

Planning a Small Wind Turbine Project



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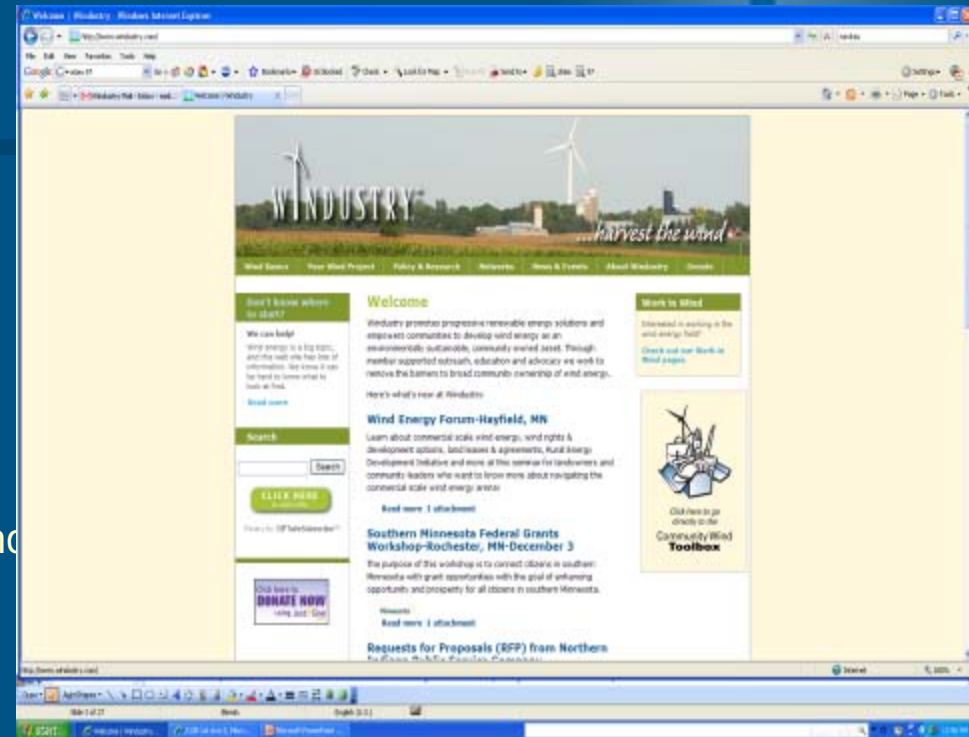
Small-Scale Wind
February 11th, 2009
St. Cloud, MN

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

- Non-profit organization based in Minneapolis, MN - work locally, regionally and nationally
- www.windustry.org
- Focus on community wind, landowner options, and rural economic development
- Provide landowner education, outreach and technical assistance
- Tailor our efforts for agricultural organizations, rural landowners & communities and local elected officials



Mission Statement:

“Windustry promotes progressive renewable energy solutions and empowers communities to develop wind energy as an environmentally sustainable, community-owned asset. Through member supported outreach, education and advocacy we work to remove the barriers to broad community ownership of wind energy.”



