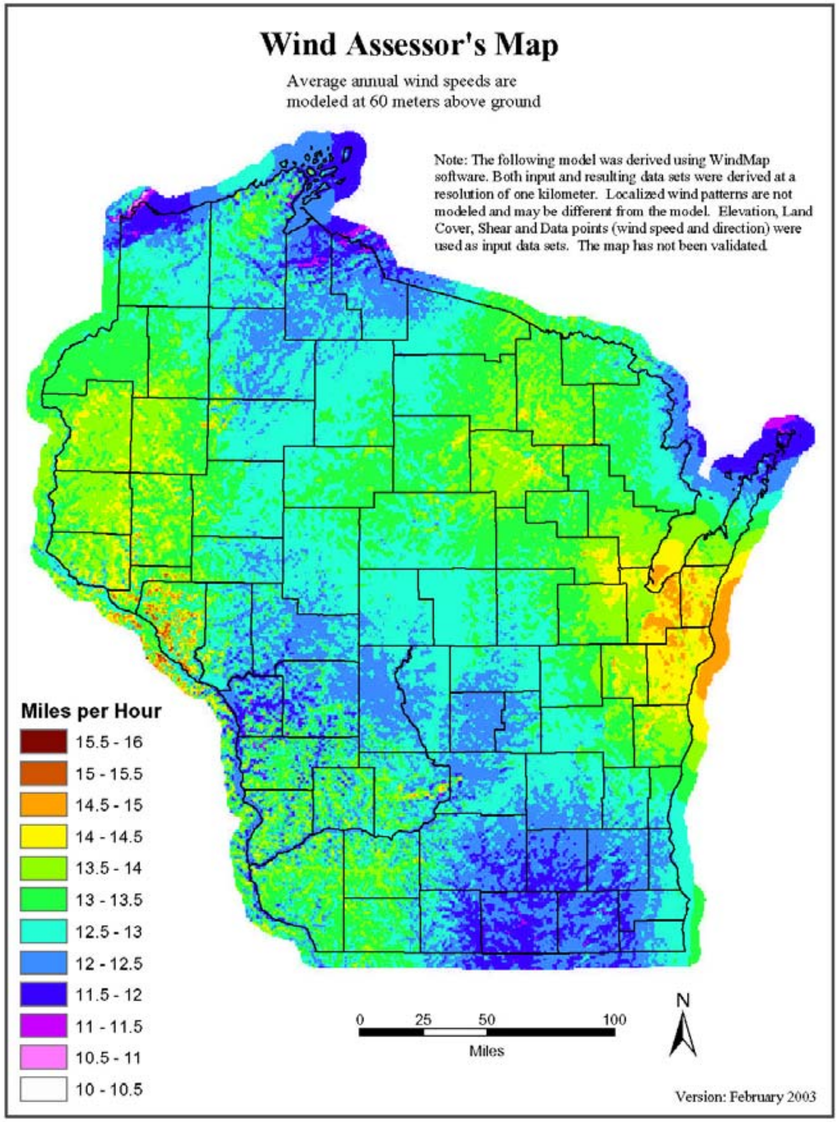
Jacobs 31-20	Vestas V15-65	Vestas V17-90	Vestas V47-660	G. E. 1.5 MW	
31 ft	49.22 ft.	55.8 ft	154.2 ft	252.6 ft	**Rotor Diameter**
120 ft	110 ft.	140 ft	213.64 ft	262.5 ft	**Hub Height**
3.5	**11.5**	**18.5**	**145**	**325**	**Average Homes Powered**

Why not monitor "for at least a year"?

- But systems cost $30k to 130K, not $1,500k to $2,500k
- Not cost effective for small wind ≤ 100 kW
- "I don't have to do this for PV"
- Turns prospective owners off or to other technologies
- So, how do you know what your wind resource is?

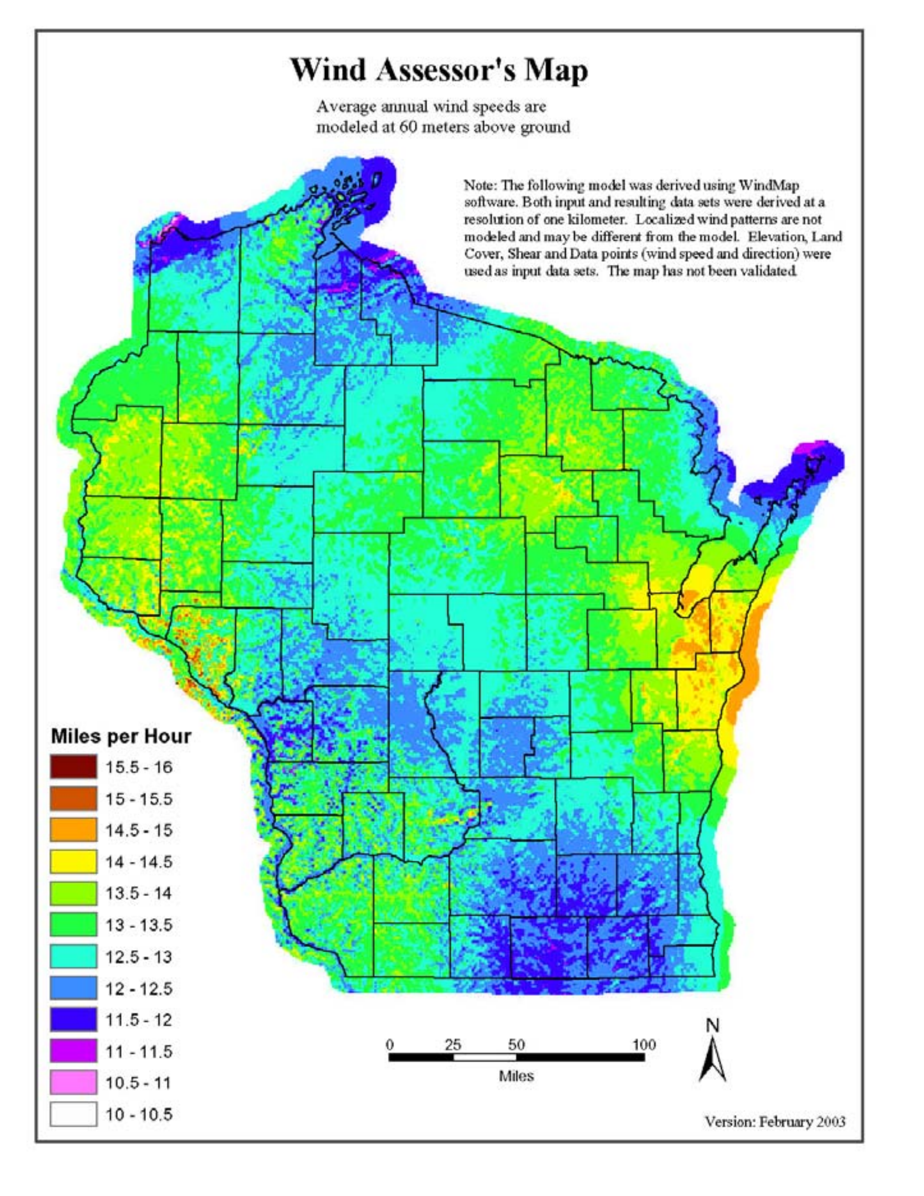
Best sources of info

- State wind maps
  - Most focus of big wind resource
  - May be subjective
  - Can extrapolate winds down to home-sized towers
  - Good enough for WI's Focus On Energy



Pick a color

Wind is not site specific but towers certainly are

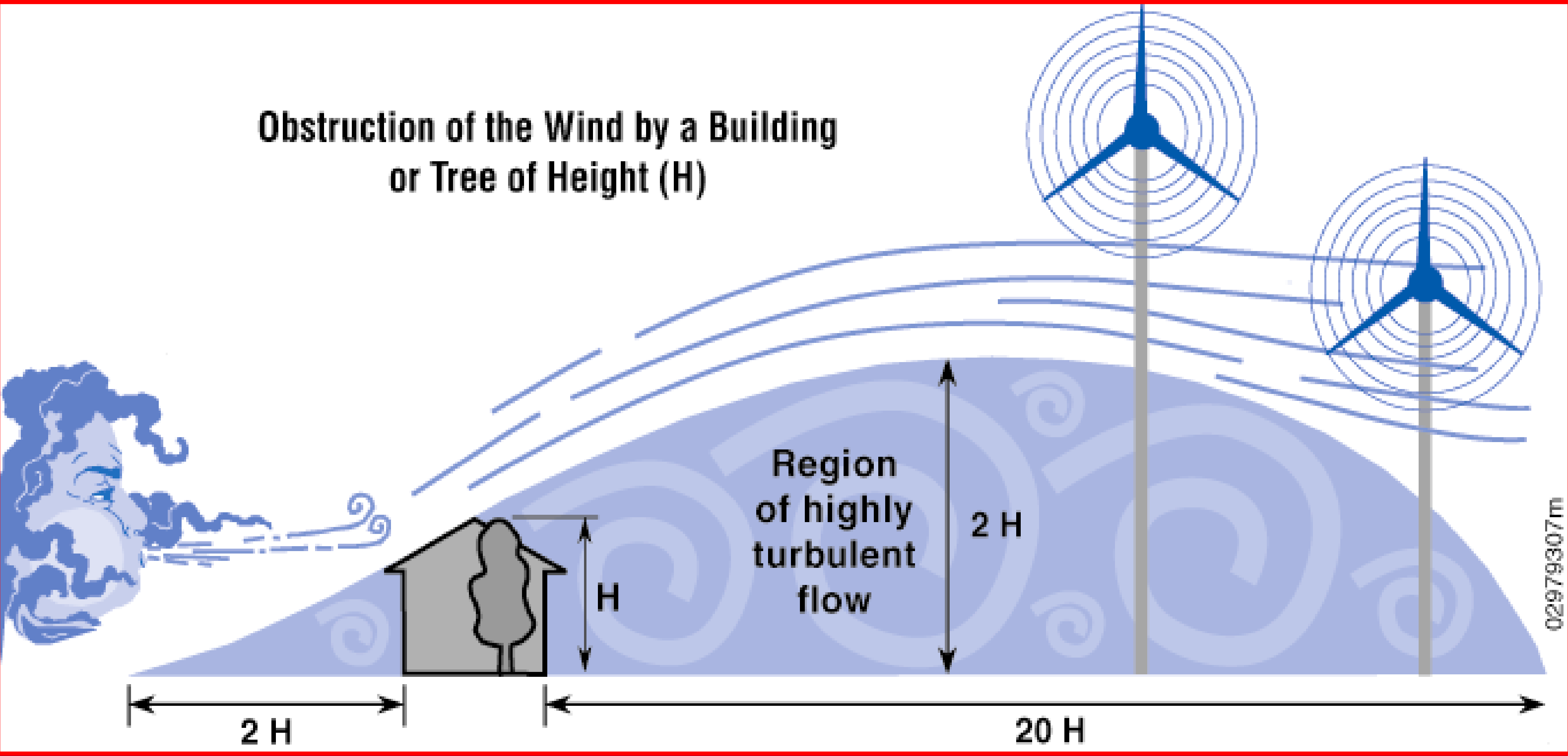


Why not “monitor for at least 1 year”?

- Monitoring not necessary for small wind--home or farm-sized wind turbines
- Requiring monitoring only delays small wind
- Remember: only $30k to $130k

- However, monitoring does help expand our knowledge base of the fuel (resource)

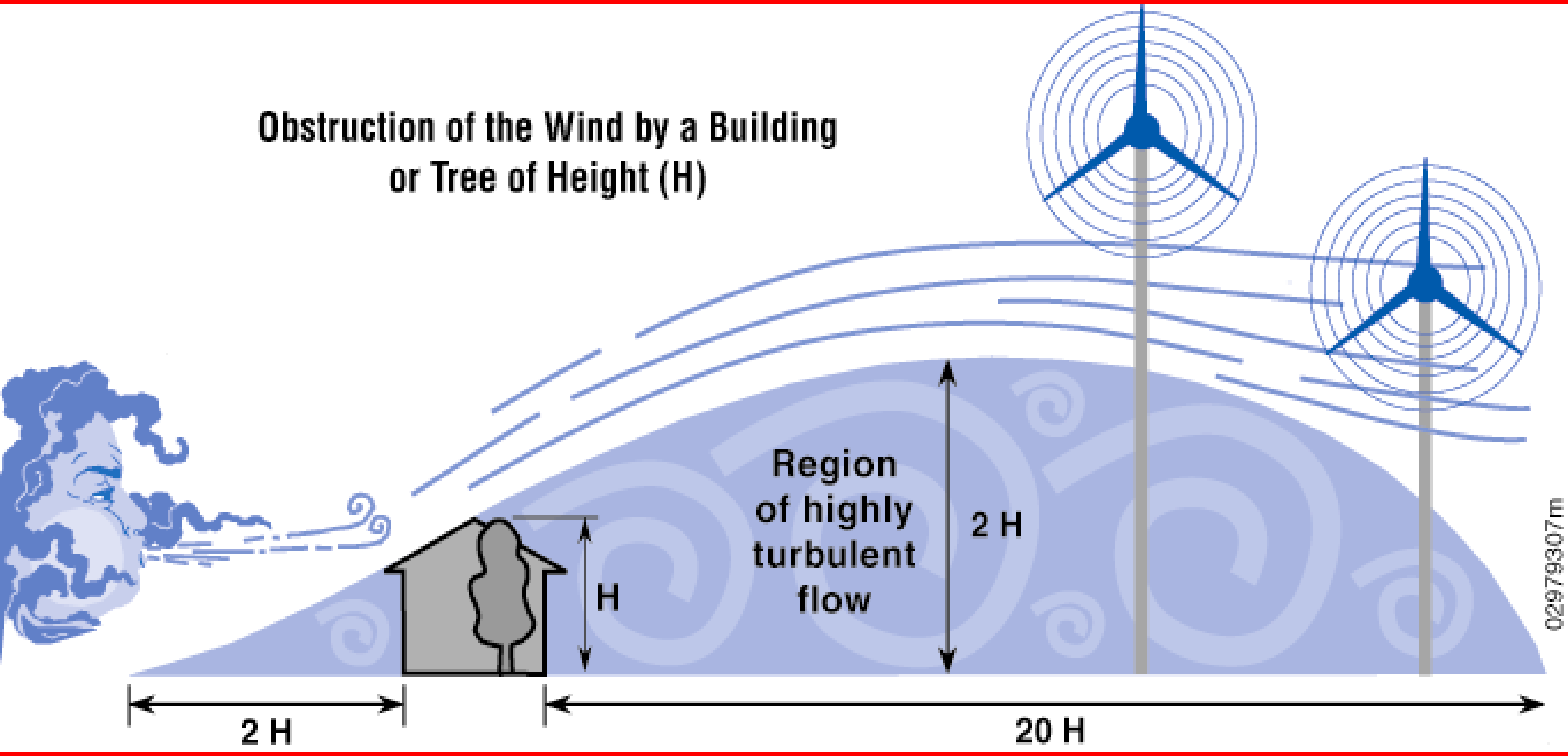
Importance of “Micro-Siting”



