

Wind Power for Communities

Small & Community Wind Development

Small vs. Community Scale

- Small Wind
  - On-site generation
  - Personal use
  - Demonstration project
  - 1-100 kW
- Community Wind
  - 1 or more utility-scale turbines
  - Element of local ownership, or retention of benefits locally

Similar phases, different magnitude & structure

Small Scale Wind Development

- On-Site personal use
  - On or off-grid system
  - <100kW

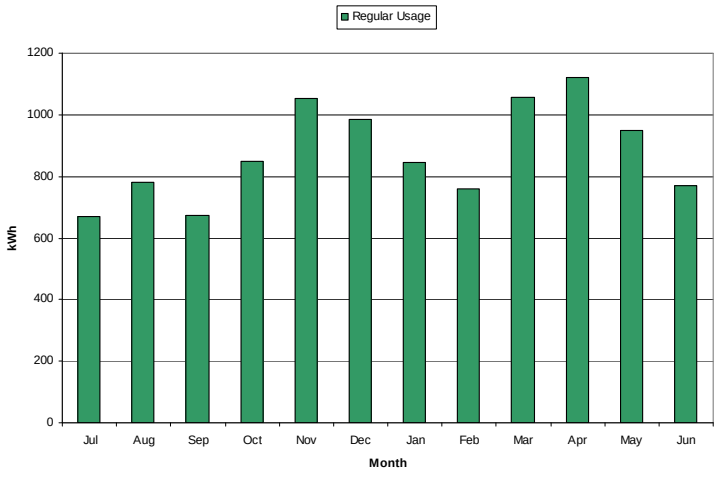
Small Scale Wind Development

- Understand current energy use & needs
- Resource Assessment
- Siting and turbine placement
- Permitting
- Interconnection & Net Metering
- Financing
- Installation & Maintenance

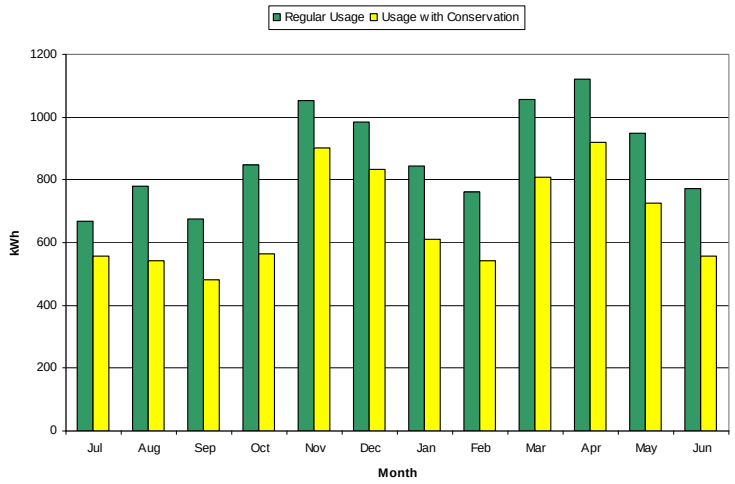
Energy Needs

- Analyze current energy use and patterns
  - Conservation First!
- Energy needs
  - Goal is to significantly offset energy demand
  - Look at your electricity bill to find your monthly/yearly usage
  - Size the system to meet that usage, or some percent of the usage