Types of Wind Projects

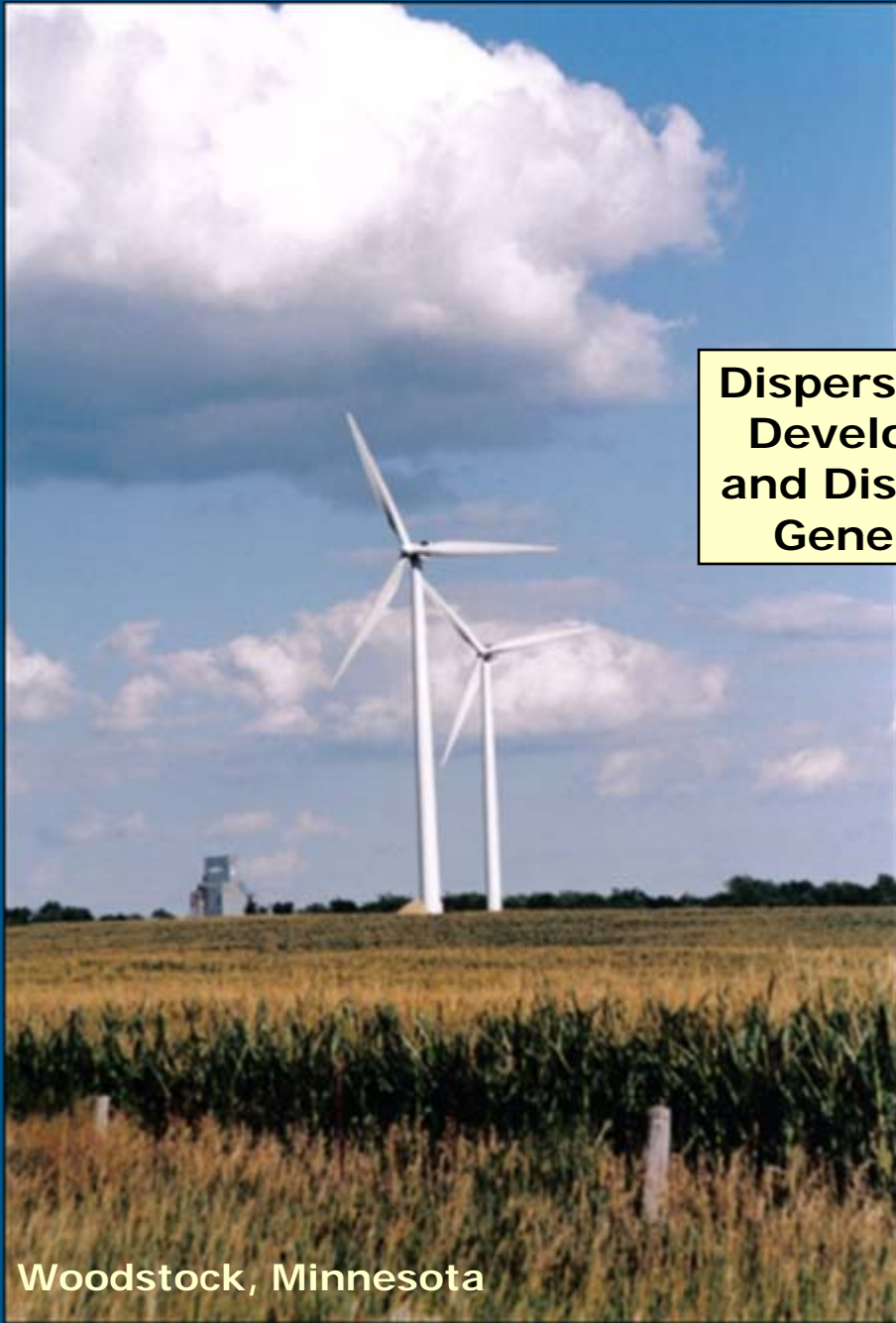
- Large Wind Farms
 - large number of large-scale turbines.
- Dispersed Wind Projects
 - one or a few large-scale turbines.
- Small wind turbines
 - residential or farm use.