Rules of thumb for siting residential wind turbines

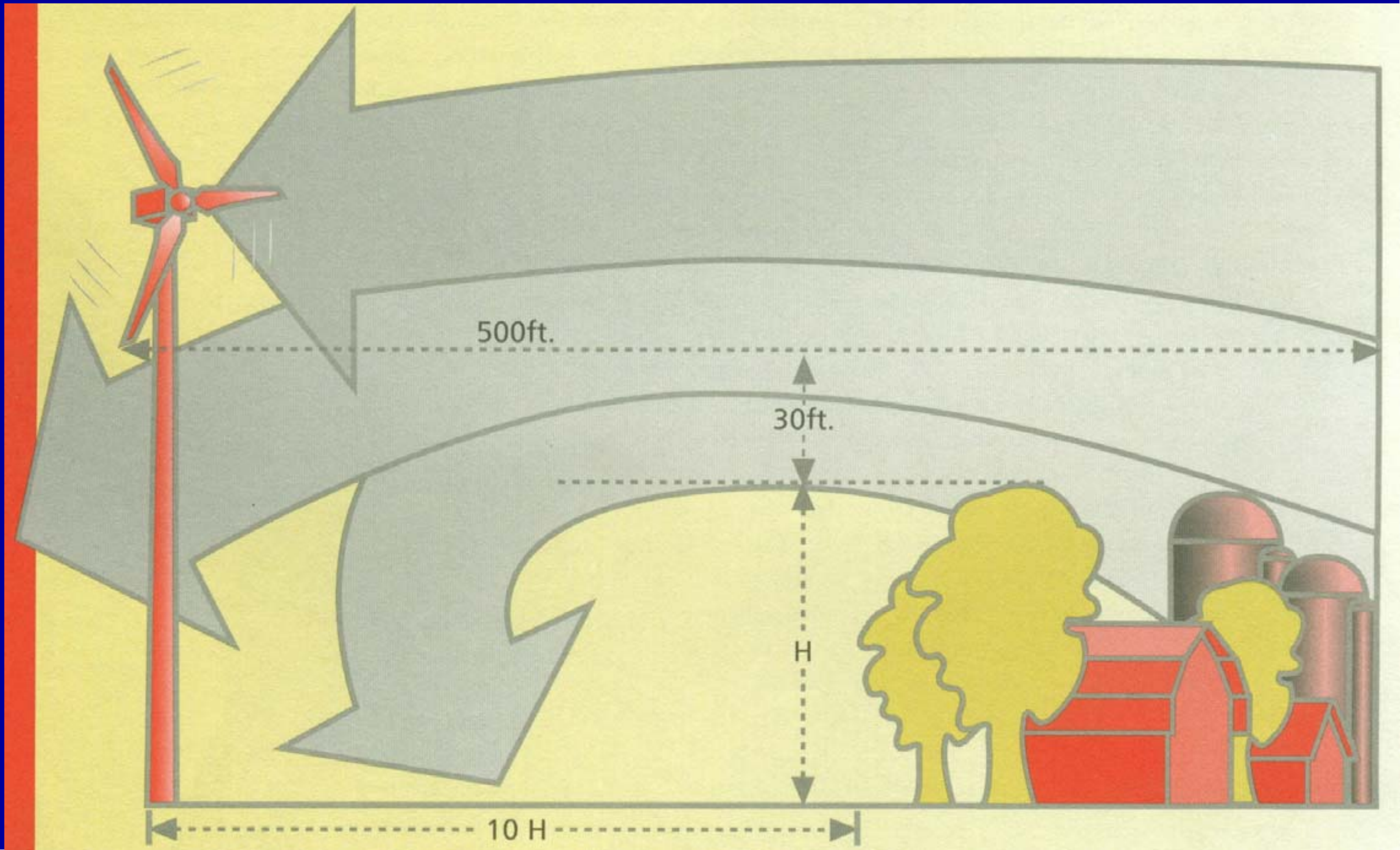
- Vertical separation due to ground clutter
  - Foremost consideration
- Therefore, "neighbors" determine tower height…
- …not what the manufacture offers or what the dealer sells

Importance of “Micro-Siting”



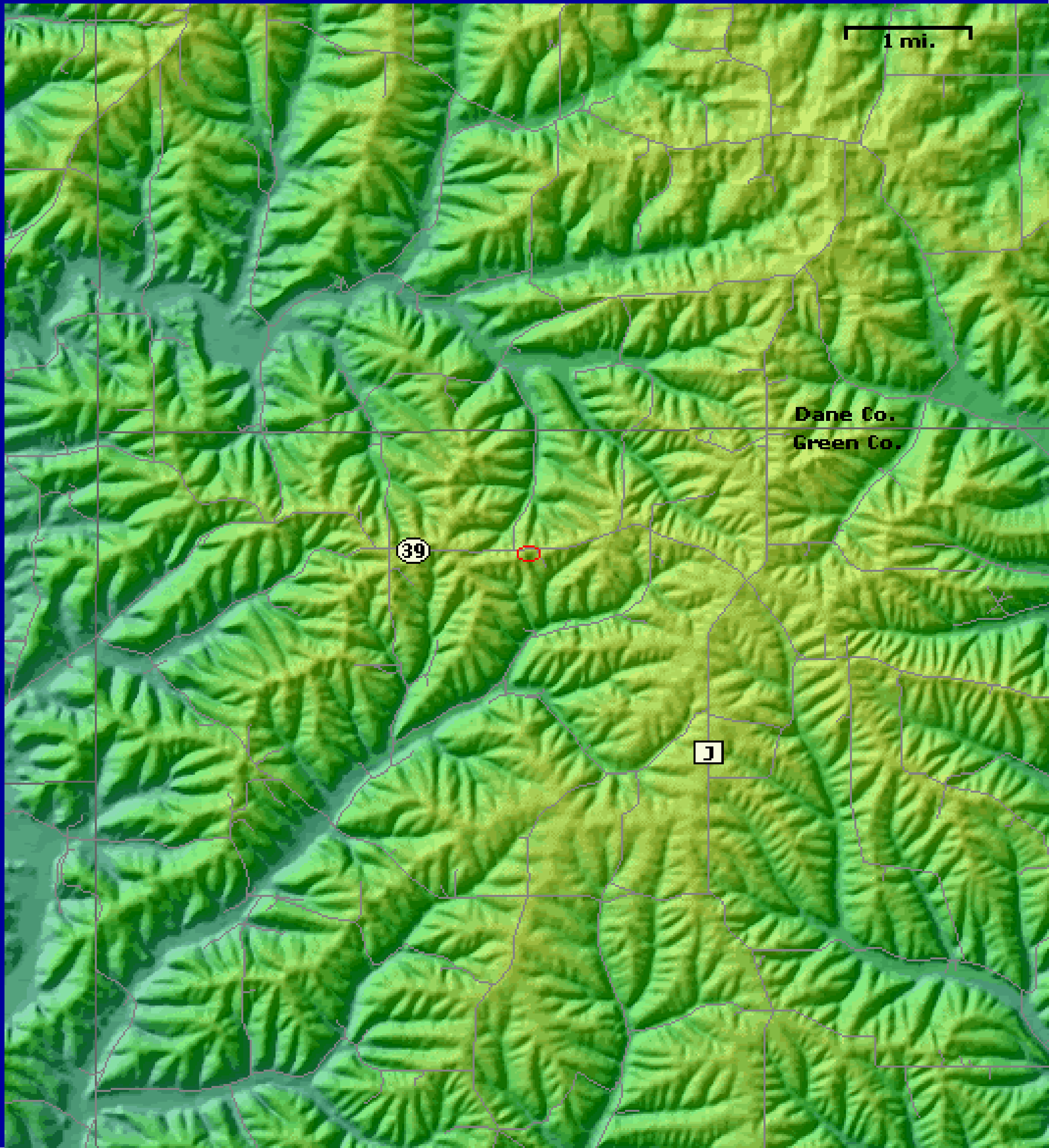
Rules of thumb for siting residential wind turbines

- 30’↑ within 500’
- Or treeline, which ever is higher



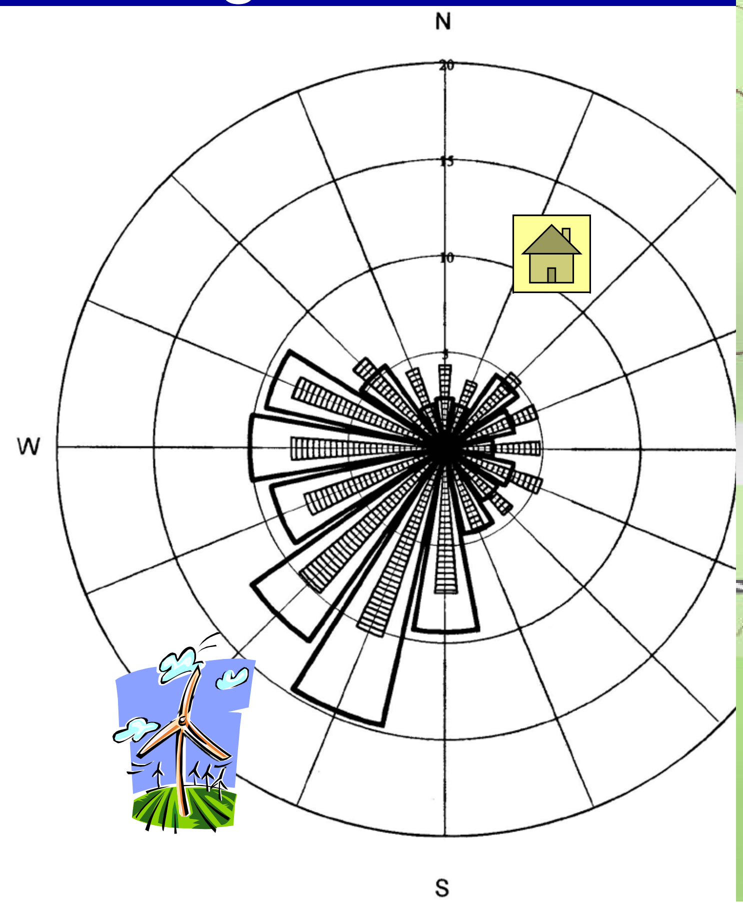
Rules of thumb for siting residential wind turbines

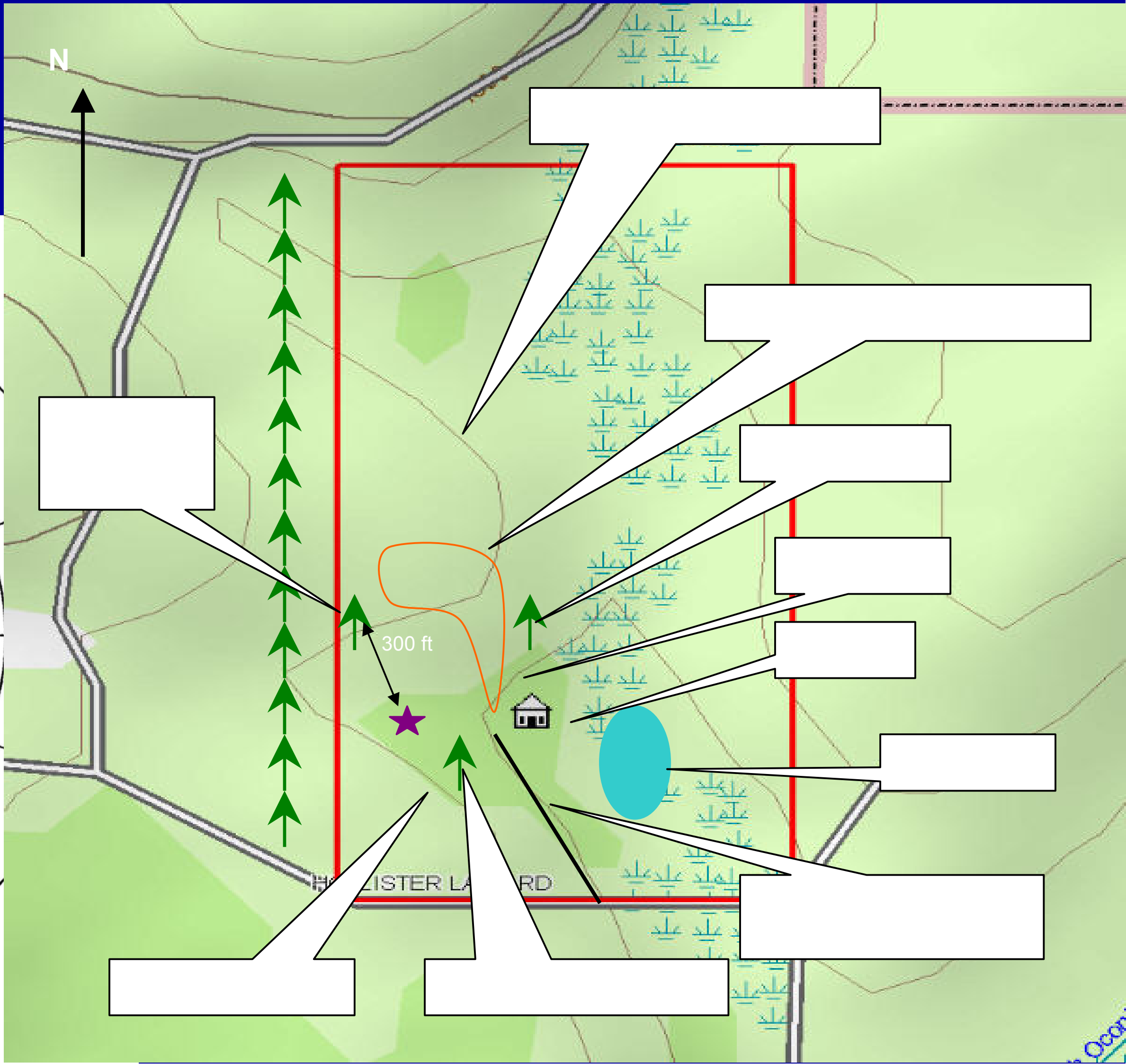
- Rougher surfaces or terrain produce gustier winds
- Therefore minimize turbulence with taller towers



