



Wind Power *Land Use and Policy Issues*

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Interest in Wind Power

Why is everyone talking about wind power?

- 1. Farmers and large tract owners, because -
 - they seek supplemental income
 - they realize they have a competitive edge in turbine siting due to rural setting
- 2. Self-described “conscientious consumers” and “green lifestyle consumers”
 - because they seek products that support local, low-impact sustainable development



Interest in Wind Power

- 3. Public policy-makers, because they want to
 - improve local opportunities for employment
 - lower air pollution by reduced reliance on carbon-based energy sources
 - recycle capital locally by purchasing energy and equipment in-state
 - lower the cost of government by purchasing wind energy for their own facilities



Reducing Emissions

- Electric generation from fossil fuel-fired power plants
 - 39% of carbon dioxide (CO₂) emissions,
 - 22% of nitrogen oxide (NO_x) emissions,
 - 69% of sulfur dioxide (SO₂) emissions, and
 - 40% of mercury emissions in the US.
 - Others include volatile organic compounds (e.g., benzene, dioxins) and heavy metals (e.g., arsenic, lead).



Wind Costs have Dropped, While Other Types are Rising

- Nuclear
- Solar PV
- Oil
- Biomass
- Natural gas
- Coal
- Wind





Wind Power in View

- Studies are showing support for wind power development is strong, especially “Not In My Back Yard” (NIMBY)
- Researchers are beginning to apply place theory models, criticizing studies that target just the points of opposition



Public attitudes toward wind

- Danish survey:
 - Women prefer groups of 2-8 turbines
 - Men prefer parks of 10-50 turbines
 - Regarding Noise:
Found that people without direct experience believe the noise is louder than is reported by those with direct experience (neighbors of wind)



Source: Holdningsundersogelse, 1993



Aesthetics



- *Beauty is in the eye of the beholder. Some find the sight of windmills **appealing** – they are symbols of energy independence – while others find them **appalling** – they are an industrial intrusion.*



Pros and Cons

Maybe Yes...

- **Proponents:** wind power can supplement other sources, wind power is never going to rise in cost, wind power does not pollute the air or water, wind turbines are visually appealing, wind turbines are not too noisy, wind power increases national security



Pros and Cons

Maybe No...

- **Opponents:** wind power is intermittent, wind turbines spoil the scenery, wind turbines are noisy, wind turbines are dangerous, wind turbines kill too many birds, wind power is too expensive



Issues for Local Officials

- Tower Height
- Tower Setbacks
- Climbing Hazards
- Noise Levels
- Shadow Flicker
- Decommissioning
- State Law? County Law?





Michigan Guidelines



- Michigan Siting Guidelines (DLEG 2007) provide local leaders with ordinance phrasing to handle several important issues
- The guidelines suggest that local governments should adopt different requirements for
 - On Site Use (accessory use - with towers up to 40 meters high) and larger
 - Utility Grid Systems (principle use - with towers up to 90 meters high).



DLEG Siting Guidelines

- On Site Use Wind Energy Systems
 - “An On Site Use wind energy system is intended to primarily serve the needs of the consumer. An On Site Use wind energy system with a tower higher than 20 meters shall be considered a Special Land Use. On Site Use wind energy systems with no towers or towers 20 meters or less shall be a Permitted Use in all zoning classifications”



DLEG Siting Guidelines

- Utility Grid Wind Energy Systems
 - “A Utility Grid wind energy system is designed and built to provide electricity to the electric utility grid. Utility Grid wind energy systems shall be considered a Special Land Use.”



Decommissioning example

- “The plan shall include:
 - 1) anticipated life of project
 - 2) estimated decom costs
 - 3) assurance of long-term fund availability
 - 4) how site will be restored”

Michigan Land Use Guidelines for Siting Wind Energy Systems DLEG, 2007
Recommended language for local zoning ordinances <http://www.michigan.gov>



Shadow Flicker example

- "...applicant shall conduct an analysis of potential shadow flicker at occupied structures...over the course of a year...describe measures that shall be taken to eliminate or mitigate..."

Michigan Land Use Guidelines for Siting Wind Energy Systems DLEG, 2007

Recommended language for local zoning ordinances <http://www.michigan.gov>



Tower Heights

- *Most jurisdictions in Michigan have provisions about structure height in their ordinances, but they do not specifically provide for wind towers*





Tower Heights

- *The blades on many of the newest wind power generation facilities are quite large.*





Tower Heights

- *This 40 meter blade is about to be installed on a 78 meter tubular tower as part of a 1.8 MW system.*