Large Wind Farm, Southwest Minnesota

**Dispersed Wind
Development
and Distributed
Generation**



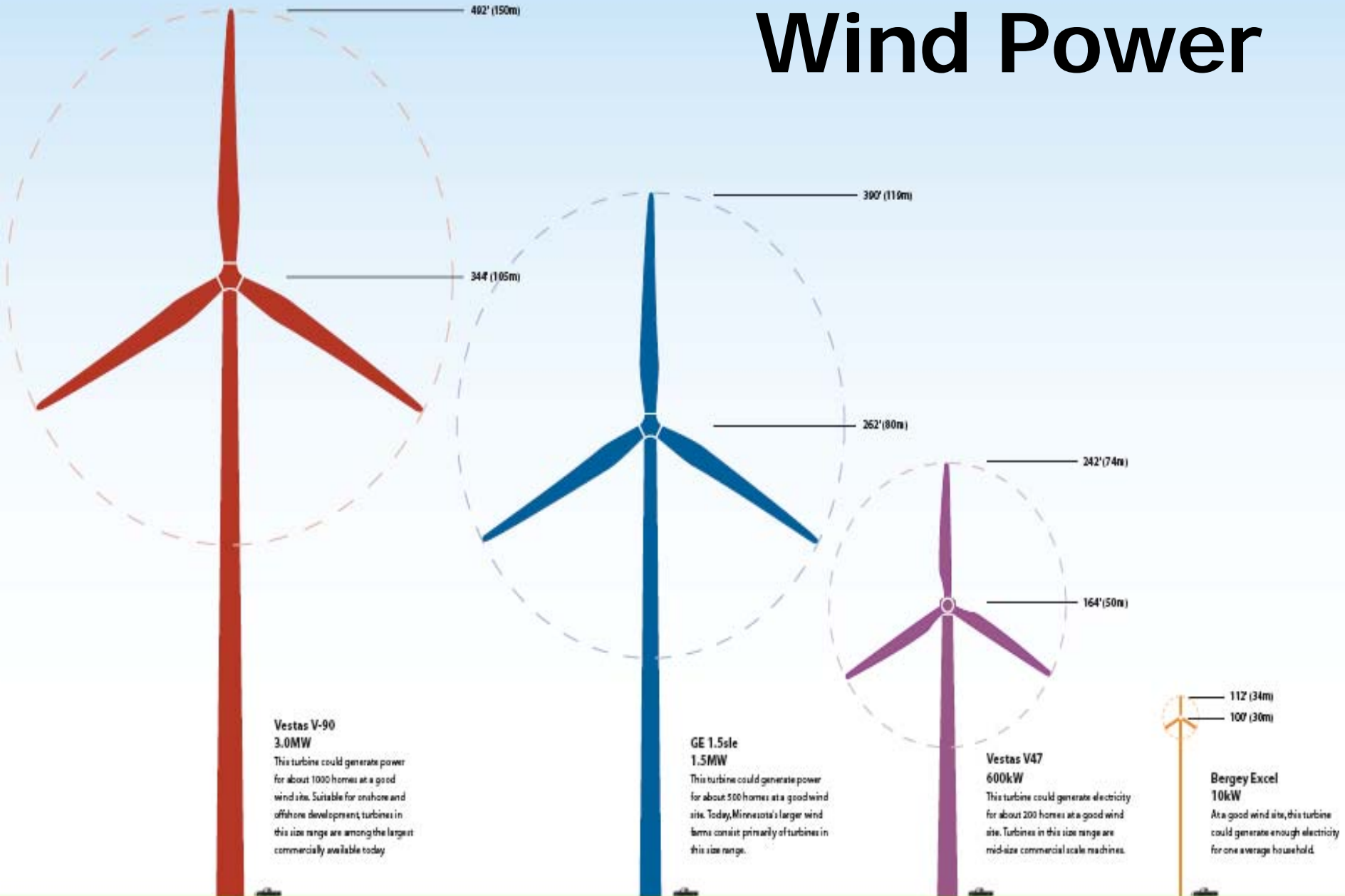
Woodstock, Minnesota





Small Wind Turbines

The Scale of Wind Power



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

Steps to Planning a Small Wind Turbine Project



- Wind Resource Assessment
- Economic Analysis
- Investigate Potential Installers
- Permits
- Micro Siting
- Financing
- Final System Design
- Construction, Inspections and Interconnection
- Ongoing Maintenance