Rules of thumb for siting residential wind turbines

- Upwind of ground clutter





A basic, but little remembered fact about trees…

Wind Energy in per cent of Wind Energy Without Obstacle

m height

	100	100	100	100	100	100	100	100	100	100	99	99	99	98	98	97	97	96	96	95	94
	100	100	100	100	100	100	100	100	100	99	99	99	98	98	97	96	96	95	94	93	92
	100	100	100	100	100	100	100	100	100	99	99	98	97	97	96	95	94	93	92	91	90
	100	100	100	100	100	100	100	100	99	99	98	97	96	95	94	93	92	91	90	89	88
	100	100	100	100	100	100	100	99	99	98	97	96	95	94	92	91	90	88	87	86	84
	100	100	100	100	100	100	99	99	98	97	96	94	93	91	90	88	86	85	83	82	81
	100	100	100	100	100	100	99	98	97	95	94	92	90	88	86	84	82	81	79	77	76
	100	100	100	100	100	99	98	97	95	93	91	89	86	84	82	80	78	76	74	72	71
	100	100	100	100	99	99	97	95	93	90	87	84	82	79	76	74	72	70	68	66	65
	100	100	100	100	99	97	95	92	89	86	82	79	76	73	70	67	65	63	61	59	58
	100	100	100	99	98	96	92	88	84	80	76	72	68	65	62	59	57	55	53	52	51
	100	100	100	99	96	93	88	83	77	72	68	63	59	56	53	51	49	47	45	44	43
	100	100	99	97	94	88	81	75	68	63	58	53	49	46	44	41	40	38	37	36	35
	100	100	99	95	89	81	72	64	57	51	46	42	38	36	34	32	30	29	29	28	28
24	100	100	97	91	81	70	60	51	44	38	34	30	27	25	24	23	22	21	21	21	21
23	100	99	94	83	69	56	45	37	30	25	22	19	17	16	15	14	14	14	14	14	15
21	100	98	88	71	53	39	29	21	17	13	11	10	9	8	8	8	8	8	9	9	9
20	100	95	76	53	34	21	13	9	6	5	4	3	3	3	3	3	4	4	5	5	6
18	100	87	57	30	14	7	3	2	1	1	1	1	1	1	1	1	1	2	2	2	3
17	99	72	31	9	2														1	1	1
15	96	43	7																		1
14	84	11																			
12	51																				
11	5																				
9																					
8																					
6																					1
5																		1	1	3	4
3															1	2	4	6	9	12	15
2										1	3	6	10	14	18	23	27	31	35	39	42

Rules of thumb for siting residential wind turbines

1. Towers can be a considerably expense, but…
2. This is about renewably generated kWh, not spinning blades
3. Without a tower…see rule #2

- Remember: incremental cost for incremental tower height

Resistance to tall towers

- **"If I was meant to be 100' in the air…"**

3 most common mistakes

- 1.
- 2.
- 3.

What not to do…

What to do

What to do

Resources

- *Wind Power—Renewable Energy for Home, Farm, and Business* by Paul Gipe
- Small Wind Toolboxes at
  www.renewwisconsin.org
- Wind shade calculator at Danish Wind Energy Association www.windpower.org

Focus on Energy

- Production-based incentives
- Dependent on a wind site assessment
- Minimal administrative oversight

What the assessor does

- Qualifies the site
- Looking for ground clutter
  - Buildings
  - Trees
  - Neighbors
  - Can it comply with zoning?

What the assessor does

- Topographic maps
- Aerial photographs
- Wind map
- Wind turbine output calculator
- Incentive calculator

What the assessor does

- Determines the minimum acceptable tower height for site
- Conservatively estimates wind speed at tower height
- Specifies turbines based on the client's preferences and needs (efficiency)
- Estimates the production of those turbines at the estimated wind speed at the minimum acceptable tower height for the site

What the assessor does

- Sends wind site assessment report
- Includes grant amount based on production

- Reports good enough for bank loans

Production incentive

- Assume a BXC XL-S
  - Costs $60,000 on a 120’ guyed tower completely installed
  - Produces 12,000 at 12.1 mph at 120’

Production incentive

- Incentive = estimated kWh/year x $/kWh calculation

$/kWh Calculation =

(System cost x 25%)

÷

(rated turbine capacity x (8760 x 20%))

For example

- kWh Calculation =

($60,000 x 25%) or $15,000

÷

(10kW x 1752) or 17520 kWh

=

$0.86/kWh

For example

- Incentive = estimated kWh/year x calculation

- = 12,000 kWh/year x $0.86/kWh or $10,320

Confused ?

- Requires
  - Site assessor training
  - Trained assessors for hire
  - Some spreadsheets
  - Your wind map
  - Minimal administrative work

Why do this ?

- Grants become ‘self-selecting’
  - Good wind sites and good producers get installed
  - Poor wind sites or producers do not
  - ‘producers’ = wind turbines with mediocre capacity factors

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Small Wind Energy System Ordinance

Note: This ordinance was funded in part through the Focus on Energy Program

The following agencies provided input for the development of the Small Wind Energy System Ordinance:

Focus on Energy
National Renewable Energy Laboratory
Public Service Commission of Wisconsin
University of Wisconsin-Extension Service
Wisconsin Division of Energy
Wisconsin Towns Association

The following people helped develop, gave legal input as appropriate, and reviewed the Small Wind Energy System Ordinance:

David Blecker, 7th Generation Energy Systems
Alex DePillis, Renewable Energy Engineer, Wisconsin Division of Energy
Jim Green, National Renewable Energy Laboratory
Sherrie Gruder, University of Wisconsin-Extension Service
Paul C. Helgeson, Senior Engineer, Public Service Commission of Wisconsin
John Hippensteel, Lake Michigan Wind & Sun
Larry Krom, Focus On Energy Renewable Energy Program
Shelly Laffin, Focus On Energy Renewable Energy Program
Carol Nawrocki, Legal Counsel, Wisconsin Towns Association
Brian Ohm, Legal Specialist, University of Wisconsin-Extension Service
Cheryl Rezabek, Chief of Planning and Evaluation, Wisconsin Division of Energy, Department of Administration
Mick Sagrillo, Wind Energy Specialist, Focus On Energy Renewable Energy Program
Michael Vickerman, Focus On Energy Renewable Energy Program
Patrick Walsh, Energy and Environmental Specialist, University of Wisconsin-Extension Service
Don Wichert, Director, Focus On Energy Renewable Energy Program

The Small Wind Energy System Ordinance was developed as a permitted use ordinance, as we were advised that this would be the more difficult ordinance to draft. The ordinance can be simply used as a conditional use permit for a small wind turbine by inserting sections into the permit:

00.05 Standards
00.06 Permit Requirements.
00.07 Abandonment.

Small Wind Energy System Ordinance

00.01 Title.

This ordinance may be referred to as the Small Wind Energy System Ordinance.

00.02 Authority.

This ordinance is adopted pursuant to authority granted by:
For counties: Wis. Stat. § 59.69 and 66.0401
For towns and villages: Wis. Stat. § 60.61 or 60.62 and 62.23(7), or 60.22(3) and 66.0401

00.03 Purpose.

The purpose of this ordinance is to:

(1) Oversee the permitting of small wind energy systems

(2) Preserve and protect public health and safety without significantly increasing the cost or decreasing the efficiency of a small wind energy system (per Wis. Stat. §. 66.0401).

00.04 Definitions.

In this ordinance:

(1) "Administrator" means the (County or Town) of __________ Land Use Administrator or Planning and Zoning Administrator

(2) "Board" means the (County or Town) of __________ Board of Supervisors.

(3) "Meteorological tower" (met tower) is defined to include the tower, base plate, anchors, guy cables and hardware, anemometers (wind speed indicators), wind direction vanes, booms to hold equipment anemometers and vanes, data logger, instrument wiring, and any telemetry devices that are used to monitor or transmit wind speed and wind flow characteristics over a period of time for either instantaneous wind information or to characterize the wind resource at a given location.

(4) "Owner" shall mean the individual or entity that intends to own and operate the small wind energy system in accordance with this ordinance.

(5) "Rotor diameter" means the cross sectional dimension of the circle swept by the rotating blades.

(6) "Small wind energy system" means a wind energy system that
(a) is used to generate electricity;
(b) has a nameplate capacity of 100 kilowatts or less; and
(c) has a total height of 170 feet or less.

(7) "Total height" means the vertical distance from ground level to the tip of a wind generator blade when the tip is at its highest point.

(8) "Tower" means the monopole, freestanding, or guyed structure that supports a wind generator.

(9) "Wind energy system" means equipment that converts and then stores or transfers energy from the wind into usable forms of energy (as defined by Wis. Stat. §. 66.0403(1)(m). This equipment includes

any base, blade, foundation, generator, nacelle, rotor, tower, transformer, vane, wire, inverter, batteries or other component used in the system.

(10) "Wind generator" means blades and associated mechanical and electrical conversion components mounted on top of the tower.

00.05 Standards.

A small wind energy system shall be a permitted use in all zoning districts subject to the following requirements:

(1) Setbacks. A wind tower for a small wind system shall be set back a distance equal to its total height from:

(a) any public road right of way, unless written permission is granted by the governmental entity with jurisdiction over the road;

(b) any overhead utility lines, unless written permission is granted by the affected utility;

(c) all property lines, unless written permission is granted from the affected land owner or neighbor.

(2) Access.

(a) All ground mounted electrical and control equipment shall be labeled or secured to prevent unauthorized access.

(b) The tower shall be designed and installed so as to not provide step bolts or a ladder readily accessible to the public for a minimum height of 8 feet above the ground.

(3) Electrical Wires. All electrical wires associated with a small wind energy system, other than wires necessary to connect the wind generator to the tower wiring, the tower wiring to the disconnect junction box, and the grounding wires shall be located underground.

(4) Lighting. A wind tower and generator shall not be artificially lighted unless such lighting is required by the Federal Aviation Administration.

(5) Appearance, Color, and Finish. The wind generator and tower shall remain painted or finished the color or finish that was originally applied by the manufacturer, unless approved in the building permit.

(6) Signs. All signs, other than the manufacturer's or installer's identification, appropriate warning signs, or owner identification on a wind generator, tower, building, or other structure associated with a small wind energy system visible from any public road shall be prohibited.

(7) Code Compliance. A small wind energy system including tower shall comply with all applicable state construction and electrical codes, and the National Electrical Code.

(8) Utility notification and interconnection. Small wind energy systems that connect to the electric utility shall comply with the Public Service Commission of Wisconsin's Rule 119, "Rules for Interconnecting Distributed Generation Facilities."

(9) Met towers shall be permitted under the same standards, permit requirements, restoration requirements, and permit procedures as a small wind energy system.

00.06 Permit Requirements.

(1) Building Permit. A building permit shall be required for the installation of a small wind energy system.

(2) Documents: The building permit application shall be accompanied by a plot plan which includes the following:

(a) Property lines and physical dimensions of the property
(b) Location, dimensions, and types of existing major structures on the property
(c) Location of the proposed wind system tower
(d) The right-of-way of any public road that is contiguous with the property;
(e) Any overhead utility lines;
(f) Wind system specifications, including manufacturer and model, rotor diameter, tower height, tower type (freestanding or guyed)
(g) Tower foundation blueprints or drawings
(h) Tower blueprint or drawing

(3) Fees. The application for a building permit for a small wind energy system must be accompanied by the fee required for a building permit for a Permitted Accessory Use.

(4) Expiration. A permit issued pursuant to this ordinance shall expire if:

(a) The small wind energy system is not installed and functioning within 24-months from the date the permit is issued; or,

(b) The small wind energy system is out of service or otherwise unused for a continuous 12-month period.

00.07 Abandonment.

(1) A small wind energy system that is out-of-service for a continuous 12-month period will be deemed to have been abandoned. The Administrator may issue a Notice of Abandonment to the owner of a small wind energy system that is deemed to have been abandoned. The Owner shall have the right to respond to the Notice of Abandonment within 30 days from Notice receipt date. The Administrator shall withdraw the Notice of Abandonment and notify the owner that the Notice has been withdrawn if the owner provides information that demonstrates the small wind energy system has not been abandoned.

(2) If the small wind energy system is determined to be abandoned, the owner of a small wind energy system shall remove the wind generator from the tower at the Owner's sole expense within 3 months of receipt of Notice of Abandonment. If the owner fails to remove the wind generator from the tower, the Administrator may pursue a legal action to have the wind generator removed at the Owner's expense.

00.08 Building Permit Procedure.

(1) An Owner shall submit an application to the Administrator for a building permit for a small wind energy system. The application must be on a form approved by the Administrator and must be accompanied by two copies of the plot plan identified in 00.06 (2) above.

(2) The Administrator shall issue a permit or deny the application within one month of the date on which the application is received.

(3) The Administrator shall issue a building permit for a small wind energy system if the application materials show that the proposed small wind energy system meets the requirements of this ordinance.