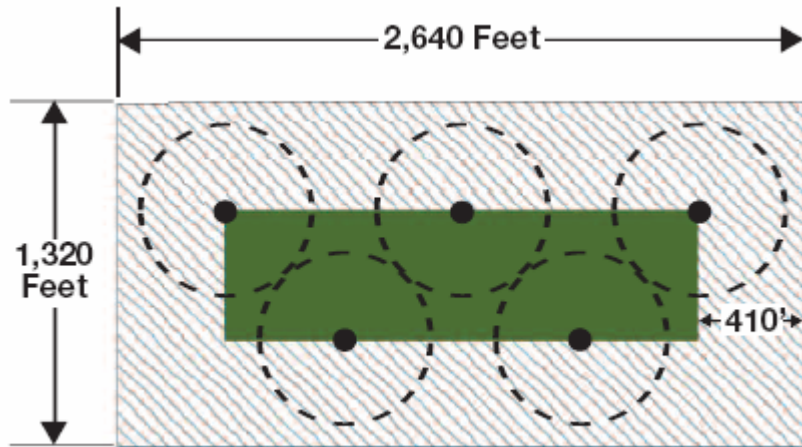




Tower Heights Related to Property Line Set Back

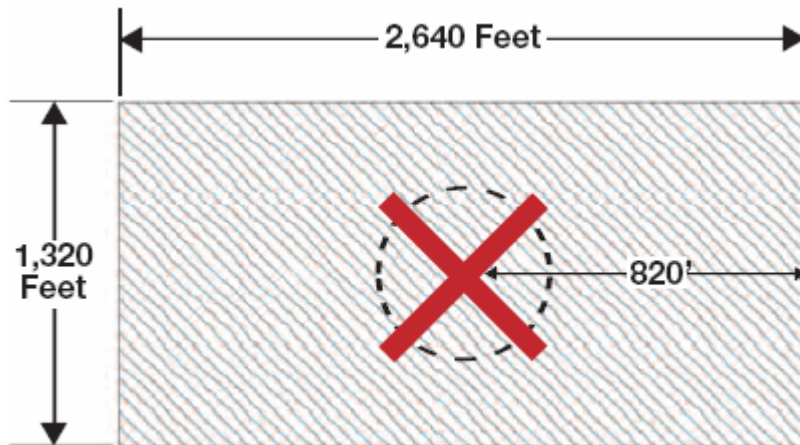
- Property Set-back: The distance between an On Site Use wind energy system and the owner's property lines shall be at least $1\frac{1}{2}$ times the height of the wind energy system
 - Example: Setback = 125 meters x 150% = 187 meters

e.g. system height = 125 meters

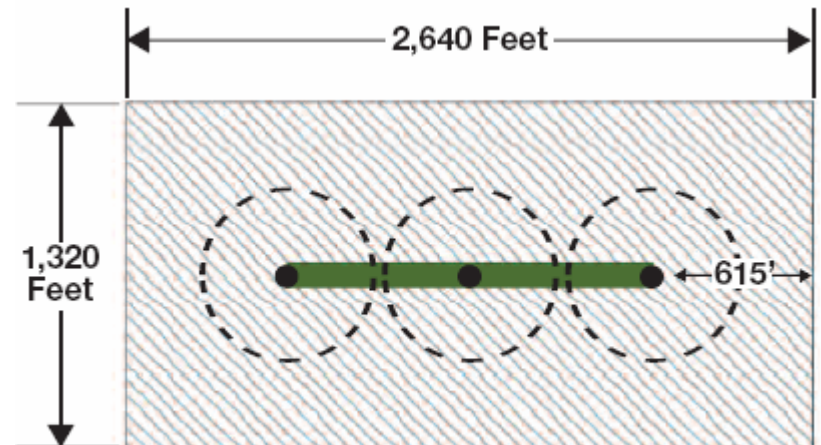


Five turbines on 80 acres with setback of 410 feet.
Setback = 125 meters

When local officials decide how large the yard setback must be, they indirectly determine the number of wind generators a landowner can install, and this affects the economic viability of developing wind power projects in the community.



No turbines on 80 acres with setback of 820 feet.
Setback = 125 meters x 200% = 250 meters



Three turbines on 80 acres with setback of 615 feet.
Setback = 125 meters x 150% = 187 meters



Setback Example

- D(2) The distance between a Utility Grid wind energy system and the property lines of adjacent non-leased properties including public rights of way shall at least equal the height of the wind energy system tower including the top of the blade in its vertical position.
- B(1) The distance between an On Site Use wind energy system and the owner's property lines shall be at least **1½** times the height of the wind energy system tower including the top of the blade in its vertical position.

Michigan Land Use Guidelines for Siting Wind Energy Systems DLEG, 2007

Recommended language for local zoning ordinances <http://www.michigan.gov>



Why is Setback Important?



Noise Levels

- Some older noise provisions in local ordinances simply use “in the ear of the complainant” - a reasonable standard
- Property line is the usual listening point
- What is noise?
 - Beautiful music in the “ear of the beholder”



Most indoor conversation is in the range of 55 to 60 dB(A)

COMMON SOUND LEVELS

Sound pressure level dB(A)

Threshold of hearing	0
Broadcast studio or rustling leaves	10
Quiet house interior or rural evening	20
Quiet office interior or ticking watch	30
Quiet rural area or theater interior	40
Quiet suburban area	50
Office interior or ordinary conversation	60
Vacuum cleaner ten feet away	70
Passing car ten feet away	80
Passing bus or truck ten feet away	90
Passing subway train ten feet away	100
Night club with band playing	110
Threshold of pain	120



Noise Example

- On Site Use wind energy systems shall not exceed 55 dB(A) at the property line closest to the wind energy system....
 - This sound pressure level may be exceeded during short-term events such as utility outages and/or severe wind storms.
- If the ambient sound pressure level exceeds 55 dB(A), the standard shall be ambient dB(A) plus 5 dB(A).

