

Planning a Small Wind Turbine Project

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Local Energy/Local Opportunities
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Outline

- About Windustry
- Wind Energy Development: Types of Projects and Types of Ownership
- Wind Technology
- Small Wind Turbine Project Planning
- Advice for Before You Buy



Windustry

- Increasing wind energy opportunities for rural landowners and communities.
- Non-profit organization based in Minneapolis, MN
- www.windustry.org/smallwind/default.htm
- The Windustry Newsletter
- Wind Easement Agreements
- National Community Wind Conference
- Wind Farmers Network



Types of Wind Projects

Wind is a modular technology:

- Large Wind Farms-
large number of large-scale turbines.
- Dispersed Wind Projects-
one or a few large-scale turbines.
- Small wind turbines-
residential or farm use.



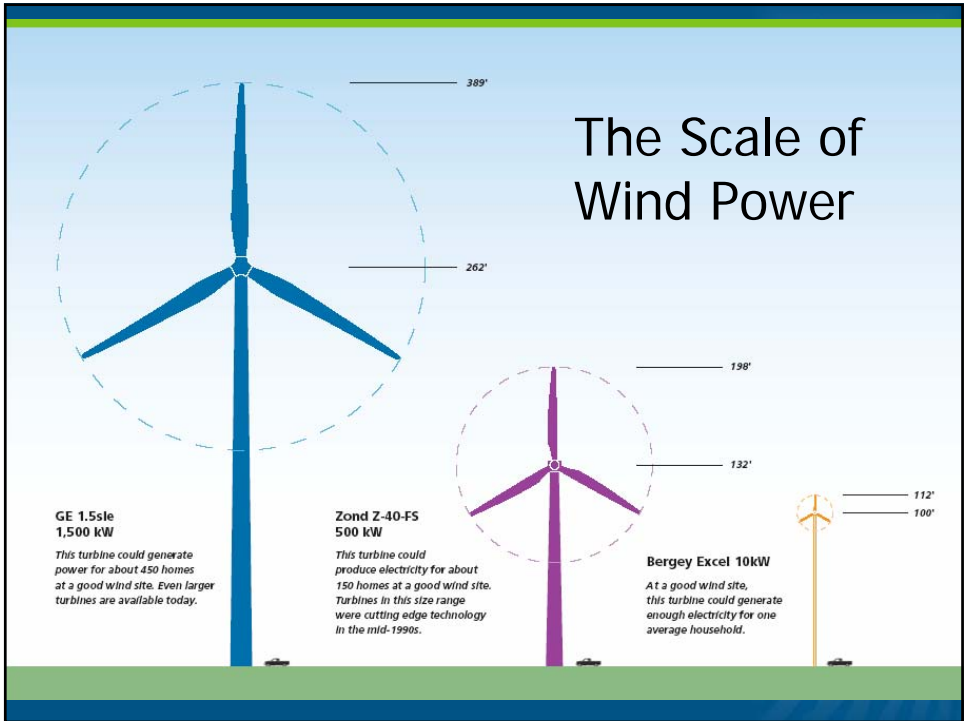


Large Wind Farm, Southwest Minnesota



**Dispersed Wind
Development
and Distributed
Generation**

Woodstock, Minnesota



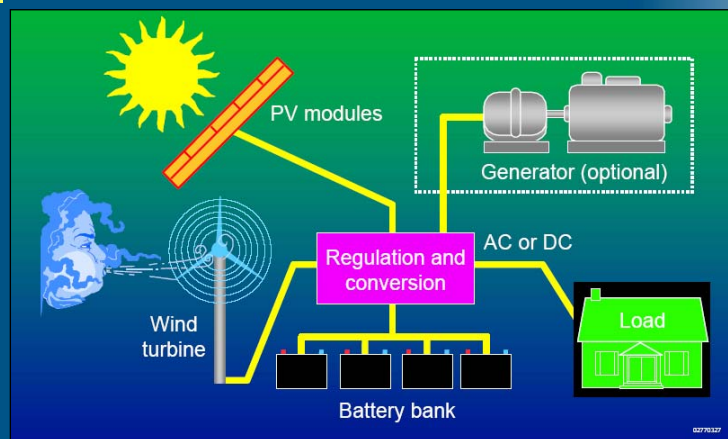
Why Small Wind Turbines?

