

Wind Energy Basics

Hilltowns Community Wind Forum



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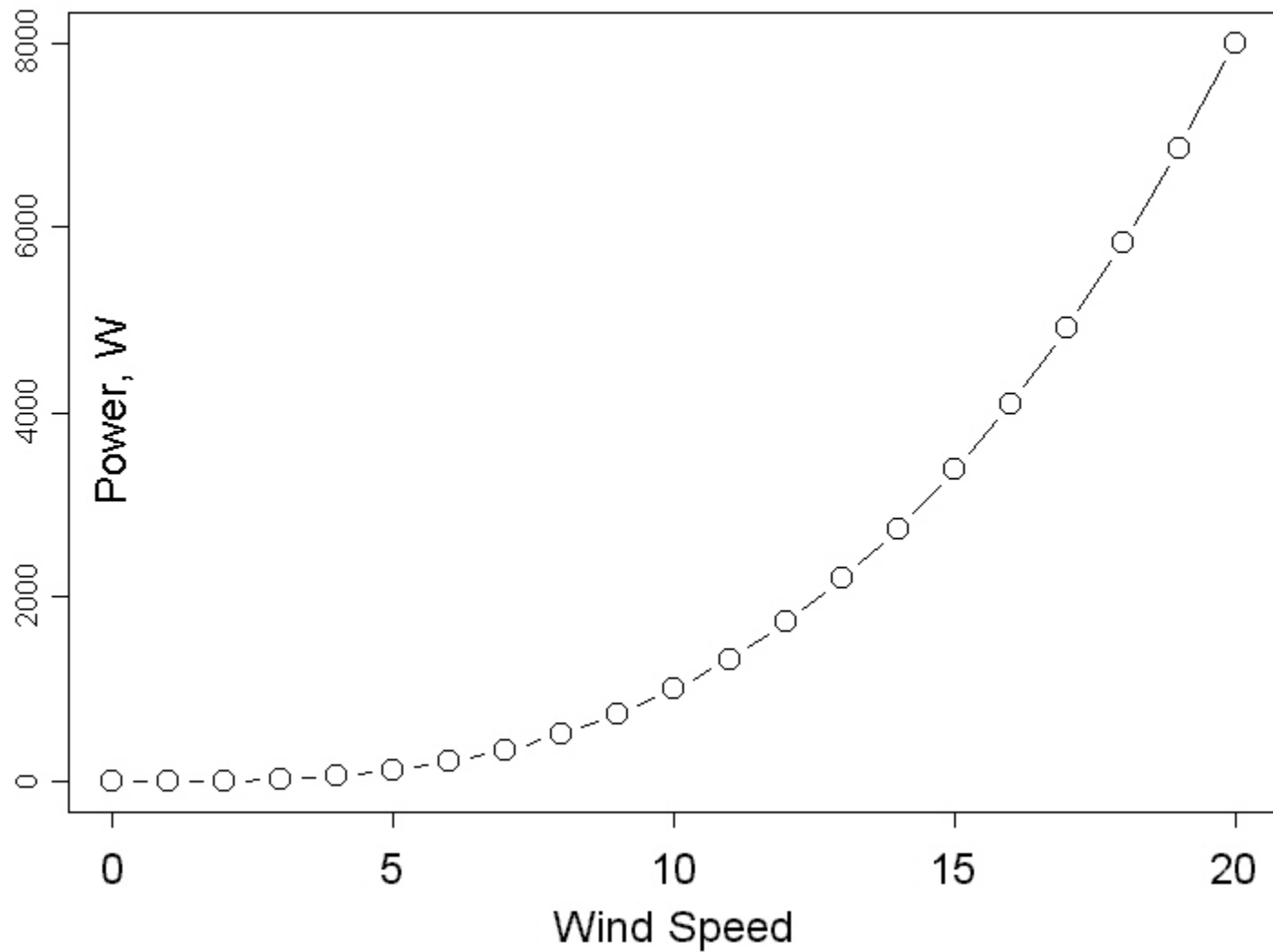
Wind speed is greater at higher elevations

