



# Distributed Wind Energy for Communities, Schools and Businesses

Mark Boumansour  
Director of Sales  
Entegrity Wind Systems



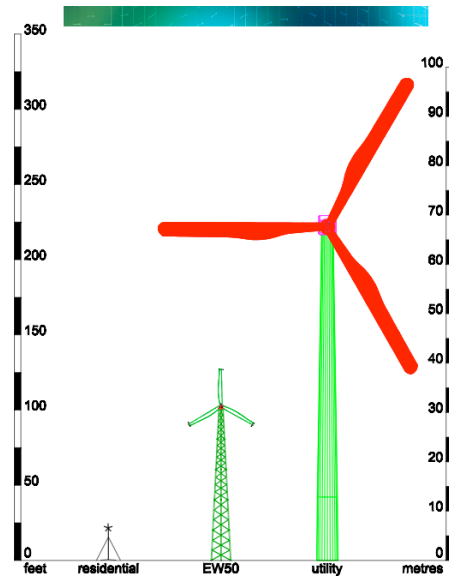
## Entegrity Wind Systems Inc.

- US Headquarters in Boulder, CO
- Manufacturing/Engineering in Canada
- 34+ Employees
- Wind & Distributed Energy Experts
- Manufacturer of the EW50 Wind Turbine
- Vertically Integrated
- Worldwide Installations
- Distributed Wind Energy to Control Energy Costs



# Distributed Wind Energy - Scale Matters...

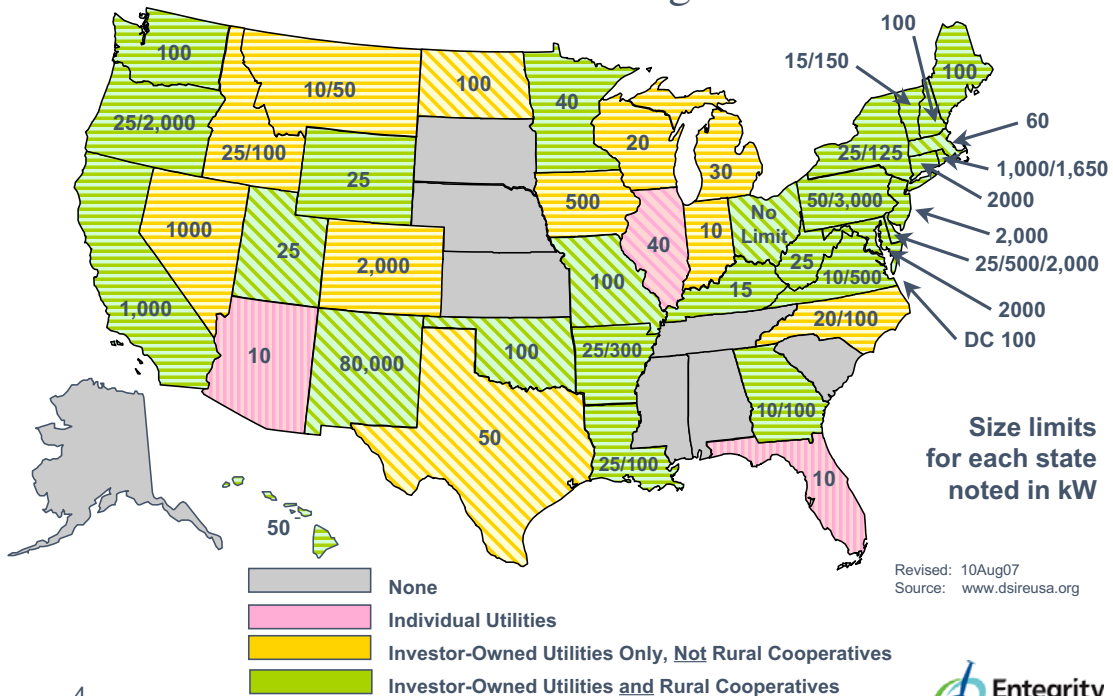
- Utility-Scale Wind Power
  - 600 - 1,800 kW wind turbines
  - Installed on wind farms, 10 – 300 MW
  - Professional maintenance crews
  - 13 mph (6 m/s) average wind speed
  - Permitting Difficult, 5-7 Years
- Small Wind Power
  - 1.8 kW - 100 kW wind turbines
  - Installed at individual homes, farms, businesses, schools, etc.
  - On the “customer side” of the meter, or off the utility grid entirely
  - High reliability, low maintenance
  - 9 mph (4 m/s) average wind speed



3



# Net Metering



4



# Valuing Distributed Wind Energy



3 - 5 ¢/kWh  
(fixed value)



7 - 16 ¢/kWh  
(increasing value)



5



Energy and finance sectors agree electricity costs will rise.