■ Typical Motivations

- Want energy independence
- Environmentally friendly
- Like to tinker with machines
- Reduce monthly energy charges
- Hedge against future rises in energy rates
- Educational value

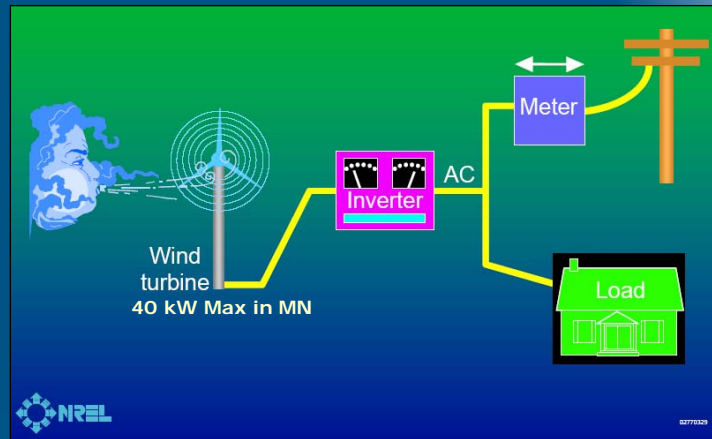
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Off Grid System



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Typical Grid-tied System (Net Metered)



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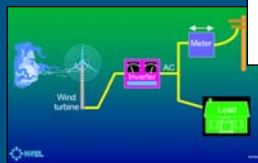
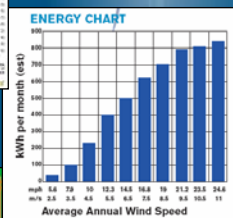
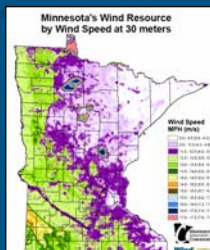
Steps to Planning a Small Wind Turbine Project

- Preliminary Wind Resource Assessment
- Preliminary Conversations With Your Utility and Local Permitting Agencies
- Investigate Potential Installers
- Permits
- Micro Siting
- Financing
- Final System Design
- Construction, Inspections and Interconnection
- Ongoing Maintenance

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Preliminary Economic Analysis

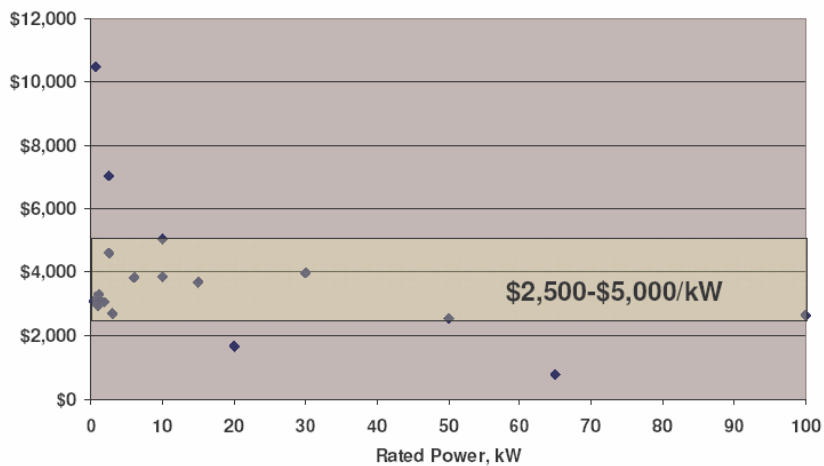
- Determine simple payback:
 - Estimate energy production
 - Low and high end
 - YOUR cost of energy
 - \$/kWh
 - Estimated installed system cost
 - Loan payments?
 - Annual escalation of energy rates
 - Annual Insurance