Map at:
www.truewind.com

transmission →



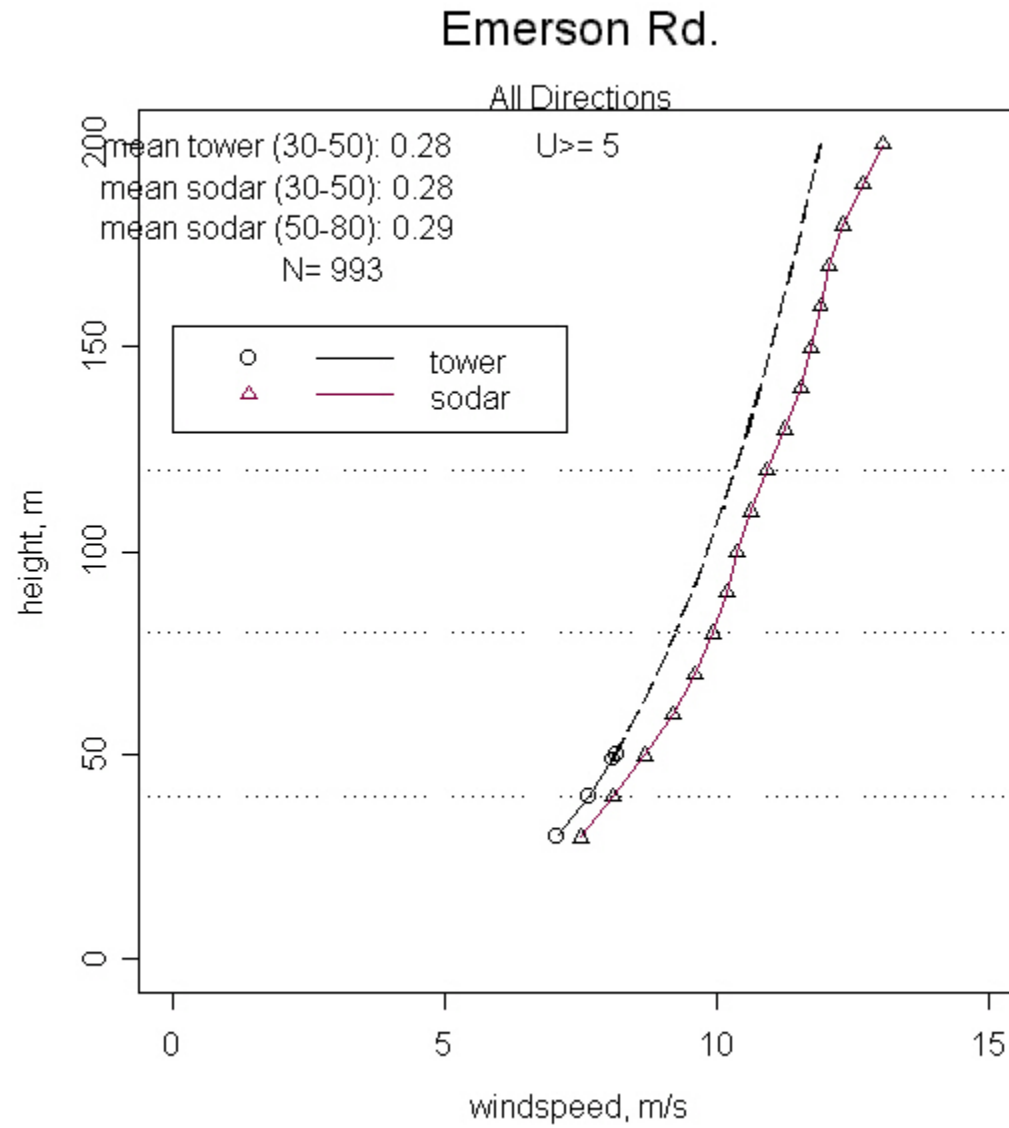
Power a Cubic Function of Wind Speed



Power is also **directly proportional to the density of air**, which depends on the **temperature**.