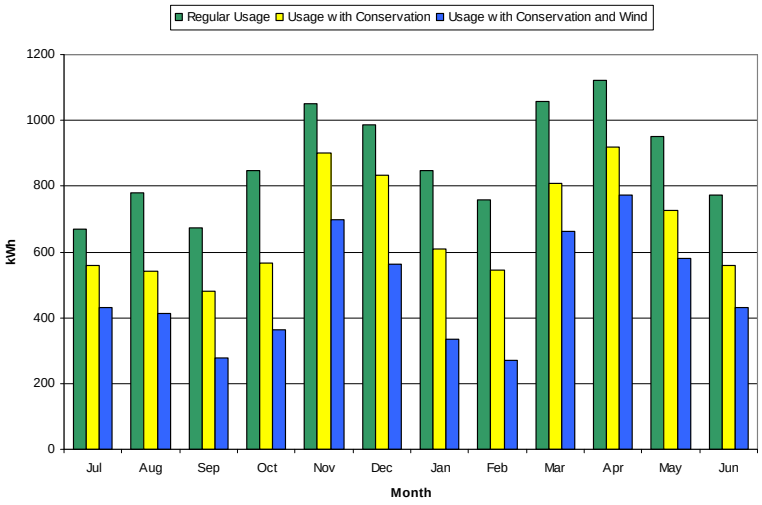
Typical Monthly Usage



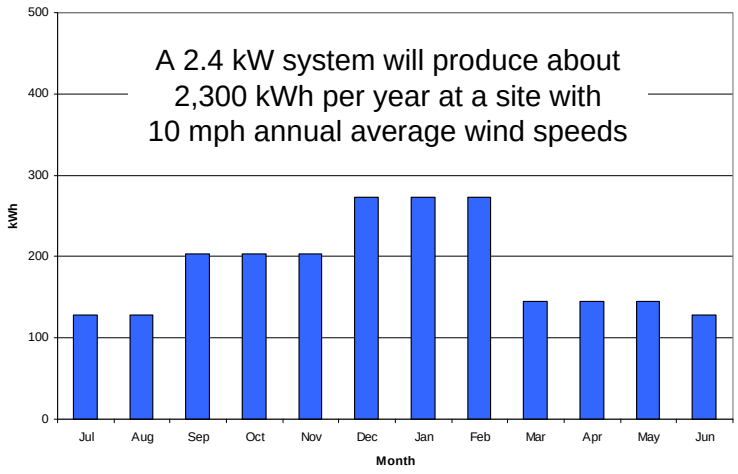
Typical Monthly Usage



Typical monthly usage



Production from 1.8 kW wind system



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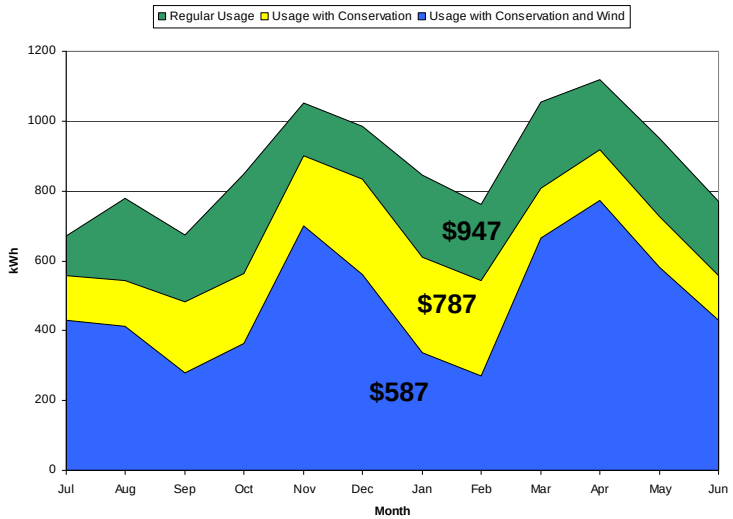
Impact on your annual bill



NORTHWEST S·E·E·D ECONOMIC DEVELOPMENT

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Resource Assesment

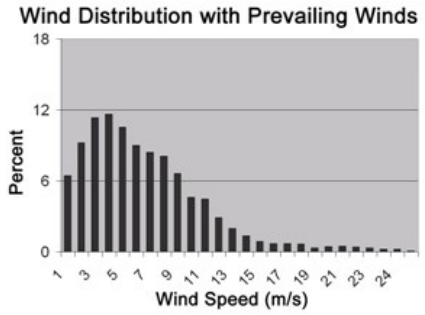
Wind Vocabulary:

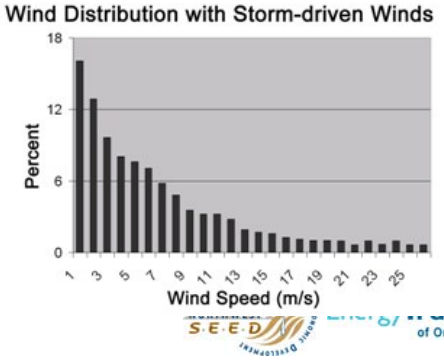
- ***Wind Power Density (Wind Class):*** The power density of the wind determines how much energy can be extracted by a wind turbine and is influenced by two factors: *wind speed* and *air density*.
- Standardized Wind Power Classes (1-7)

Wind Power Class	50 meters		
	Wind Power Density (watts/m^2)	Wind Speed (m/s)	Wind Speed (mph)
1	<200	<5.6	<12.5
2	200 - 300	5.6 - 6.4	12.5 - 14.3
3	300 - 400	6.4 - 7.0	14.3 - 15.7
4	400 - 500	7.0 - 7.5	15.7 - 16.8
5	500 - 600	7.5 - 8.0	16.8 - 17.9
6	600 - 800	8.0 - 8.8	17.9 - 19.7
7	>800	>8.8	>19.7

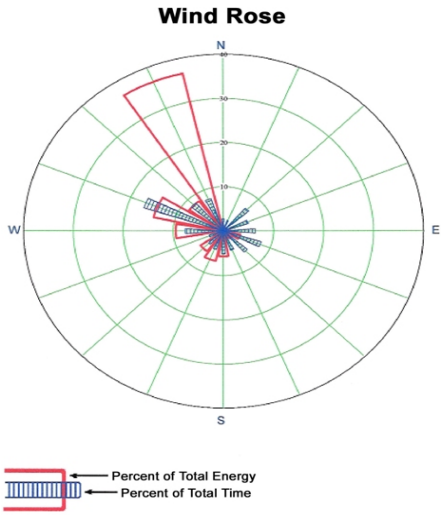
Source: Battelle Wind Energy Resource Atlas, for standard sea level conditions

Frequency (Weibull/Rayleigh) Distribution: The basic tool for estimating energy production at a site is the frequency distribution. A frequency distribution shows the percentage of time that the wind is blowing at certain speeds over the course of a study period.





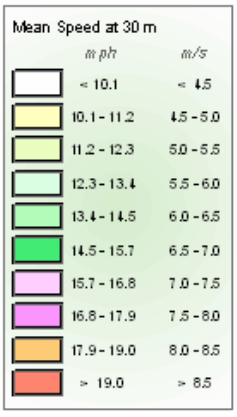
Wind Rose: A wind rose is a useful tool for delineating the directions from which the wind blows. It displays not only wind direction, but also the percentage of the power in the wind that comes from that direction.



This wind rose shows that the prevailing wind at a site is not necessarily the direction from which the majority of the energy comes from.