(4) If the application is approved, the Administrator will return one signed copy of the application with the permit and retain the other copy with the application.

(5) If the application is rejected, the Administrator will notify the applicant in writing and provide a written statement of the reason why the application was rejected. The applicant may appeal the Administrator's decision pursuant to Chapter 68 Wis. Statutes. The applicant may reapply if the deficiencies specified by the Administrator are resolved.

(6) The Owner shall conspicuously post the building permit on the premises so as to be visible to the public at all times until construction or installation of the small wind energy system is complete.

00.09 Violations.

It is unlawful for any person to construct, install, or operate a small wind energy system that is not in compliance with this ordinance or with any condition contained in a building permit issued pursuant to this ordinance. Small wind energy systems installed prior to the adoption of this ordinance are exempt.

00.10 Administration and Enforcement.

(1) This ordinance shall be administered by the Administrator or other official as designated.

(2) The Administrator may enter any property for which a building permit has been issued under this ordinance to conduct an inspection to determine whether the conditions stated in the permit have been met.

(3) The Administrator may issue orders to abate any violation of this ordinance.

(4) The Administrator may issue a citation for any violation of this ordinance.

(5) The Administrator may refer any violation of this ordinance to legal counsel for enforcement.

00.11 Penalties.

(1) Any person who fails to comply with any provision of this ordinance or a building permit issued pursuant to this ordinance shall be subject to enforcement and penalties as stipulated in ch. ___ section ___ of the zoning code.

(2) Nothing in this section shall be construed to prevent the (County or Town) Board from using any other lawful means to enforce this ordinance.

00.12 Severability.

The provisions of this ordinance are severable, and the invalidity of any section, subdivision, paragraph, or other part of this ordinance shall not affect the validity or effectiveness of the remainder of the ordinance.

www.RENEWWISCONSIN.org

Small Wind Toolbox

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Small Wind Toolbox

Note: Some of the materials below are copyrighted by Mick Sagrillo and are provided exclusively for individual educational use, NOT for purposes of bulk copying, distribution or sales. For any other use, please contact Mick Sagrillo at msagrillo@itol.com for specific permission.

Documents are in Adobe PDF Format and will require Acrobat Reader

Toolbox - Applications and forms

FAA

7460-1 Application Form
Instructions for 7460-1
Notice Instructions

Interconnection

Application Flow Chart in WI Interconnection Guidelines
Introduction to Distributed Generation
PSC 119 Rules for Interconnection
PSC 6027-Application Form for up to 20 kW
PSC 6028-Application Form for 20 kW to 15 MW
PSC 6029-Agreement Form for up to 20kW
PSC 6030-Agreement Form for 20 kW to 15 MW
Utility Data Release Form
Utility Designated Points of Contact for Interconnection
Wisconsin Interconnection Guidelines-April, 2004

Wisconsin Electrical Codes

Department of Commerce Chapter 16
PSC 113-Service Rules for Electric Utilities
PSC 114-Wisconsin State Electric Code

Toolbox - Funding Opportunities

Wisconsin Focus on Energy's Renewable Program

Eligibility Tool

Acknowledgement:

This toolbox set was assembled and provided by Mick Sagrillo of Sagrillo Power & Light. Many of the fact sheets were authored by Mick over many years for publication in other venues.

Although many of the materials are Wisconsin-specific, we hope that this toolbox will be of assistance to anyone planning to install a wind turbine for their own use.

###

Small Wind Site Assessment Request Form (20kW or less)
Commercial Wind Site Assessment Request Form (more than 20kW)

Full Service Wind Installers Working in Wisconsin

Focus Funding

Residential Incentives
Business Incentives

Wisconsin Public Power Wind Energy Incentive for Customers of Municipal Utilities
WPPI Residential Incentive

USDA Section 9006 Energy Efficiency & Renewable Energy
Funding For Farms and Rural Small Businesses

Grants & Loan Guarantee Overview
U. S. Dept. of Agriculture -- Rural Development Website

Toolbox--Fact Sheets

Abandonment
Aesthetics
Assessment of Risk Due To Ice
Bats
Birds
Bird Mortality by Percentage Histogram
Epilepsy and Other Such Ruses
FAA
Fences
Ice shedding
Lightning
Sound
Net metering and zoning
Payback
Property values
Setbacks
Shadow flicker and strobing
Stray voltage
Tower engineering for building permits
Tower heights and zoning hearings
Tower Styles
TV and communications interference
Visibility

Focus on Energy Fact Sheets/Case Studies
Harvesting your own wind-generated electricity
Using wind energy: small-scale systems
Wind turbines and birds: Putting the situation in perspective in WI
Doing Business with Wind Energy
Owning a PV/Wind Hybrid System: Being Your -Own Utility

Toolbox--Information for Homeowners and Installers

Annual inspections
Apples & Oranges
Apples & Oranges Technical Appendix
Buying used equipment
Caveat Emptor
Code compliance
Home-built wind generators
Installing your own wind system
Filing an insurance claim
Keep it spinning

Tool box--Legal

Tool box--Zoning

Turbines and towers funded by Focus on Energy

State of Wisconsin \ DEPARTMENT OF NATURAL RESOURCES

WISCONSIN
DEPT. OF NATURAL RESOURCES

Jim Doyle, Governor
Scott Hassett, Secretary

101 S. Webster St.
Box 7921
Madison, Wisconsin 53707-7921
Telephone 608-266-2621
FAX 608-267-3579
TTY Access via relay - 711

December 21, 2006

Mr. Mick Sagrillo
Focus on Energy
E3971 Bluebird Rd.
Forestville, WI 54213

Subject: Rick Adamski Wind Turbine Application - Shawano County

Dear Mr. Sagrillo:

This is to confirm that the WDNR does not require or recommend wildlife studies for wind turbines of the size used to supply an individual home, farm, small business, school or nature center. As I indicated in a previous conversation, there is no evidence linking single wind turbines of that size (less or equal to 100 kW in capacity and 170-feet of total height) with potentially-significant wildlife collision fatalities or other adverse wildlife impacts. Therefore WDNR does not recommend formal wildlife studies for those types of installations.

In particular, individual turbines that meet the State's definition of a small wind turbine have not been associated with wildlife fatalities or behavioral effects, and in my professional opinion, are not likely to be a significant conservation concern. These turbines should not be confused with the large (around 400-foot total height) commercial wind turbines that generate power at a utility scale.

Further, if this turbine is not near to a significant wildlife area that is heavily used by small birds and raptors, there is even less likelihood that significant adverse impacts on wildlife are possible.

I hope that this letter clarifies the WDNR's position on this type of installation.

Sincerely,

Steven M. Ugoretz
Environmental Analyst – Office of Energy

SOLID & HAZARDOUS WASTE EDUCATION CENTER

Small Wind Energy System Model Ordinance — An Overview

Written by: Sherrie Gruder

Small wind turbines are being installed to supply power to a variety of sites -- including farms, businesses and schools. A small-scale wind energy system can help make a home or business energy-independent. A grid-connected wind system provides the benefits of wind energy and the consistency of the utility. An off-grid system has no connection to utility lines, so it is very useful in isolated locations. Installing a wind turbine is a productive way of offsetting high utility costs while making a commitment to the community and the environment.

The most significant barrier to small wind turbine installation can be local zoning. This has been an incidental result of uncertainty about large wind farms by some communities. To help educate local officials, Focus on Energy and UW-Extension have developed a small wind energy system model ordinance for local towns and counties. The ordinance complies with the relevant state statute, WI s.s. 66.0401, governing a municipality's ability to regulate wind systems.

There are several ways a town or county can use the small wind energy system model ordinance. It can be adopted as-is, or it can be used as the basis for a conditional-use permit. For example, the Town of Ahnapee in Kewaunee County took out the standards, abandonment, and permit requirements sections and put them into a conditional-use permit. The Town of Merton in Waukesha County is doing the same thing. Alternatively, Calumet County adopted many of the recommendations in the small wind energy model ordinance and placed it into the overall county wind ordinance that also includes large wind.

For further assistance with small scale wind energy systems and issues, go to the Focus on Energy Web site at www.focusonenergy.com/renewableenergy or call 800 762-7077. With specific questions on zoning issues related to wind, contact Mick Sagrillo through Focus on Energy or directly at (920) 837-7523, msagrillo@itol.com.

focus on energy℠
The power is within you.

Wind Energy Site Assessment
Report Form

Name of Consultant: Amy Taivalkoski

Consultant contact information:
ALT Energy
W231 N7458 E. Stoneridge Ct.
Sussex, WI 53089
262-246-0795
email ataivalkoski@wi.rr.com

Date of Consultation: January 12, 2007

Time Spent on site: 1:45 hrs Mileage: miles RT

Latitude: 43.42848 Longitude: -89.39159 Elevation: 900'

Name of Client: Vern XXXXX
XXXXX Hwy 51
Poynette, WI 53955
vernXXXXX@yahoo.com
608-000-0000 (cell)
608-000-0000.

County: Columbia
Utility: Alliant

Project Overview

Mr. XXXXX is a mechanical engineer and, as he approaches retirement, he wants to refocus on energy issues and in particular renewable energy. His son, an engineering student, is also interested in renewable energy and both father and son look forward to working on a wind system as an education and as hobby. They want to be very involved with the installation and maintenance of the wind system. Mr. XXXXX wants a wind system rated at 20kW or less in order to take advantage of net metering. He also would like the turbine to be is a visual location in order to make a statement.

CLIENT INFORMATION

1. Why is the client interested in renewable energy?

Mr. XXXXX and his son are very interested in renewable energy and in the engineering aspects of a wind system.

2. What types of system(s) is the client interested in?

Wind

3. Is the system being installed as part of a new construction, or as a retrofit?

Retrofit.

4. What is the client's timeline for installation?

If a suitable turbine and tower can be found, he may be ready to go sometime in 2007

5. How involved is the customer willing to be with the system?

☐ Is interested in being involved in the installation of the system.
☐ Will take full responsibility for the maintenance of the system.
X Will perform basic maintenance, but wants technical back up for problem situations.
☐Wants maintenance performed by outside contractor.

Comments: Mr. XXXXX and his son want to be very involved in the installation and maintenance.

6. Description of Site and Property:

A. Are there any airports located nearby?

The closest airport is the Portage municipal airport which is 11 miles to the north. There is also a landing strip (Bancroft) which is 2½ miles to the northwest. If this is a **public access** runway they may need to be notified of the wind system depending on the length of their runway. If the runway > 3200', then, because the wind system is within 3.75 miles, an FAA application may have to be submitted. The contact information for the local FAA representative is given at the end of this report. It is best to verify any permit requirements with him. It the landing strip is not public access than no FAA application is required.

B. Soil type and depth of bedrock:

Mr. XXXXX indicated that the soil was a silty loam with some large rocks. This should not pose any special problems when digging the tower foundation.

C. Electrical Service

There is single phase service at the site with 200 amp service. The main service is to the shop which then feeds the house. They are both on one meter. The wind turbine would tie into the shop's service panel which is located in its southwest corner. Open slots are available.

D. Electrical Usage
The main electrical loads for the home include a well pump and all the typical household appliances: a refrigerator (10 years old), 2 freezers (older-holding meat from the cattle), a space heater in the bathroom, a hot tub/spa, and central air conditioning. The space heat comes from a new corn burning furnace and a wood stove with backup LP (which they try not to use). The stove, hot water heater, and dryer are LP. They are trying to get used to CFLs for the lighting.

In addition to the house loads, the shop includes some power tools, a welder, an engine heater, and there is a hot water heater for the 20+ cows. Also some lighting in the shop and the barn.

Load History Summary:
Based on the load history of the last year, the XXXXX's use about 16,063 kwh/yr; averaging about 1,336 kwh/mo.

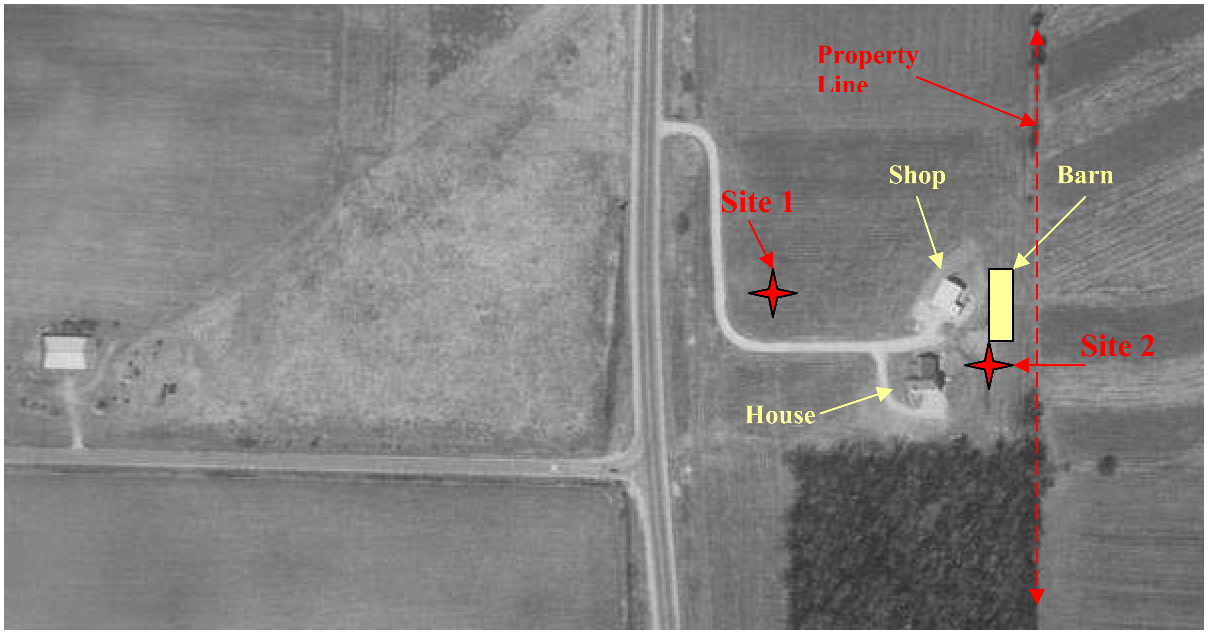
Jan '06	Feb '06	Mar '06	April '06	May '06	June '06	July '05	August '05	Sept '05	Oct '05	Nov '05	Dec '05	Total
1427	1282	1540	1177	1310	1005	1486	1110	1097	1232	1326	2071	16,063

Looking at the summary above, and adding the fact that in December of 2005 the usage was also high at 2,526 kwh, it would seem the XXXXX's put out a large Christmas display!