The density of air varies by about 20% due to temperature variations.

Wind speed increases with height above the ground

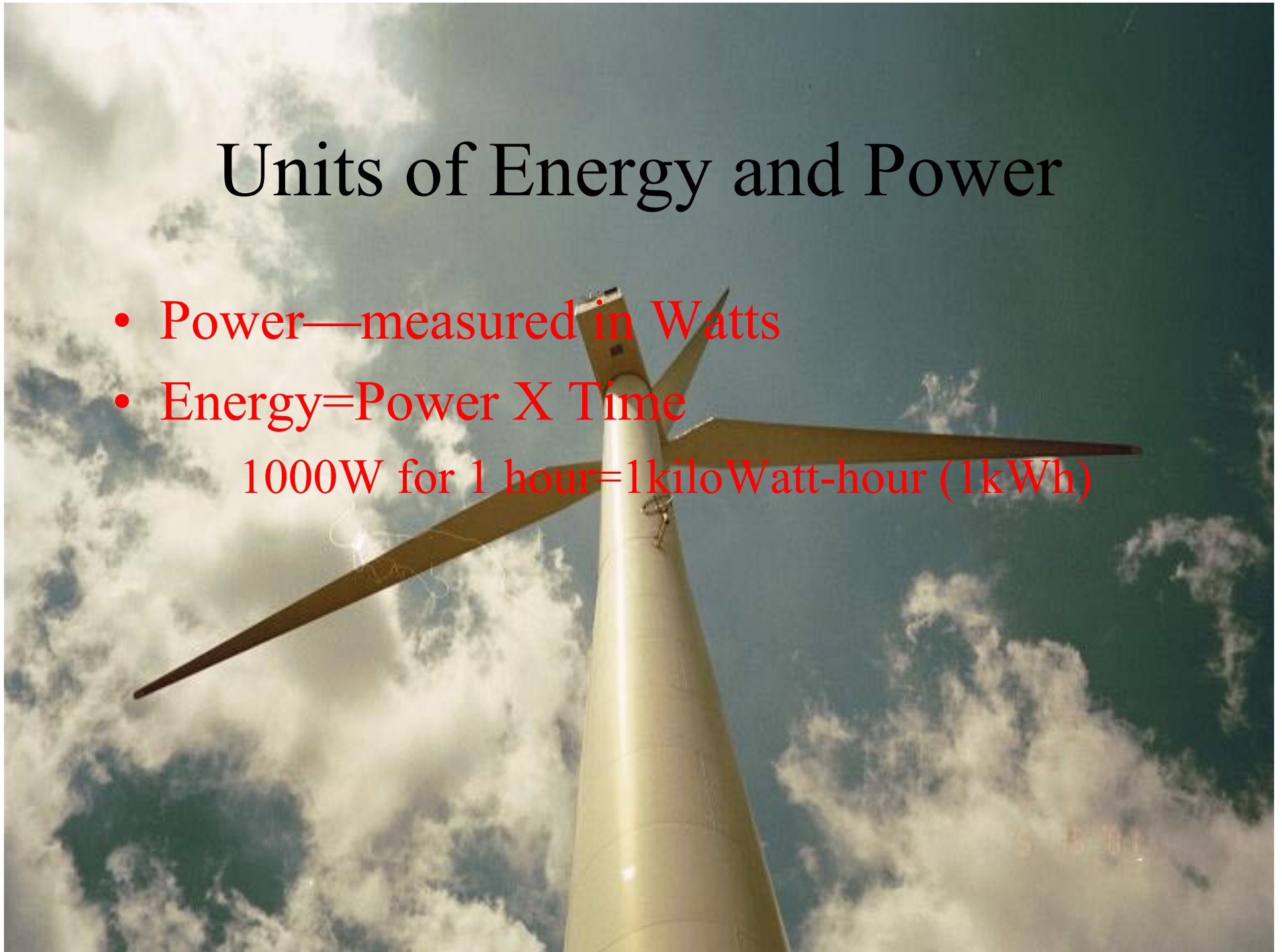


Wind is an Intermittent Source

- Varies seasonally
- Varies from hour to hour
- Turbines are rated by their capacity (kW, MW)—but actual energy output is typically 30% of rated capacity X time