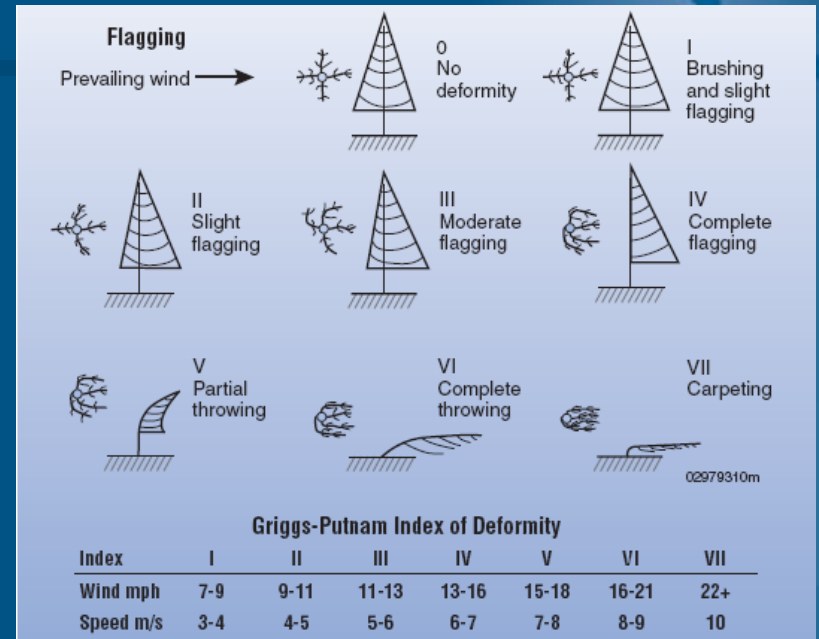
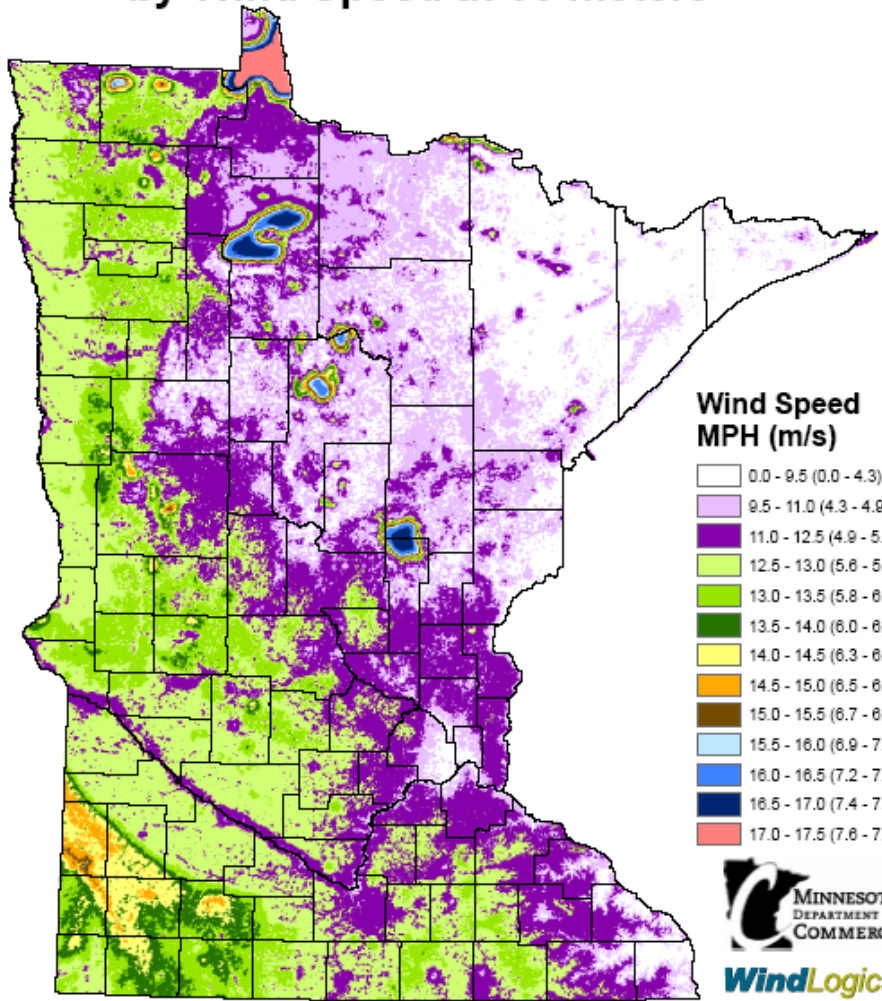


Wind Resource Assessment



- Determine if you have a good enough wind resource
 - Wind turbine without wind = solar panel in the sun
 - Typically, need average wind speed of 10-12 mph
- State Wind Resource Maps
- Existing Data (state programs)
- Historical data (airports, weather stations)