Michigan Land Use Guidelines for Siting Wind Energy Systems DLEG, 2007

Recommended language for local zoning ordinances <http://www.michigan.gov>



Don't Limit Technology

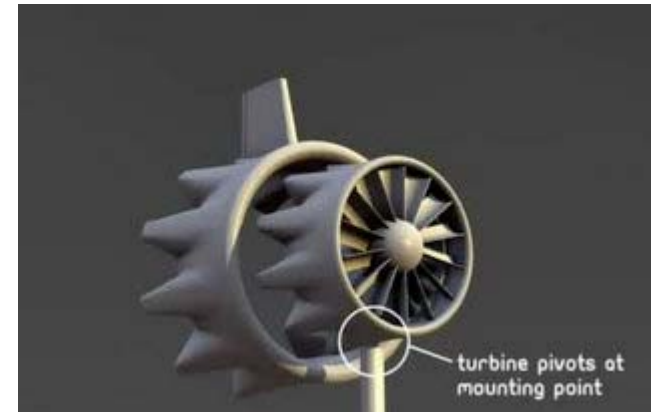
- This new vertical axis machine is about 30 feet tall, producing 2000 kWh





When You're Writing for Siting – Don't Mistakenly Limit Marketplace

- A small Massachusetts start-up, [FloDesign Wind Turbine](#), recently received support for a "shrouded turbine" design that it says can generate 3 to 4 times more electricity than today's propeller wind turbines.



Local government ordinance language should anticipate change...

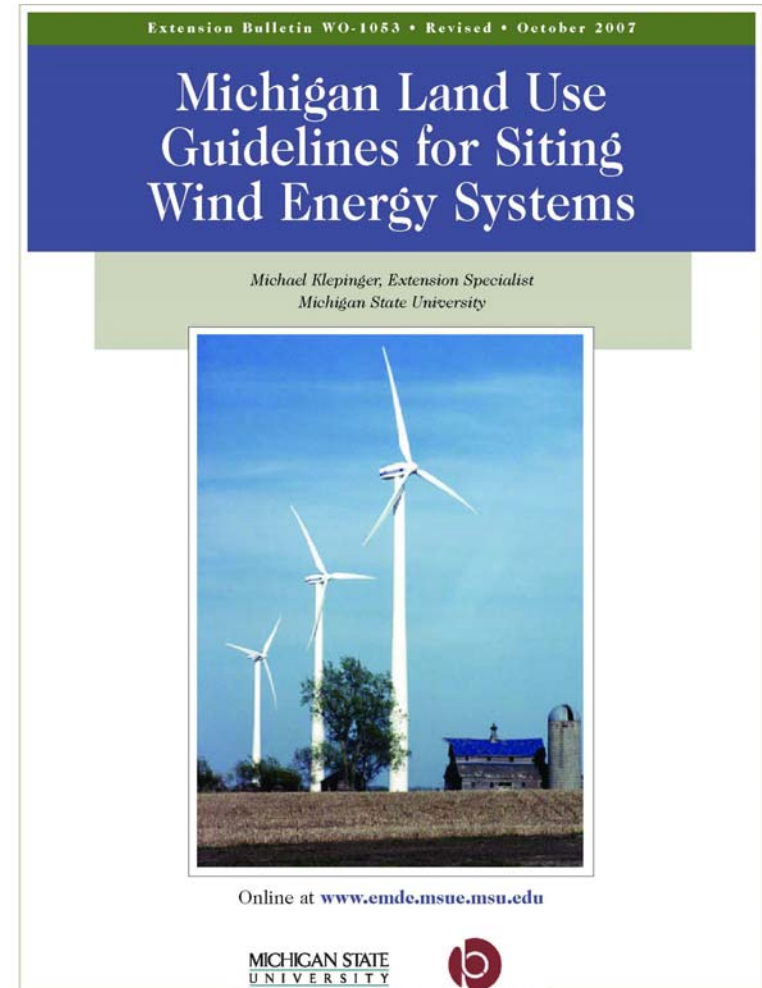


Additional help for local land use officials...

- MSU Extension Bulletin #WO-1053
- Industry - NACO Publication

Wind Energy Guide for County Commissioners

<http://www.nrel.gov/docs/fy07osti/40403.pdf>





What About Bird Kill?

U.S. Annual Bird Mortality Comparison - Selected Causes

Causes of bird mortality	2005 estimated annual bird mortality range	2020 estimated annual bird mortality
Hunting by house cats	75 million to 100 million	More than 75 million
Collisions — vehicles	10 million to 60 million	More than 10 million
Collisions — buildings and structures	100 million to 500 million	More than 100 million
Wind power developments	20 thousand to 30 thousand	80 thousand to 120 thousand

Note: This chart, which draws on the latest bird mortality studies, assumes the number of wind turbines will rise fourfold between 2005 and 2020 (a possibility but by no means a certainty).