Units of Energy and Power

- Power—measured in Watts
- Energy=Power X Time
1000W for 1 hour=1kiloWatt-hour (1kWh)



Utility-scale vs. Onsite Generation

- Need 7 m/s (15.7 mph) or greater (annual average)
- Hub heights of 200 feet (60 m) or more
- Rated capacity of 0.6 to 2 MW
- Generation is sold wholesale
- Need 5 m/s (11 mph) or greater annual average depending on cost of electricity from local utility & gov. incentives
- Displaces utility provided electricity (retail)

Wind power and agriculture are compatible land uses



Issues:

- Birds, Bats, & Wildlife
- Noise
- TV Reception
- Tourism
- Blade or Ice Throws
- Shadow Flicker
- Property Values
- Visual Impact
- Land Use Issues



Benefits of Wind Power

- Zero emissions of carbon dioxide, oxides of nitrogen, sulfur dioxide, etc.
- Open space conservation
- Another “crop” for farmers
- Source of revenue for municipalities
- Free “Fuel”
- Energy diversity- reducing conventional fuel price volatility

Buffalo Wind Action Group (WAG)

- The Buffalo WAG, which is comprised of concerned citizens, elected officials, industry experts, regulatory agents, and environmental representatives, was formed to promote wind energy in Buffalo area.

(<http://greengold.org/wind/index.php>)

Wind Energy Development Process

- Resource Assessment
- Engineering Studies
- Transmission
- Economic Studies
- Power purchase agreements
- Environmental review
- Construction

Cost of Utility-Scale Wind

- \$1.00 per Watt (\$1.5 million per turbine)
- Costs are incurred early
- Cost of producing wind-generated electricity is competitive with other sources

Resource Assessment

- Modeling and Mapping
- Measurement

Feasibility Studies

- Distance to Transmission
- Slopes, soils
- Excluded areas (e.g. wetlands)
- Access to Site
- Other considerations

WindFarmer - Demosite

File Modes Add MCP Map View Window Help

Anemometers
 Background
 Boundaries
 Boundary Points
 Cabling
 DTM
 Dwellings
 Exclusions
 Grid Lines
 Grid Markers
 IDs
 Noise
 Overload
 Photo Markers
 Radar Stations
 Roads
 Shadow Flicker
 Shadow Receptors
 Terrain
 Text
 Turbines
 Viewpoints
 Wind Energy
 Wind Speed
 WRGs
 ZVI

1.0 Icon scale

Demosite Map

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Hunt Law
 Heriot Cleugh
 Shoestane
 Heriot Mill
 Carcant
 Raeshaw
 Dod Law
 Corsehope Fr
 Bathwick Hall
 Shoestanes Burn

Welcome to GH WindFarmer

GH demonstration site
 Number of turbines 6
 Cursor
 336577 652880
 Bottom Left
 336000 650869
 Iterations 0
 All Sites
 Net Yield 0 MWh
 Currently Selected Site
 Net Yield 0 MWh
 Capacity factor 0.00 %
 Working mode...