This load is fairly high which is not surprising considering the 2 older freezers and an electric hot tub. It is strongly recommended that Mr. XXXXX consider a solar thermal (as opposed to solar electric PV) site assessment, especially since he has a nice south facing roof. This could preheat the water for either the domestic hot water, or the spa, or both; saving electricity and/or LP. He may also consider solar thermal for the hot water heater for the cattle. This is the most economical of the renewable energy systems and may also be a good project for father and son, depending on their plumbing skills.

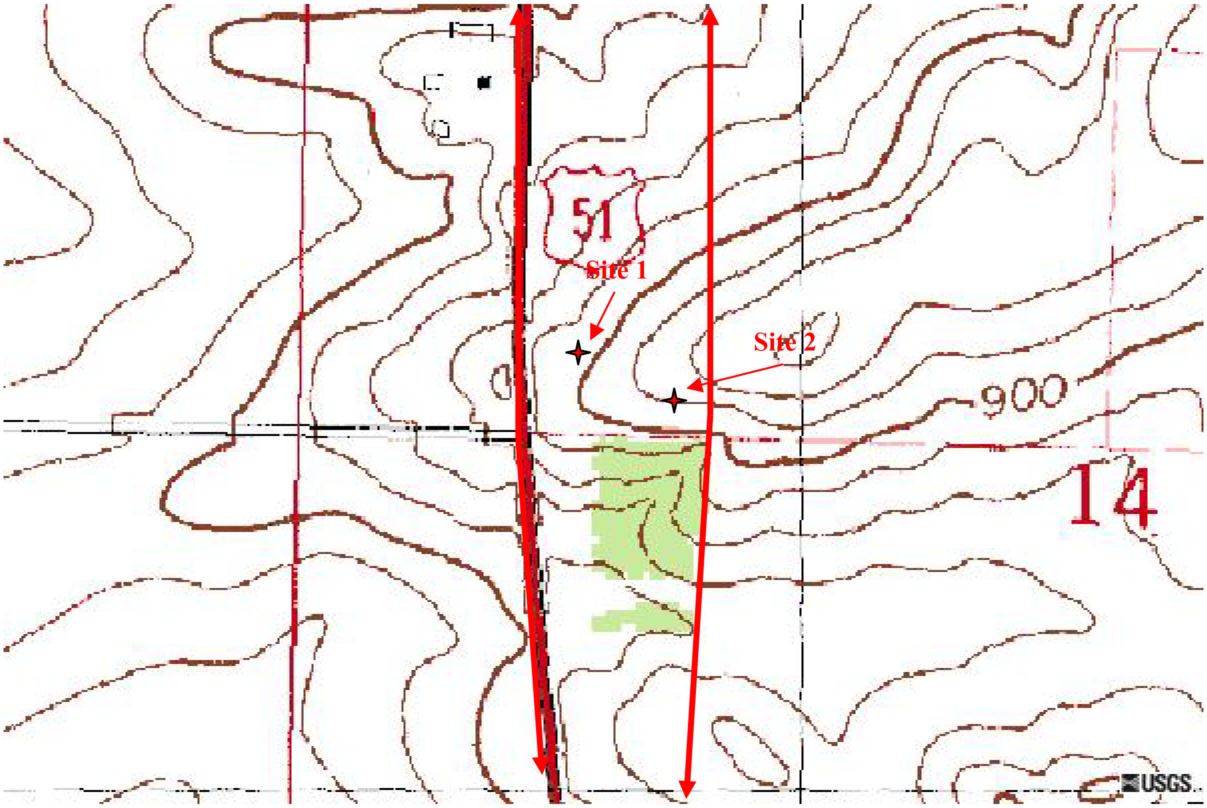
E. Physical Description of site and property:
Mr. XXXXX owns a 46 acre strip of land in a rural area. The house, shop, barn, and garage are up on a hill at an elevation of about 900' on the eastern edge of the property, just north of an area of trees. The land slopes down to the west, south, and to the north of the homestead area.
The well is located on the west side of the house and the septic system is in the northwest corner behind the house.

The following pages show aerial and topographical views of the site, as well as a 360 photo panorama.



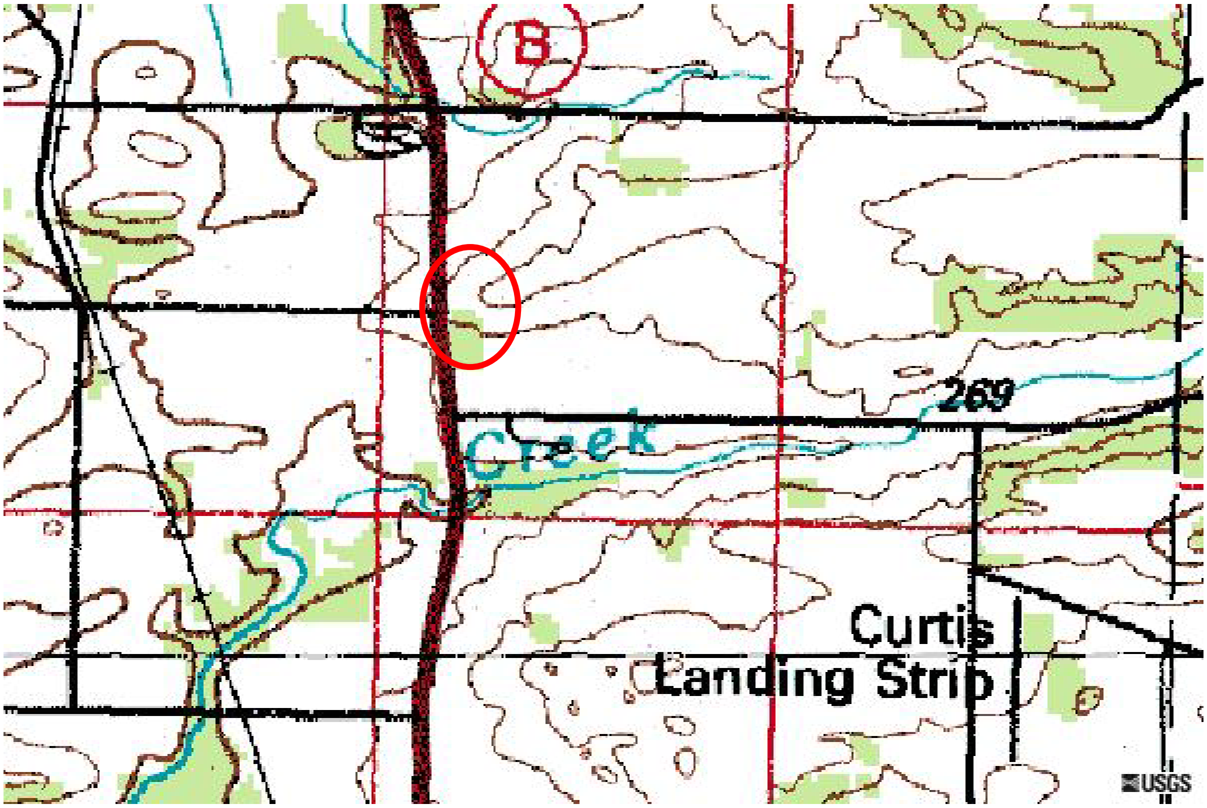
1″ = 100yds

1″ = 200yds



1″ = 200yds

.4 mi = 1"



.4 mi = 1"

Looking west at Site 1

360 degree Panoramic Photos from Site 1

South

Southwest

West

Northwest

North

Northeast


East

Southeast

Looking east at Site 2

360 degree Panoramic Photos from Site 2

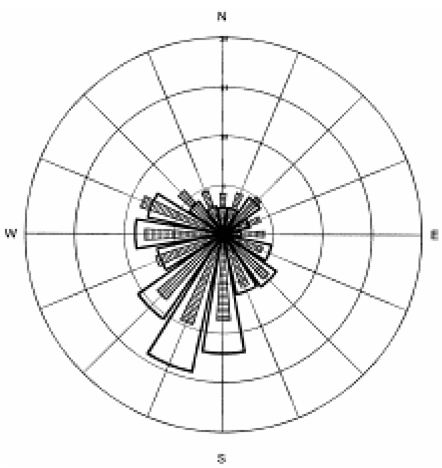

South | **Southwest**

West | **Northwest**

North | **Northeast (shows what is on the other side of the barn)**

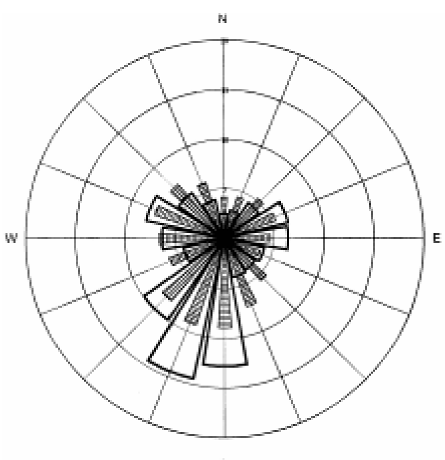
East | **Southeast**

F. Prevailing wind direction: When siting a turbine, it is important to know what kind of wind resource is available. From 1997 to 2001 a study called the Wind Resource Assessment Program (WRAP) was conducted in Wisconsin by a consortium of utilities. The purpose of the study was to measure the wind resource in the state based on 14 monitoring stations. The wind speed and wind direction were recorded at 60 meters (197') above ground level at all stations for 3 years. The report, released in January 2002, resulted in a "wind map" of Wisconsin. The wind map provides estimates for average annual wind speeds (at a height of 197') for all areas of the state. This map can be found at the Focus on Energy website www.focusonenergy.org and is attached at the end of this report. A diagram illustrating the prevailing wind directions was also created for each station. This diagram is called a **wind rose.** Unfortunately, there were no monitoring stations close to Poynette. The wind roses for the stations closest to this site are #407 - Rock River (located approximately two miles northeast of Allenton in Washington County) which is 60 miles due east of this property, and Montfort, #406, which is located about 60 miles southwest of this site. The wind roses are shown below. From these diagrams, we can see that the predominant winds in this area come from the south, southwest, and westerly directions, with very little wind coming out of the north. The Montfort wind rose also shows some winds out of the east.

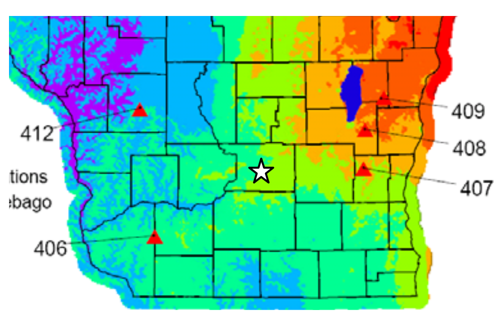


#407 Rock River Wind Rose

This **wind rose** graph illustrates the percent time and percent energy in each direction sector. The wide, outlined bars represent the percent of total energy and the narrower, shaded bars illustrate the percent of total time in each of the sixteen direction sectors. (Wind rose from Wisconsin Wind Resource Assessment Program (WRAP) 2002 report).



#406 Montfort Wind Rose



white star indicates approx. Location of XXXXX property

7. Description of Potential Wind System

A. Tower Choices

There are three main types of towers that can be used for small residential size wind systems, 20KW and under:

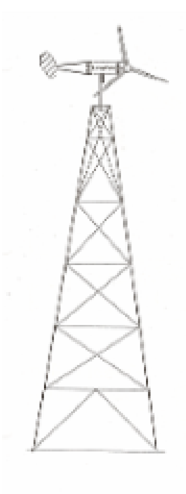
- Guyed Lattice towers
  - Have three sets of guy wires.
  - Least expensive type of tower.
  - Guy wires holding up this tower have a radius of around 45'- 75' from the base, depending on the tower height.
  - Requires climbing the tower for maintenance.

- Tilt-up towers
  - Have four sets of guy wires.
  - Only slightly more expensive than guyed lattice towers.
  - Maintenance can be performed without climbing the tower.
  - Guy wires have a radius of 25' – 50' from the base depending on tower height.
  - Requires relatively flat terrain for the length of the tower in at least one direction from the base of the tower, in order to lower the tower to the ground.

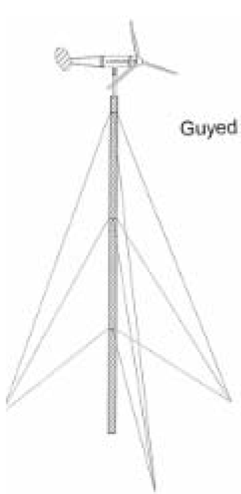
- Free-standing towers
  - Have no guy wires.
  - Small footprint (about 12'-15' square), which is good for tight spaces.
  - More expensive because it contains the most steel and weighs more than the other types.
  - Most visible on the landscape because of all this steel.
  - Can accommodate larger, heavier turbines than guyed and tilt-up.
  - Requires climbing the tower for maintenance.

On guyed towers the guy wires are virtually invisible when viewed from a distance.

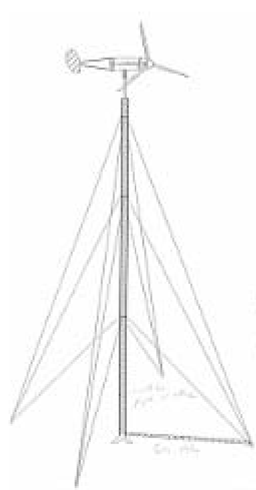
For small commercial wind systems, 35kW to 90kW, a free-standing tower is used and will provide the strength necessary to handle not only the weight of the turbine, but also the torque as the winds push on the rotor. Monopoles are usually used for larger commercial turbines.