Start with Wind Maps

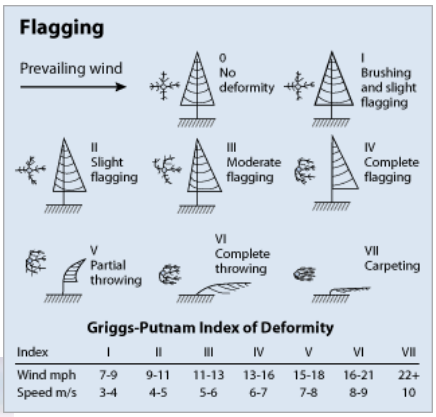
http://www.windmaps.org



Online tool: http://firstlook.3tiergroup.com

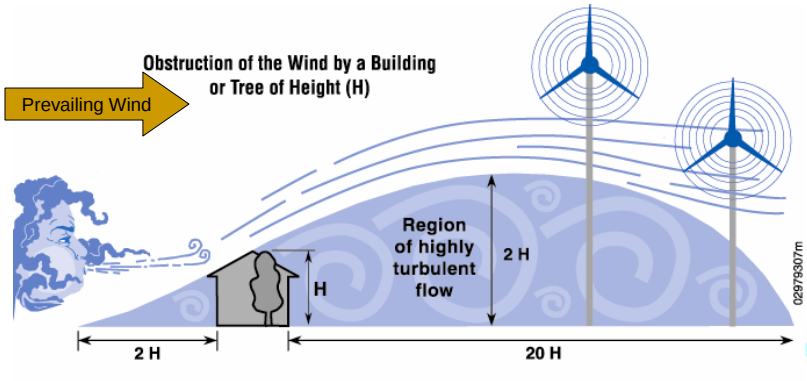
Site Specific

- Site visit by contractor, tree flagging, data correlation, etc.
- On-site measurement – Met Tower
- Anemometer Loan Program



Siting Considerations

- Good wind resource
- Space (1 acre or more of land, clear of obstacles for 300 ft)
- Location with minimal interference from trees, buildings, etc.
- Proximity to interconnection point
- Ease of construction/terrain



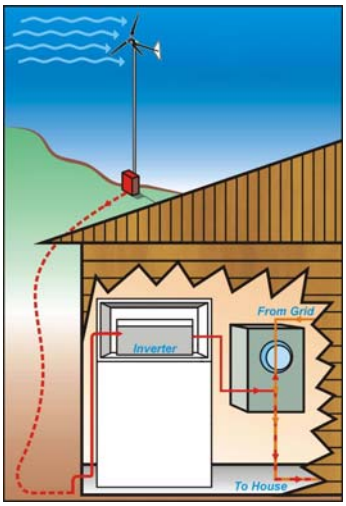
Permitting & Community Engagement

- Obtain permits
  - Building permit, varies by county
- Talk to neighbors!
  - Before, during and after installation
  - Let them know how you are already addressing their concerns
  - Invite them to participate in the process
  - Set ground rules for interested parties passing by

Interconnection

System parts that are directly related to interconnection include:

- the DC to AC power inverter
- disconnect switches (often a DC disconnect switch between the generator and inverter and an additional lockable AC disconnect switch)
- distribution panel (a.k.a. circuit breaker box)
- meter (includes the building's electric service meter and possibly an additional production-side meter).
- A grid-tied system that includes battery backup will have additional interconnection components.



Find out your utility requirements early!

Financial Incentives

- Tax Incentives - Federal
  - Investment Tax Credit
- Tax Incentives - State
  - Residential Energy Tax Credit (RETC)
  - Business Energy Tax Credit (BETC)
- Loans
  - Small-scale Energy Loan Program (SELP)
- Other funds available
  - Energy Trust
  - USDA Rural Development's REAP Grant

Total Cost (10 kW Example)

Component	Cost
Resource Assessment and Permitting	$500
Turbine, tower, shipping and other equipment	$70,000
Installation	$10,000
O&M	$200/year
Total	**$80,500 + $200/year**

Financing

- Financing – expect a long payback
  - Initial Capital Cost = $80k for 10kW
  - Produces about 14,000 kWh/year
  - Value of power @ $.065/kWh = $910/year

    >> Simple payback: 88 years!

- Incentives help!

Financing Example (10 kW)

Total Installed Cost	$80,500
USDA Grant	$20,125
Fed Investment Tax Credit (grant)	$18,112
BETC (pass-through)	$14,792
Energy Trust Incentive	$27,000
Total Cost to Owner	**$471**

Vendor Selection

- Research and select turbine vendor
  - Commercially proven; check warranty
  - AWEA Small Wind Certification underway: www.awea.org
  - Check Energy Trust requirements

- Select installation contractor
  - Design-build bid
  - www.energytrust.org

Installation & Maintenance

System owner responsibilities:

- Interconnection/Net Metering Contracts
- Site preparation
- Oversee installation
- Ongoing O&M - minimal