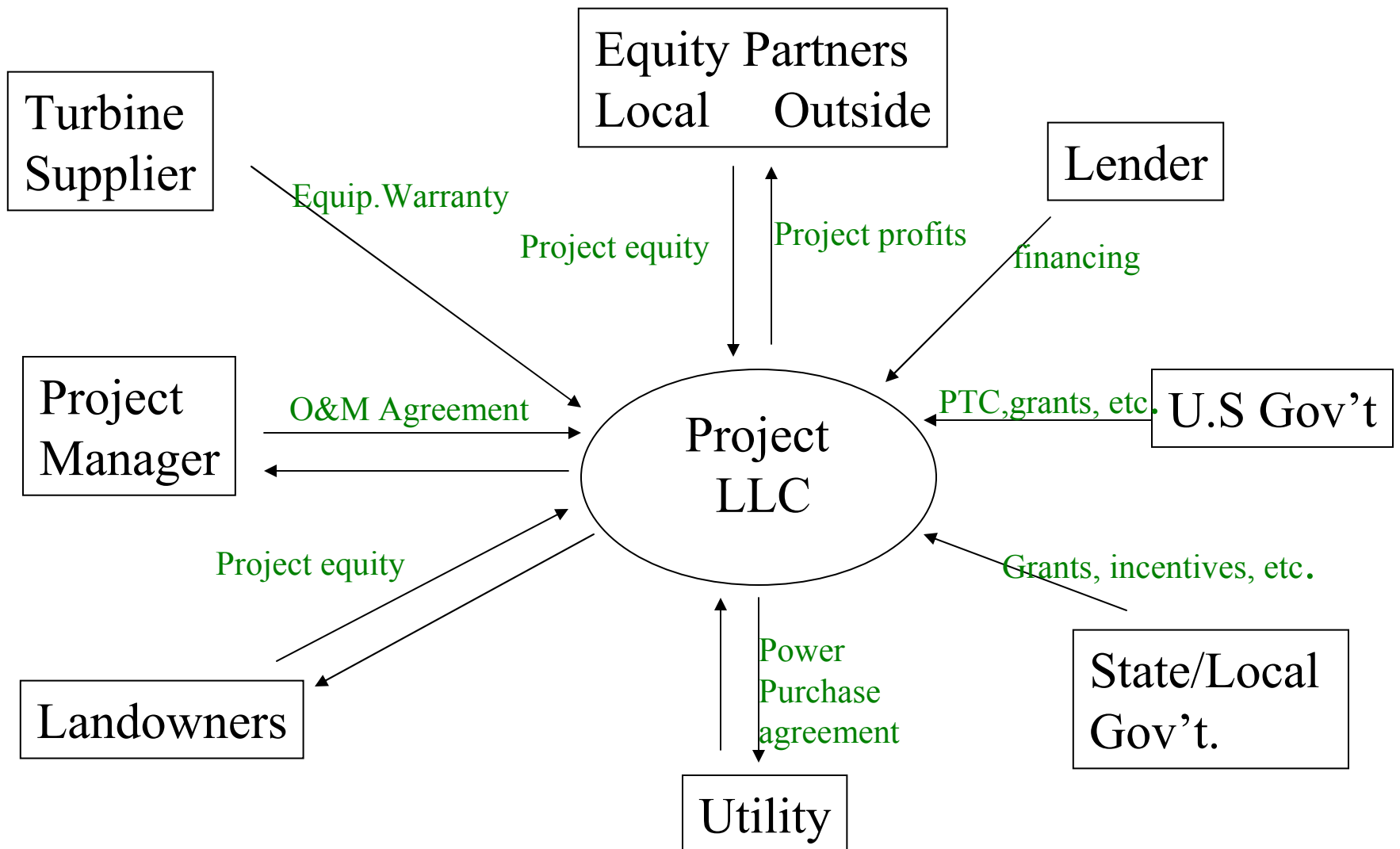
ID	Yield	Wa...	T
1	0 M...	100...	E
2	0 M...	100...	E
3	0 M...	100...	E
4	0 M...	100...	E
5	0 M...	100...	E
6	0 M...	100...	E

Information Legend

NUM

For Help, press F1

Community Wind Financing



Get the Facts

- Noise
- Shadow Flicker
- Foundation depth
- Blade or Ice Throws
- Who benefits

Project types/Examples

- Fenner – 30 MW utility scale wind farm
- Hull, MA project – 660 kW owned by municipal utility company
- Toronto Renewable energy Cooperative – 750 kW

State of Wind Energy in NYS

- < 100 MW online already
- >500 MW under serious development
- NYS is working toward an RPS, but...
- Albany county may adopt RPS
- Status of net metering legislation
- Farm Bill
- Role of NYSERDA

5-15-01

What's Next?