Freestanding



Guyed Lattice



Guyed Tilt-Up

Monopole

Mr. XXXXX is considering a used tilt-down freestanding tower from California. These towers were typically used for the Jacobs turbines. This type of tower is eligible for Focus on Energy incentives, but it should be noted on the Cash-Back application that this will the type of tower being used for the wind system.

B. Potential Sites for Wind System:
The turbine should be located where it can intercept the most wind, based on the prevailing wind directions and the locations of the highest obstructions. The more wind the more electricity. Obstructions, such as buildings, rough terrain, and tall trees disrupt the flow of the wind and create turbulence. Turbulence not only reduces the amount of energy that can be extracted, but also creates a harsher environment for the wind turbine, especially the rotor blades, and this may shorten the life of the system. The best sites for wind systems are on wide open land and on the tops of ridges. To reduce the effect of turbulence, the turbine should be sited farther away from the obstructions and/or on a higher tower where the turbine and the rotor can be above the turbulence. According to the wind roses at this site, the prevailing winds are from the southerly and westerly directions. The Montfort wind rose also indicated that there are some easterly winds. If wide open land is not available, it is best to site the turbine where the obstructions do not block the wind from these prevailing wind directions, and/or significantly above the tallest obstruction.

Possible Wind System Locations:
Although the locations of both of the monitoring sites used for wind direction information in this report are about 60 miles from the client's property, they both indicate that there are very predominant winds from the south and west. The client's site has very open access to the winds from the west, but there is a large are of trees just to the south of the property. To overcome this type of obstruction we must use a taller tower in order to get the turbine above any turbulence caused by these trees and up into the clean wind. At this site there are 2 options. The wind system can be sited toward the western edge of the property where the wind system would be clear of the trees to the south, but lose 10'-15' in elevation; or, the wind system could be sited at the highest elevation, but in a less convenient location. Both sites are indicated on the aerial photo and topo map, along with photos taken from the sites in all compass directions, on the pages above.

Site 1) This site is located just inside the curve of the driveway. Because there are such predominant winds coming from the south, the idea is to move the wind system far enough to the west to make the clump of trees to the south, less of an obstruction. Depending on the setback requirements from the road, the wind system could be even further west on the other side of the driveway. This site has the advantage of clear winds from the south, west, and north in a nice out of the way location, away from the house and the shop. It would be about a reasonable 300' wire run to the shop meter, and it would be in a very visible location which is what Mr. XXXXX wants in order to make a "statement". The disadvantage is, of course, the loss in elevation of about 10' to 15' which makes the trees to the southeast and the buildings to the east effectively taller obstructions.

Site 2) This site is about 100' west of the eastern property line, at an elevation of 910'. The elevation gives it a height advantage on the all the surrounding obstructions including the trees 200' to the south, which is always good for a wind system because it offers better exposure to the winds from all directions. Also the wire run to the shop meter is only about 150'. The disadvantage of this site is that it is in a more congested area of buildings, right in between the house, the barn and the shed. It is about 100' from the property line and there is a nice flat area to tilt down the tower. The minimum height of the tower is determined in the next section of this report. Mr. XXXXX will want to check with the zoning authorities about the required setback from property lines. Also, this site is farther from the main road and the wind system may be less visible than if it were placed at Site 1, making less of the desired "statement" (although it will be higher).

Both of these locations would work well for a wind system. It will up to Mr. XXXXX to decide where he would like to place it. A common setback from roads and property lines is equal to the total height of the tower plus 1 blade length. If Site 2 is chosen, than this setback requirement becomes a key factor because site 2 is 100’ from the eastern property line.

A model for a small wind ordinance is included in this report which can provide the local zoning commission with some guidelines if they do not have a wind ordinance already in place. Also included is a copy of State statute 66.0401 which outlines the rights of renewable energy system owners.

C. Minimum Tower Height

The general rule for determining tower heights is to position the lowest point of the turbine rotor at least 30' above the highest obstruction within 500 feet (trees, buildings, etc…) or the prevailing tree line. This is to ensure that the turbine is clear of any turbulence which, as discussed earlier, affects the wind generator output and possibly the life of the system.

The prevailing winds in this area come strongly from the southerly and westerly directions, with some from the east. The tallest of the buildings at this site is the large barn at about 23’. Therefore, the area of trees to the south will be the obstruction of the most concern. The height of these trees will be used to compute the minimum tower height. The tallest of these trees was estimated to be about 50’ tall. These trees are almost mature, but they may reach 60’ in the 20 year lifespan of the wind turbine.

At Site 2, there is a drop in elevation from the site location to the base of the trees, 200’ to the south, of about 5’; making the relative tree height 55’. Therefore, the minimum tower height would be:

Site 2:

Minimum Tower Height = 55’(mature tree height) + 30’ (rule of thumb) + 12’ (blade length)
= 97’

Towers usually come in 20’ sections, so Site 2 would require a 100’ tower.

At Site 1, the relative tree height becomes taller by 10’ to 15’ because of Site 1’s lower elevation. Therefore the tower would have to be this much taller, or 107’- 112’. Alternatively, if the wind system at Site 1 is far enough to the west that it is clear of the trees to its south, than the trees could be eliminated as an obstruction based on the fact that neither of the wind roses shows significant winds coming from the southeast. In this case the tallest obstruction would be the barn with its 23’ height plus the elevation change of 15’, which comes to about 38’. In this case, the minimum tower height would be:

Site 1

Minimum Tower Height = 38’ (future tree height) + 30’ (rule of thumb) + 12’ (blade length)
= 80’

If the height of the used tilt-down towers that Mr. XXXXX is considering is at least 80’ tall, than they would work at Site 1.

The taller the tower, the higher the wind speed, resulting in a higher energy output for any given turbine, and less turbulence, so taller towers should always be considered. Taller towers cost a little more, but the increase in energy output (which is tied to the cash-back incentive) almost always make it economically worthwhile At Site 2, a 100’ tower would be necessary. This report will look at both tower heights.

D. Wind resource estimate:

How well the wind turbine performs is based on the speed and the consistency of the wind intercepted by the turbine; a continuous high-speed wind being the best condition. Knowing the average annual wind speed at a specific site will enable us to determine how various turbines will perform at this site.

As mentioned previously, the Wisconsin Wind Resource Assessment Program (WRAP) study provided a wind map of Wisconsin which provides estimates of the average annual wind speeds for all areas of Wisconsin at a height of 60 meters (197 ft.). Actually 2 maps were made using different modeling software. Copies of these maps are included with this report.

The wind speed for the Poynette area, determined by averaging the wind speed estimates on the 2 Wisconsin wind maps (13.5-14.0 mph on one and 14.5-15.0 mph on the other), gives 14.0 – 14.5 mph as the average range. Since the terrain in this area is fairly wide open, an average annual wind speed of 14.3 mph at 60 meters (197 ft) will be used.

Since the wind speed increases with increasing height above ground, we must do some calculations to extrapolate this wind speed of 14.3 mph taken at 197', down to our assumed 80' and 100' tower heights.

The following equation (ref. *The Wind Power Book* by Jack Park) is used to compute the wind speed at the turbine height:

$V = (H/H_0)^{\alpha}V_0$ where:

V = the wind speed at the desired height (the tower height)
V_o = 14.3 mph - the wind speed at the original height (from the map and adjusted downward)
H = 80', 100' - the tower heights/ turbine hub heights
H_o = 197' - the original height that the original wind speed was measured
α = .22 the wind shear coefficient

The wind shear coefficient is variable used to adjust for the type of ground clutter at a site. For this site it will be set at .22 which indicates "mostly open fields with some trees or buildings". Using the above equation for wind speed we get:

V = Average Annual Wind Speed at Hub Height = 11.7 mph at 80'
= 12.3 mph at 100'

This number correlates well with the average wind speed recorded near Madison by Seventh Generation Energy Systems, Inc. at 110' (logged between 12/05/05 and 7/04/06) which was 12.6 mph. This will be the wind speed used to calculate the average annual energy output of some potential wind turbine choices.

E. Turbine possibilities:

Renewable energy systems, including wind systems, can take advantage of what is called "net metering". Net metering means that when the wind turbine (or solar PV array) is generating more electricity than is needed at the site, then the excess is fed back onto the power grid and the electrical meter simply runs backward; so the utility is essentially "paying" retail rates for the power. In Wisconsin net metering is limited to a maximum of 20kW rated power for renewable energy sources connected to the grid.

The electrical loads at this site do warrant turbines rated at over 20kW, and Mr. Karaman is interested in a smaller turbine, so all the turbines listed below can be net-metered.

Because the wind does not blow all the time, a wind system is usually sized based on producing an amount of electricity equal to the annual requirements of the client. In summer, when the wind resource is less, the client may be purchasing electricity from the utility (meter running forwards). In the winter, the client may be "selling" excess back to the utility (meter running backwards). The usual goal is to be close to a net zero annual bill. If there is a net excess of energy production, the utility will send the client a check. (may be monthly or annually depending on the utility).

Turbine	Rated Output	Rotor Diameter ft
Bergey XL1	1.0 kW	8'
Southwest SkyStream	1.8kW	12'
Abundant Renewable Energy 110	2.5 kW	12'
Proven 2500	2.5 kW	11'
Proven 6000	5.0 kW	18'
Bergey XL-S	10 kW	23'
Abundant Renewable Energy 442	10kW	24'
Wind Turbine Industries Jacobs 31-20	20kW	31'

The **Bergey XL1 and XL-S** are nice durable machines that have been around for 20 years, although the 10 kW XLS has a new blade design as of 2004, and improvements to these blades have been made in 2006. These turbines are designed for high speed winds and do not perform at their best in Wisconsin winds.

The **Southwest Windpower Sky Stream 3.8** is a brand new turbine with a unique blade design. There is no history with this turbine or this blade design as of yet.

The **Proven 2500 and 6000** are Scottish turbines with a unique hinged blade design which automatically adjusts to varying wind speeds. They are rated at 2.5 kW and 6.0 kW respectively when running on a battery DC system, 2 kW and 5 kW when grid tied. They are pricier because of the exchange rate with the Euro and the additional shipping cost from Europe.

The **ARE 110** 2.5 kW and 442 10 kW are brand new turbines, but both are showing great promise for producing more energy output than similarly sized machines for the same wind speeds.

The **Jacobs** 31-20 turbine is the only one, of the residential size turbines, which has a gear box located at the top of the tower. It is a good medium duty turbine but, because of the gear box, there are more moving parts which means more maintenance; probably a lot more maintenance. With this type of turbine, you (or your service contractor) should plan on climbing the tower at least every 4-6 months to inspect the wind turbine for wear and tear on the blade assembly, the gearbox and shafts, the slip ring brushes, etc… and to grease parts.

Turbines

Bergey XL1

Southwest Sky Stream3.8

ARE 110

Proven 2500

Proven 6000

Bergey XL-S 10kW on an 80' tower

Abundant Renewable 442 10kW

Jacobs 31-20 20kW

F. Energy Outputs
To determine the expected power output of the turbines at this site we use our wind speed as calculated above.

The estimated energy outputs in the table below were calculated by using the "Wind Turbine Estimated Energy Output Calculator v. 9.4", which is an Excel spread sheet developed by Seventh Generation Energy Systems. Taken into account are factors such as: the elevation of the site, the air density, the wind speed from the wind map, the probability of the distribution of wind speeds the site is likely to get, the turbine rotor area, the tower height, and the manufacturers' power curve for the turbine. The energy output calculated is also de-rated by 20% to account for turbulence and other losses.

The table below shows the estimated monthly and annual energy outputs that could be expected with the **tower height of 80'**, and annual average **wind speed at hub height of 11.7 mph.**

Turbine	Est. Monthly Energy Output (kWh)	Est. Annual Energy Output (kWh)
Bergey XL1	138	1,659
Sky Stream 3.8	215	2,577
Proven 2500	324	3,888
ARE 110 2.5 kW	322	3,866
Proven 6000 5.0 kW	832	9,983
Bergey XL-S 10kW	938	11,251
ARE 442 10 kW	1,386	16,632

Note that the Jacobs 31-20 has a 15.5' blade length and so could not be installed on the 80' tower and get access to the winds from the east.

The table below shows the estimated monthly and annual energy outputs that could be expected with the **tower height of 100'**, and annual average **wind speed at hub height of 12.3 mph.**

Turbine	Est. Monthly Energy Output (kWh)	Est. Annual Energy Output (kWh)
Bergey XL1	155	1,859
Sky Stream 3.8	243	2,916
Proven 2500	359	4,304
ARE 110 2.5 kW	361	4,327
Proven 6000 5.0 kW	925	11,095
Bergey XL-S 10kW	1,058	12,696
ARE 442 10 kW	1,546	18,558
WTI Jacobs 31-20 20kW	1,968	23,621

The wind speeds and turbine output values presented here should be taken as rough estimates, and should in no way be interpreted as a guarantee of the average wind speed or the average output of a particular wind turbine at your site.

The total electricity use for the XXXXXs is 16,063 kwh/yr. and 1,336 kwh/mo, so based on the tables above, Mr. XXXXX can select the size turbine he wants for the percentage of his load that he hopes to offset. His main interest was not offsetting the load so much as the total cost of the project.

G. System Cost

The estimated installed system costs are listed below, as well as the Focus on Energy financial incentives that are available to residential customers.

The Cash Back Reward applies to turbines rated at 20kW and below. It is based on an estimate of the amount of electricity (in kilowatt-hours) that the wind system will produce in an average year:

Cash Back Reward = (estimated annual electricity produced in kilowatt-hours) x (Reward Factor),

where **Reward Factor** is based on how the wind turbine should perform at a good site and on the installed cost. The maximum Cash Back is 25% of the installed cost or $35,000 which ever is less.