Survey Performed by Jim Green, National Renewable Energy Laboratory

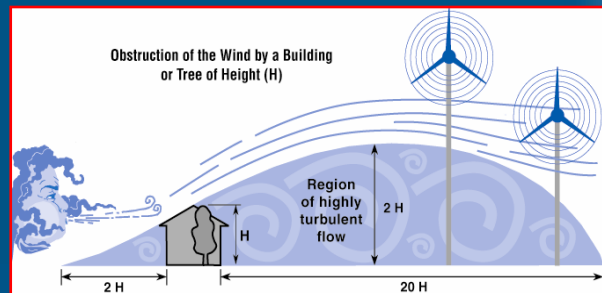
Wind Turbine Cost per kW

including turbine, tower, and inverter



Small Wind Siting basics

- Turbulent winds do not produce energy well
 - Get the machine **AT LEAST** 30 ft above objects within 500 feet of machine.



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Small Wind Siting Basics

- Generally need ½ acre or more
- Trees grow over time
- Direction of prevailing wind
- New construction in the future
- Setback requirements
- Topography of site and proximity to point of interconnect



Elm tree 5-6 years old will reach 40-50 feet in 10-15 years

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Permits (research at the beginning!)

- Contact local zoning/permitting agency for applicable permits
- Educate the agency **BEFORE** the hearing
 - Things to bring:
 - Model ordinance to show officials
 - Make and model of machine (with pictures)
 - Electrical capacity
 - Tower height
 - Electrical wiring schematics (complies with international electrical codes)
 - Tower rating for Wind speed and ice loading (TIA/EIA-222-G compliant)
 - Foundation design (complies with international building codes)
 - Distance to dwellings and property lines (including detailed site map)
 - FAA Ruling stating project is not a hazard (form 7460-1)
 - No lighting is required (in most cases)
 - Information about sound (less than 40db at tower height distance away)
- **Talk to your neighbors before they receive notice of the hearing!**



Used Equipment

Used equipment can be cheap but not necessarily inexpensive in the long run

- Remanufactured equipment
 - What does remanufactured mean?
 - History of the machine
 - Warranty
 - O&M contract
- Availability of spare parts?
- **Solid references**



Before Buying (Triple Check)

- 5-year warranty support from manufacturer, minimum, for **ALL** hardware
- Certified turbines
 - NYSERDA - www.powernaturally.org
 - California Energy Commission – www.consumerenergycenter.org
 - Small Wind Turbine Certification Corporation (coming soon)
- Commercially available equipment
- **Solid references from prior customers**



Additional Resources

- Windustry – Small Wind How To
 - www.windustry.org/smallwind/default.htm
- Renew Wisconsin – Mick Sagrillo's Small Wind Tool Box
 - www.renewwisconsin.org/wind/windtoolbox.htm
- Database of State Incentives for Renewable Energy (DSIRE)
 - www.dsireusa.org
- American Wind Energy Association (AWEA)
 - www.awea.org/smallwind/



Thanks and Questions?

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www.windustry.org



Estimated System Cost

- Annual insurance premiums
- On-grid
 - Turbine
 - Tower
 - Electrical work
 - Installation fees
 - Maintenance contract and warranty
 - Permit fees
 - Electrical inspection
- Off-grid
 - Different insurance requirements
 - Batteries



Final System Design

- Tower options
- Wind turbine options
- On-grid vs. off grid

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Free standing
lattice



Guyed lattice

Tower Options



Tilt-up

Tilt-up (Monopole)



- Least expensive option
- No need for crane
- Tilt down machine to do maintenance which can be dangerous
- Height limitations

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Guyed Lattice Tower



- More expensive
- Can be tilt-up or crane installed
- Climb tower to do maintenance
- Stronger tower to reach higher into better winds

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Free Standing Lattice



- Most expensive due to requirement of crane
- Most stable
- Climb tower to do maintenance
- Stronger tower to reach higher into better winds