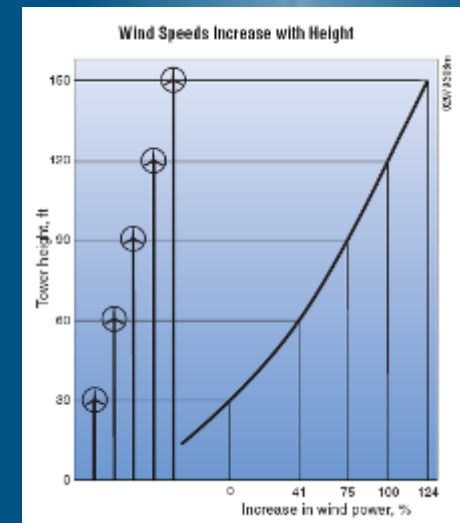
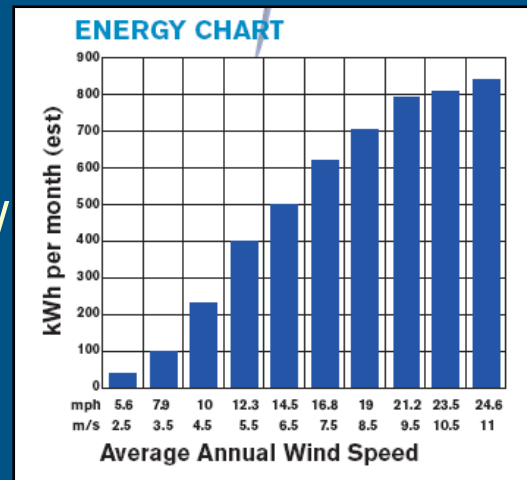
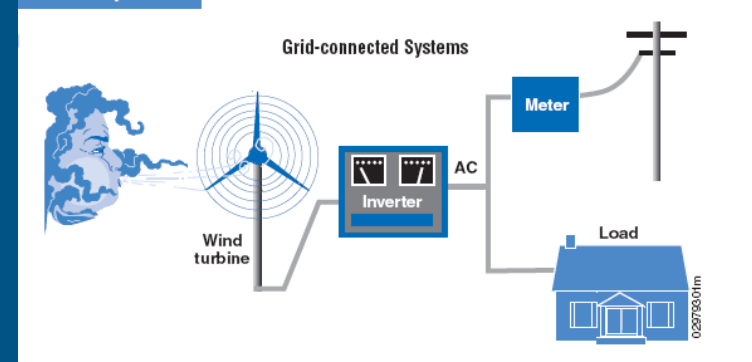
Minnesota's Wind Resource by Wind Speed at 30 meters



Economic Analysis

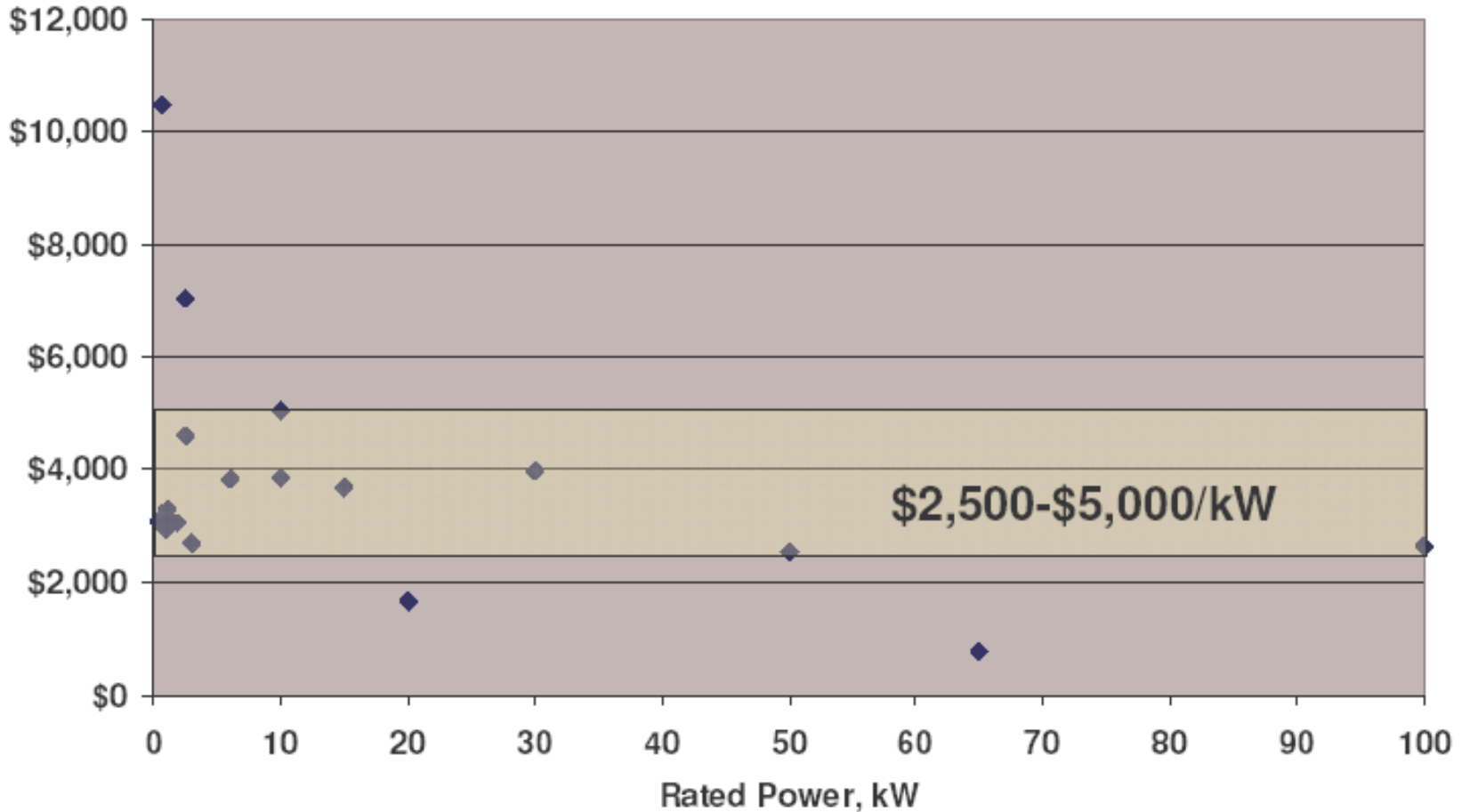
- Determine simple payback:
 - Estimate energy production
 - Low and high end
 - YOUR cost of energy
 - \$/kWh
 - Estimated installed system cost
 - Loan payments/Interest
 - Annual escalation of energy rates
 - Annual Insurance