As mentioned previously, there are several types of towers, each with its own advantages and disadvantages. Guyed towers are cheaper, but the guy wires can be cumbersome. Tilt-up towers are nice because there is no climbing involved, but the tilt-up/down process is not an easy procedure, and there must be a big enough area for the tower and the guy wires to lie down. Not all tower types are compatible with every turbine. Talk to an installer or the turbine manufacturer to verify the compatibility of your turbine selection with your tower choice. The client must weigh the pros and cons of each tower type and make his own decision. The approximate installed system costs are listed below for the suggested turbines on an 80' guyed tower (unless noted):

Turbine	Installed Cost of System	Estimated Annual Energy Output kwh	Cash Back Reward	Total Installed Cost
Bergey XL1 (80' tilt-up)	$13,173	1,659	$3,118	$10,055
Sky Stream (84' tilt-up)	$21,200	2,649	$4,452	$16,748
Proven 2500	$31,613	$3,888	$7,015	$24,598
ARE 110 2.5 (85' tilt-up)	$21,390	3,989	$4,870	$16,520
Proven 6000 6.0 kW	$55,043	$9,983	$13,378	$42,970
Bergey XL-S 10 kW	$53,693	11,251	$8,620	$45,073
ARE 442 10kW	$65,568	16,632	$15,561	$50,007

The approximate installed system costs are listed below for the suggested turbines on a 100'guyed tower (unless noted):

Turbine	Installed Cost of System	Estimated Annual Energy Output kwh	Cash Back Reward/ Implementation Grant	Total Installed Cost
Bergey XL1 (104' tilt-up)	$13,648	1,896	$3,412	$10,236
Sky Stream (105' tilt up)	$22,200	2,993	$5,267	$16,933
Proven 2500	$32,563	4,304	$8,000	$24,564
ARE 110 2.5 (106' tilt-up)	$22,234	4,452	$5,559	$16,675
Proven 6000	$56,348	11,095	$14,087	$42,261
Bergey XL-S 10 kW	$55,069	12,696	$9,977	$45,092
ARE 442 10kW SSV	$67,256	18,558	$16,814	$50,442
WTI Jacobs 31-20 100' free standing	$60,860	23,621	$10,257	$50,603

Note that these costs are ball park estimates only; an installer will be able to give actual installation costs. A list of full-service installers is provided with this report.

From these tables it can be seen that by going with a taller tower the Cash-Back Reward increases. This is because the annual output of the turbine (kwh/year) increases. Therefore, usually the increased cost of going to the taller tower is outweighed by the value of the increased energy output over the life of the turbine (about 20 years if well maintained).

The installed cost include the materials and labor for installing the entire wind system including having the foundation for the tower and/or the guy wire anchors poured, tower assembly, crane rental for raising the tower and attaching the turbine, trenching, installing the balance of system (BOS - rectifier, inverter, disconnect, etc) and all the wiring for the electronics. You may be able to save on some of the cost by purchasing a used tower (some wind system dealers may have access to these), and by doing the tower assembly and the trenching yourself. You would have to work this out with the installer and Focus on Energy to see if it would be approved.

For questions regarding this incentive, contact:

Mick Sagrillo
E-mail: msagrillo@itol.com
Phone: 920-837-7523

H. Other Economic Considerations.

- **Maintenance**: In addition to the installation costs, the owner of a wind system should expect to put aside 1% of the installed cost for ongoing maintenance (2% for the Jacobs). This amount may not be used every year, but down the road there may be some replacement parts needed, e.g. new blades or an inverter.

- **Insurance:** An insurance requirement on turbines 20 kW, and under, is $300,000. This is usually the amount covered under a normal homeowner's insurance policy for an uninhabited structure on the property. No special policy for a wind turbine is required, only standard homeowners or business insurance w/ liability coverage.

- **Income Tax:** Another factor to take into account is that income tax must be paid on the income received when the utility is paying for the excess generation. If a turbine is chosen which has an energy output which is less than, or equal to the load than this should not be an issue.

- **Tax Write Offs:** There are currently no federal tax incentives for wind systems. However, because you are running a business, you may be able to take advantage of the Modified Accelerated Cost Recovery System (**MACRs**), a depreciation method used to figure the deductions you get over the life of tangible property for tax purposes. You may be able to write off the capitol cost of your wind system over 5-6 years (50% in the first year). Check with your accountant. This makes purchasing a wind system much more attractive.

8. Summary

Mr. XXXXX has an excellent location for a wind system and some good sites available on his property. Site 1 would seem to be the best site because it is an open area and has better access to the winds from the south. The wind system could be placed anywhere in the general vicinity of Site 1 and get very similar energy output results (try to keep to the west of the trees). Remember that an 80' tower would be the minimum needed at this site, and that since there is space at this site, a taller tower should definitely be considered. If a 100' tower was chosen, then the wind system could be placed higher up the slope toward the shop since the extra height would position the turbine high enough to clear the turbulence caused by the trees to the south.

If Site 2 is chosen, a free standing tower should probably be used since there is not enough room for guy wires. Since the tower at this site must be at least 100' tall, there may be a setback issue from the eastern property line. This distance must be measured more accurately once a turbine is selected and the blade length is known to make sure there is the clearance necessary for the tower height plus blade length.

9. Follow Up

A. Energy efficiency is always a cheaper option than installing more capacity. Mr. XXXXX should try to make his home to as energy efficient as possible. This includes evaluating the older freezers in the basement; perhaps 1 larger Energy Star freezer would handle the volume of meat and save money too. Also, a Solar Thermal site assessment is strongly recommended for the electric spa and the hot water heating for the cattle.

B. Contact several of the qualified full-service wind installers in the area (list provided in this report) to get actual price estimates for installation and maintenance, to choose a turbine and other system components, determine delivery timelines, as well as discussing what permits may be needed. Since Mr. XXXXX is considering a used tower, it would be a good idea to talk with the installers to hear their experience with this type of tower and how it would work with his choice of turbine.

C. It would be a good idea to go see the suggested turbines in action and talk to the owners. The installers on the attached installers list should be able to suggest some locations.

D. Decide if the economics work out to your satisfaction based on all the costs and incentives, and the energy savings/income from the estimated energy output of the wind systems provided in this report for this site. Remember that electrical rates will probably continue to rise.

E. Contact Mick Sagrillo directly at (920) 837-7523, to confirm the grant amount you are qualified for, especially if you are going to use a used tower or refurbish a turbine yourself. Complete the Focus on Energy Cash Back Rewards application and submit. A copy is supplied with this report. Additional copies can be obtained by contacting Wisconsin Focus on Energy at (800)762-7077, or go to their web site www.focusonenergy.com .

F. Talk to an accountant to see if you can take advantage of the accelerated depreciation of the capitol costs.

G. Check with the township building and zoning offices to make sure that there are no local ordinances or other problems with installing wind turbines and towers (including set backs from the road and property lines), and begin the permitting process. Begin to inform the neighbors of the desire to install the system, to educate them on wind systems in general, and to meet with the local zoning authorities. This will help to avoid problems and get the support of your neighbors, and pave the way for continued contact with local authorities to identify and address any building permit or zoning issues such as required set backs. There are several helpful articles on zoning issues in the "small wind toolbox" at www.renewwisconsin.org. Look for the link to "small wind toolbox" on the left side of the home page. You can also contact Mick Sagrillo for help with zoning issues msagrillo@itol.com phone: 920-837-7523.

H. The Wisconsin FAA representative is Gary Dikkers, Airspace Manager. If the Bancroft landing strip is public access, contact him to see if you need to file and FAA application. (608)267-5018. If so, the required form, 7460-1, can now be filed online at the FAA's Obstruction Evaluation/Airport Airspace Analysis (OE/AAA) website: https://oeaaa.faa.gov/oeaaaEXT/portal.jsp (see the e-filing section on the left side of the page).

I. Check with **Alliant** to discuss the grid intertie procedures and requirements, and insurance issues. The renewable energy inter-connection contact information for Alliant Energy is Leo Udee, 800-972-5325 pr 920-322-6606.

J. Contact your insurance agent about insuring the wind system. If they are unfamiliar with wind systems and unwilling to offer insurance, you may try calling Randee Block from Block Insurance (888-536-2441) who has experience with insuring these types of wind system.

K. Insure that all zoning, utility agreements, financial incentive and any other required approvals are in hand prior to making any commitment to purchase.

10. Educational Resources

- Focus on Energy web site (www.focusonenergy.org) great for lots of information on Renewable Energy.
- Fact sheets covering all issues with small wind in: toolboxes at www.renewwisconsin.org
- Home Power Magazine/Website (www.homepower.com) – Case studies and stories of renewable energy installations around the country.
- Midwest Renewable Energy Association (www.the-mrea.org) – Hands-on workshops in Wind, PV, Solar Hot water, and more.
- American Wind Energy Association www.awea.org
- Danish Wind Industry Association www.windpower.org
- Turbine manufacturer's web sites: Performance ratings, turbine and tower prices, informative articles.
  www.Bergey.com for Bergey XL-S
  www.**proven**energy.com for Proven wind turbines
  www.abundantre.com for the ARE 442
  www.windturbine.net for the Jacobs 20-31
  www.Energyms.com for the EMS Vestas V15-35

11. Materials Included in Site Assessment Report:

1. Aerial Photos of Property for wind site - courtesy USGS and teraserver-USA.com
2. Digital pictures in all compass directions for proposed sites.
3. Topographical Maps of the Surrounding Area- courtesy USGS and teraserver-USA.com
4. Electrical load history.
5. Wind Rose graphs from nearest monitored site(s)
6. Photos of turbines.

7. Websites for more information including for Focus on Energy

12. Materials Enclosed with Site Assessment Report:

1. Wisconsin Wind Maps
2. Full service wind installer list
3. Apples and Oranges article (given during site visit)
4. Cash-Back Application
5. Cash Back Reward Spreadsheet calculation
6. Small Wind Ordinance model
7. Copy of State statute 66.0401

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National Renewable Energy Laboratory

Innovation for Our Energy Future

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ZONING FOR DISTRIBUTED WIND POWER — BREAKING DOWN BARRIERS

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Introduction

Distributed wind power is attracting increasing attention in the United States. At least ten companies are currently active in this market with small wind turbines, up to 100 kW. The market is driven in no small part by emerging state incentive programs for small, distributed renewable energy systems. More grid-connected wind systems are being installed in less remote locations where zoning becomes a factor. Local zoning authorities and neighbors of prospective distributed wind turbine owners usually do not understand the acoustic, visual, safety, and other impacts of distributed turbines—they tend to fear the worst and act accordingly.

Zoning is a complicated problem. Zoning regulations vary from state to state and from one local jurisdiction to the next. There are perhaps 25,000 local zoning jurisdictions in the nation. Further, existing zoning laws seldom address distributed wind turbines. In this paper, we will highlight the experiences of veterans of zoning battles that illustrate this market barrier. We will look at the option of local action on distributed wind zoning to highlight certain shortcomings of this approach. Last, we will consider examples of state and federal limited preemption of local zoning authority as a means of promoting the implementation of new technologies, and we will present recommendations for action by the wind industry to pursue constructive and effective zoning solutions for distributed wind power.

The Zoning Barrier

Prospective distributed wind buyers frequently encounter the dilemma that existing zoning ordinances do not address wind turbines, nor do they typically allow structures taller than 35 ft. Wind turbines are rarely identified as an allowed use of property, also called a permitted use. In 2001, a committee in the California legislature concluded that potential buyers were “thwarted by archaic or even hostile local land-use regulations,” and as many as “half the applicants will give up in disgust” (Shane 2001). Those who do persevere with the process, both buyers and dealers, may have to make a significant investment of time and money to be successful. The following stories relate the experiences of three wind-turbine owners who were successful in overcoming their zoning barriers, but at a high cost.

Bob Loebelenz of Dover, Massachusetts, applied for and received a building permit in 2001 to install a Whisper 175 wind turbine on his small farm. Three months later, but before that installation was complete, his permit was revoked in response to objections from neighbors. A protracted public hearing process ensued for which Mr. Loebelenz retained legal representation and brought in expert witnesses. Finally, the permit was re-issued after 13 months and legal fees of about $13,000.

Douglas Stockman of Penfield, New York, applied for a permit from his town's Building and Planning Office. When opposition arose from neighbors, the request went before the Town Planning Board. Much disinformation was presented during an initial public hearing, which Mr. Stockman then had to refute over the following 4 months. Eventually, a special-use permit was issued. Following this ordeal, Mr. Stockman created a Web site (no longer available) and authored a magazine article (Stockman 2001) documenting the lessons learned for the benefit of others who may face a similar struggle.

Dave and Jan Blittersdorf of Charlotte, Vermont, faced a different problem. In Vermont, an on-grid wind turbine, even at 10-kW, is treated like an electric power plant. In addition to local zoning approval, it must also be approved by the state Public Service Board. That approval process includes a visual impact and aesthetics test with the burden of proof being on the applicant. The approval was granted after a contentious and convoluted process over a period of 11 months. The Blittersdorfs estimated that they and their lawyer invested the equivalent of $9,500 of their time along the way.

These stories are examples of the experience that is all too common for wind turbine owners. Fortunately, these examples are not universal. There have been numerous situations where individuals were able to secure zoning approval and building permits without significant cost or delay. Despite those successes, we are convinced that the overall market for distributed wind is limited by zoning barriers. This paper seeks to give some perspective on those barriers and explore possible remedies.

Zoning Background

Zoning ordinances are one form of land-use law and are the principle means for local governments to implement land-use planning. The legal basis for zoning has been described as follows (Wright and Gitelman 2000):

> The validity of zoning is predicated on the police power—the power to regulate for the advancement and protection of the health, morals, safety or general welfare of the community.

The specific authority for zoning is established by state laws known as "zoning enabling legislation." When zoning was first implemented in the 1920s, the U.S. Department of Commerce published "A Standard Zoning Enabling Act" (USDC 1926) as a template for zoning enabling legislation. As a result, zoning is addressed in a somewhat homogeneous manner in the various states. The resulting state statues delegate authority for land-use regulation to local government entities—this is called home rule. The intent is that land-use choices and regulation be done at a local level as close as possible to the affected property owners. Home rule is generally given a high value by both state and federal governments and the courts.