Grid Electric Systems



Wind Turbine Cost per kW

including turbine, tower, and inverter



Investigate Potential Installers

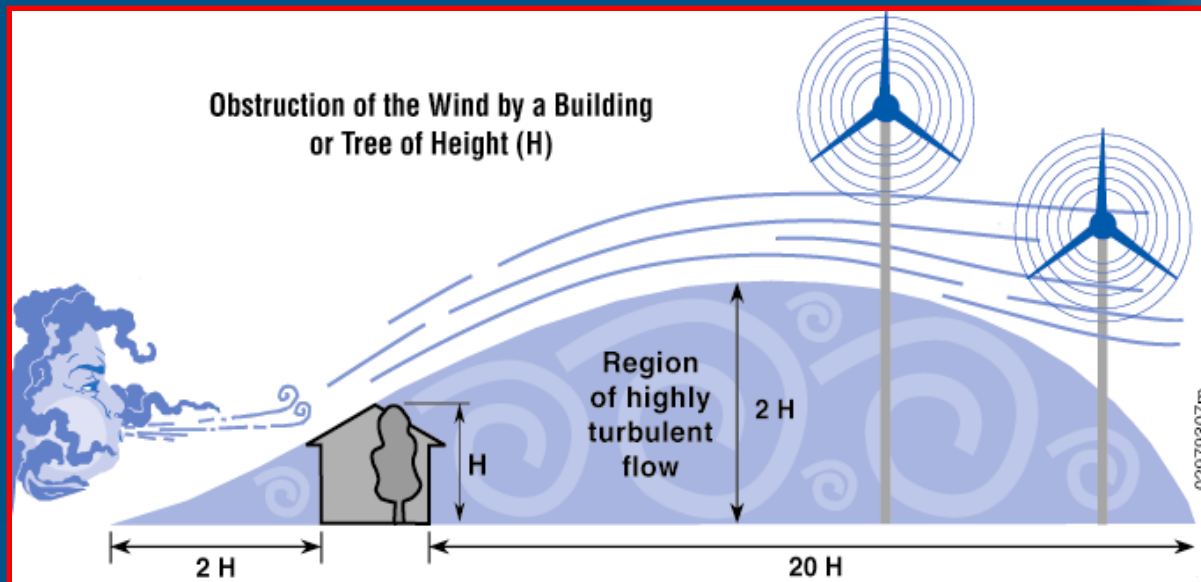
- Is important as choosing equipment
- Good Installer
 - Lots of experience (projects)
 - Solid track record
 - Ability to talk to former customers
 - Licensed and bonded electrician
- *What to Expect from your Renewable Energy Dealer*, Richard Perez, Home Power Magazine 2001

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!**

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.



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

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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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



Tower Options

Free standing
lattice



Tilt-up



Guyed lattice