Jurisdictions Having Zoning Authority

The local jurisdictions having zoning authority go by many names in the various states: counties, parishes, boroughs, municipalities, townships, towns, cities, villages, etc. Despite this diverse nomenclature, there are essentially three levels of local government at which zoning may occur: county, township, and municipality.

One of the many challenges with zoning is that the local jurisdictions having zoning authority are so numerous. Table 1 summarizes zoning enabling legislation for the 50 states (APA 1996). Not only is enabling legislation universal in the United States, home rule is literally the rule. Zoning authority is delegated all the way to the municipal level in 49 states (Hawaii is the lone exception), whereas only two states retain some zoning authority at the state level. At least 13 states also give zoning authority to townships, and 39 states explicitly grant zoning authority to counties.

Table 1. Summary of State Delegation of Zoning Authority

States with Zoning Enabling Laws	**50**
States with State-Level Zoning Authority	**2**
States with County Zoning Authority	**39**
States with Town/Township Zoning Authority	**13**
States with Municipal Zoning Authority	**49**

The next question is "How many of these local jurisdictions are there?" We have not found a specific reference to the number of local government entities having zoning authority. We can, however, make a reasonable estimate based on the data in Table 2, which shows the total number of counties, townships, and municipalities in the United States (USCB 2002).

Table 2. Total Number of Local Government Entities in the United States

Counties	**3,034**
Townships	**16,504**
Municipalities	**19,429**

Given that nearly all the municipalities, perhaps 80% of the counties, and some of the townships have zoning authority, we estimate there may be on the order of 25,000 local zoning jurisdictions in the United States.

This estimate makes the prospect of local action on distributed wind zoning a daunting task. The American Wind Energy Association (AWEA) has estimated that the effort needed to pursue ordinances for permitted use of distributed wind in each of the 534 local jurisdictions California might cost as much as $20 million (Bergey 2005). That is not a realistic cost for the wind industry to bear for the entire nation, much less for just one state.

Local Initiatives For Distributed Wind Zoning

Some local jurisdictions around the country do have zoning ordinances that specifically address distributed wind systems. These laws are typically the result of efforts by prospective wind turbine owners, often supported by their dealers, or by local renewable energy advocates. We are aware of jurisdictions in Virginia, Ohio, New York, Wisconsin, Colorado, and California that have such ordinances. There are likely many more that we don't know about. These ordinances are quite diverse in their provisions and terms. Providing for conditional or special use seems more common than permitted use. Most include height limitations on the turbine tower. With each local jurisdiction developing its own rules, the results are mixed and not always favorable to distributed wind.

AWEA (2002) has proposed a model zoning ordinance for small wind turbines. It addresses terms including tower height, property size, setbacks, noise, utility notification, and code compliance. Most important, it proposes that small wind turbines should be considered a permitted use in all zoning classifications. While it's important for the industry to take a position on this issue, the AWEA model has the vulnerability of being viewed as representing industry interests rather than the interests of local communities or zoning authorities.

A more broad-based approach to a model ordinance is currently being pursued in Wisconsin. Local zoning has repeatedly been identified as the most significant barrier to the installation of small wind systems in this state. To address this situation, Mick Sagrillo has been asked by Wisconsin's Focus on Energy to facilitate the drafting of a model zoning ordinance for small wind turbines in Wisconsin (Focus On Energy 2005). The definition of "small wind" includes turbines up to 100 kW in capacity with up to 60-ft rotor diameters and total heights of tower and extended blade of 170 ft. This definition reflects the new and remanufactured equipment commercially available in the market and eligible for Wisconsin's renewable energy buy-down program, which is also managed by Focus on Energy.

The goal of the model zoning initiative is to develop a ready-to-use ordinance crafted by credible interests that would pass legal challenges, if needed, and to be compatible with Wisconsin's wind statute. The model has been drafted with input from several stakeholders including Focus on Energy, Division of Energy of Wisconsin, Electrical Division of the Public Service Commission of Wisconsin, a township board supervisor, and a wind-system installer. The draft is currently in the hands of the University of Wisconsin Agricultural Extension Service and the Wisconsin Towns Association for legal review. Upon completion, the ordinance will be forwarded to the Wisconsin Counties Association and the Wisconsin Towns Association for distribution and presentation to their respective members. Also in the works in a reference guide that will explain the ordinance and address questions that frequently arise about the operation and safety of wind systems. Previously, a small wind toolbox including fact sheets, utility interconnection information, and zoning information specific to Wisconsin has been posted on the Web (RENEWisconsin 2005).

Alternatives, But Not Solutions

There are means of relief from existing zoning rules that have been used by individual property owners desiring to install wind turbines—variance, special exception, special use, and conditional use. In many states, zoning variances may be granted in cases where "unnecessary hardship" to the landowner would result if compliance to the existing zoning rules were enforced. “These hardship conditions… should be peculiar and unique to the land in question” (Wright and Gitelman 2000). However, the intent to install a wind turbine is not a characteristic of the property itself; it is a land-use preference of the owner. As such, the hardship resulting from a wind turbine installation being denied is a “self-induced hardship” and does not appear to be a proper use of the variance process.

Special exception, special use, and conditional use are zoning relief options similar to one another differing primarily in name (Wright and Gitelman 2000). Typically, conditions or findings specified in the existing zoning ordinance must be met for the zoning authority to grant the relief. The authority may also attach conditions to the ruling. Whereas a variance allows an otherwise prohibited use, special or conditional use is tied to existing zoning provisions.

These alternatives might be useful to a particular land owner who faces a zoning barrier. When used as noted above, the alternatives will likely stand up to court challenge. We also note that it’s not unknown for these relief options to be “abused” by stretching their application or definition beyond that described here. Each of these options will likely require a public hearing and always require a specific and unique ruling by the zoning authority. All too often, the resulting process is slow, time-consuming, contentious, and costly. These means of zoning relief clearly are neither long-term nor broad solutions to the distributed wind zoning barrier.

The Preemption Option

An option for distributed wind advocates to consider that has significant leverage is the preemption of home rule. A higher legislative authority, state or federal, can override home rule in order to implement particular land-use policy in the public interest. The preemption addressed here is limited in scope so as to preserve home rule to the extent possible while breaking through a particular zoning barrier. The key advantage of preemption is the avoidance of taking the distributed wind zoning battle to each local jurisdiction. The policy argument may be made once at a higher, more central level of government. The result is more rapid and uniform application of a particular policy. Home rule is a well-established legal principle and is not easily set aside, but there are precedents for the effective use of limited preemption.

Federal Preemption of Home Rule

The Telecommunications Act of 1996 includes partial federal preemption of home rule that facilitated the rapid expansion of the cell phone industry during the past decade (Heverly 1996). This act limits the authority of local jurisdictions to regulate the installation of cell phone antennas and towers.

The act precludes

1. unreasonable discrimination among providers of similar services;
2. prohibitions, or restrictions that have the effect of prohibiting, provision of wireless services; and
3. regulation of placement, construction, or modification of facilities based on environmental effects of radio-frequency emissions (so long as facilities comply with FCC requirements).

The act requires

4. action on applications to take place within a reasonable period of time; and
5. denial of applications be in writing supported by substantial evidence contained in a written record.

Item #2 is quite powerful in that it mandates, in effect, that wireless services must be allowed anywhere the industry chooses to provide service. Item #3 is also critical. It takes the contentious issue of the health effects of the radio-frequency emissions out of the local discussion. Whatever the FCC decides, at the national level, applies to every local zoning jurisdiction. This emotional and highly technical issue could not have been effectively argued by the industry in each local zoning jurisdiction.

Obviously, the telecommunications industry was able to convince the Congress that this level of preemption of home rule was necessary and in the national interest. They are a large and well-capitalized industry with a compelling policy argument for the national benefit of wireless telecommunications. While this is a success story for the preemption option, it may not be a realistic option for the distributed wind industry, which does not have similar financial nor political resources. And, the benefit of distributed wind may be a less persuasive national policy initiative.

State Preemption of Home Rule

Wisconsin

In Wisconsin, the state passed a rather strong statute in 1993 protecting the rights of individuals to install solar energy or wind energy systems (Wisconsin 2005). The statute, 66.0401, states:

> No county, city, town, or village may place any restriction, either directly or in effect, on the installation or use of a solar energy system…or a wind energy system…unless the restriction satisfies one of the following conditions:
>
> (a) Serves to preserve or protect the public health or safety.
>
> (b) Does not significantly increase the cost of the system or significantly decrease its efficiency.
>
> (c) Allows for an alternative system of comparable cost and efficiency.

The footnote to the statute states:

> This section is a legislative restriction on the ability of municipalities to regulate solar and wind energy systems. The statute is not superceded by…municipal zoning or conditional use powers. A municipality's consideration of an application for a conditional use permit for a system under this section must be in light of the restrictions placed on local regulation by this section.

In essence, restrictions on the construction of a wind system can only be imposed in order to protect public health or safety per section (a). The intent of section (b) is to prohibit a zoning board from requiring a shorter tower, or multiple shorter towers rather than one tall tower, so that the neighbors "don't have to look at the thing." Because of the cubic relationship of wind power to wind speed, shorter towers significantly impact wind turbine output. And just as four 20-foot silos would cost significantly more than one 80-foot silo, the same would be true for multiple wind turbines on multiple short towers. Sections (c) means that a permitting agency can require an alternative location on the applicant's property in order to address the concerns of adjacent neighbors.

The interesting twist about this ordinance is that the burden of proving that a public health or safety concern exists is on the zoning authority rather than the applicant having to prove that such a concern does not exist. Also note that the issue of public health and safety is treated differently than in the federal Telecommunications Act. That act specifically preempts local authority on this issue, whereas in Wisconsin, public health and safety is specifically delegated to the local level. This statute has been challenged in Wisconsin courts and has been subsequently upheld all the way to the state supreme court.

Nevada

A bill currently before the Nevada legislature, AB236 (Nevada 2005), addresses several aspects of the regulation of renewable energy systems including zoning for distributed wind up to 150 kW:

> This bill amends existing law to provide that an owner may not be prohibited or unreasonably restricted from using a wind energy system on his property.

The bill further states:

> For the purposes of this section, "unreasonably restricts the use of a system for obtaining solar or wind energy" means placing a restriction or requirement on the use of such a system which significantly decreases the efficiency or performance of the system and does not allow for the use of an alternative system at a comparable cost and with comparable efficiency and performance.

Other language in the bill extends this protection to covenants contained in deeds and to regulations by a homeowner's association.

The construction of this bill is a variation on the preemption theme. It uses some of the core language previously legislated in Wisconsin about efficiency, performance, and cost of wind systems while omitting the Wisconsin language delegating the decision about public health and safety to the local jurisdictions. Elimination of that decision from the local zoning process may well be expeditious for distributed wind energy projects. Of course, this bill is not yet law nor has it stood the test of court challenges, as is the case in Wisconsin. Nevertheless, it will be instructive to follow the progress of this legislation.

California

In 2001, California passed into law a bill called AB1207 (2001) addressing zoning for small wind systems. It is a more substantial preemption of home rule in contrast to the limited preemption examples discussed above. It authorizes local zoning jurisdictions to establish processes to issue conditional-use permits while laying out specific limits to local regulation of certain conditions, including notice to neighbors, property size, tower height, setback, noise, wind turbine approval/certification, and technical submittals. In the event that a local jurisdiction does not create such an ordinance, the law establishes small wind systems as a use by right if those systems are compliant with conditions enumerated in the statute. The law took effect on July 1, 2002, and has a sunset clause effective as of July 1, 2005.

The timing of AB 1207 was critical. First, California was immersed in the post-Enron energy crisis and was eager to pursue all reasonable solutions to their energy supply short-fall. At the same time, the wind industry was eager to achieve rapid changes with zoning so that wind turbine buyers could take advantage of a substantial state incentive program being offered during a limited 5-year period. Full credit should be given to Mike Bergey of Bergey Windpower and AWEA for seeing this opportunity and successfully promoting this legislation. AWEA (2003) has also created a handbook documenting some of the experience with this law. AB1207 has been substantially effective in breaking through the zoning barriers that existed in California. It also has been criticized as a "one-size-fits-all" approach (Shane 2001) that eliminates appropriate consideration of local conditions.

Recommendations

Having considered these facts about distributed wind zoning, we recommend limited state preemption of home rule as being a viable and attractive approach for advocates to pursue in addressing the distributed wind zoning barrier. It's clear that addressing zoning on the local level is and will continue to be an overwhelming task. In comparison, a single state-level action has the leverage of directly affecting hundreds of local jurisdictions—an estimated 500 jurisdictions per state on average. The experience in California demonstrates that quick results are possible, as well. Of course, federal preemption is also an option, but we expect it is not a realistic objective for the distributed wind industry. Two examples of state preemption, on the other hand, already exist.

If state preemption is pursued, a specific formulation must be chosen. From our point of view, an approach like that used in Wisconsin and in Nevada presents the best option. These approaches focus on limited preemptions that include a clear mandate for implementation much like the very successful federal Telecommunications Act of 1996. Unlike the California approach, they neither dictate nor allow a limit on tower height. We can't understate the value of this feature to promote successful distributed wind installations. Further, the substantial preemption of home rule as done in California is likely to meet with strong political resistance apart from periods of crisis. The key issue of the treatment of "public health and safety" remains an open question. In our examples, it is variously preempted at the federal level, delegated to local authority, or not addressed at all. Is one of these approaches best? Perhaps more than one of them can be successful?

We understand that others may choose to differ with our preference for this formulation for limited state preemption. It is also possible, perhaps likely, that the unique political and legal processes in the various states will result in a variety of approaches to home rule preemption. Clearly, more work remains to be done to develop models for state legislation to preempt local zoning and effectively break the zoning barrier to distributed wind. And, successfully promoting such legislation is no small task. When such legislation is in place, it should be followed with development and promotion of model zoning ordinances that are fair, effective, and endorsed by state-level organizations that will be viewed as credible and unbiased by local zoning jurisdictions. Such a process is underway in Wisconsin that, if successful, can serve as a template for other states to follow.

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