### Why Are Electricity Prices Increasing?

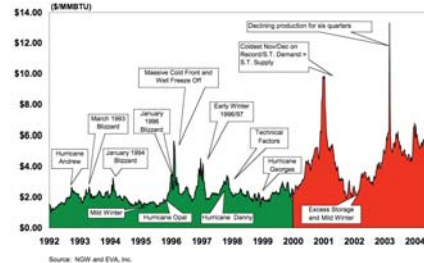
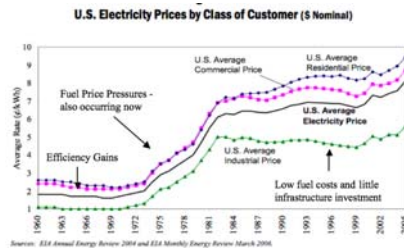
An Industry-Wide Perspective

Prepared by:  
Gregory Bartholdi  
Marc W. Dupuis  
Peter Fox-Penner  
Johannes H. Pfaffenberger  
Adam Schuchner

The Brattle Group

Prepared for:  
EDISON FOUNDATION

JUNE 2006



March 06' Lehman Brothers

"Infrastructure investments and high fuel costs spell rate shock, demand destruction and regulatory risk for traditional utilities. The projected 10 percent annual increases through the next four years could pain consumers, pressure politicians and harden regulators..."

6



## Cost of Energy

- Coal - price increases
  - Value of the \$\$\$\$
  - #1 in worldwide reserves w/ 27%
  - Export 8% (\$3.75 billion) of reserves up from 5%
  - 80 million tons in 2008
- Oil
  - 1987 to 2008
- Deferred Maintenance Costs



7



## Tools to Control Energy Costs

- Efficiency first
  - Lights, HVAC, etc...
- Efficiency measures reduce but do not control the cost of energy.
- On-site, “Distributed” renewable generation controls the cost of energy.



8



# Ingredients for Success

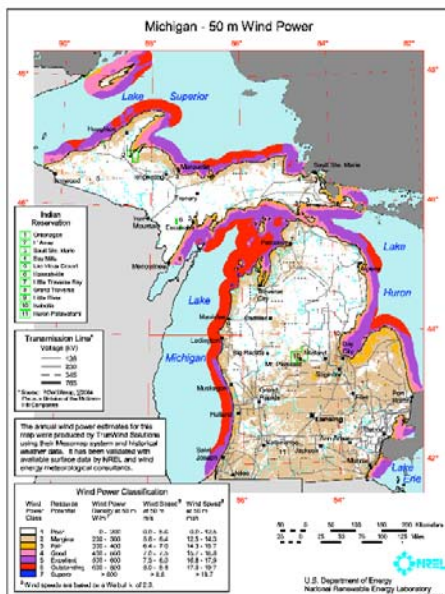
- Critical
  - Wind Resource
  - Moderate to High Cost of Energy
  - Sufficient Load
  - Available Financing/Finances
  - Appropriate Site
  - Utilities that cooperate
- Helpful
  - Green Energy Markets
  - Policy
  - Corporate, Institutional, Community Values



9



## Wind Resource - MI



10



# Is distributed wind a good choice?

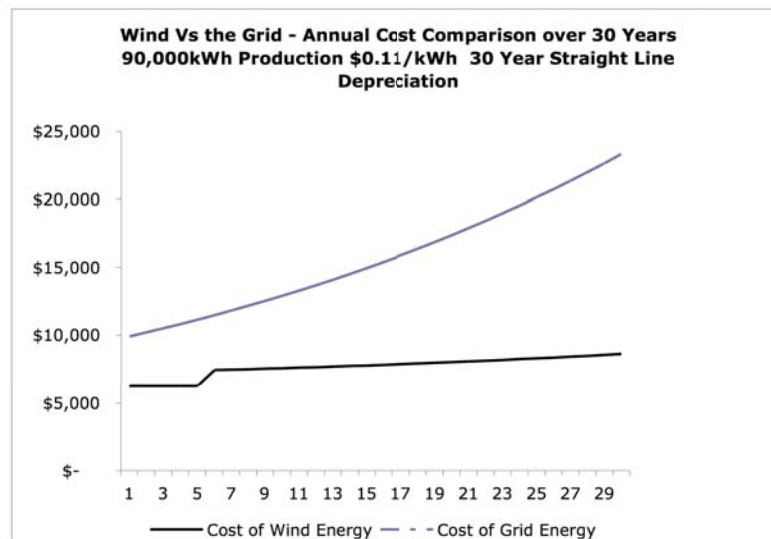


- Wind resource, energy consumption and the CoE drive project economics and payback

11



# Cost of Energy - The long term view



12



# Controlling Energy Costs

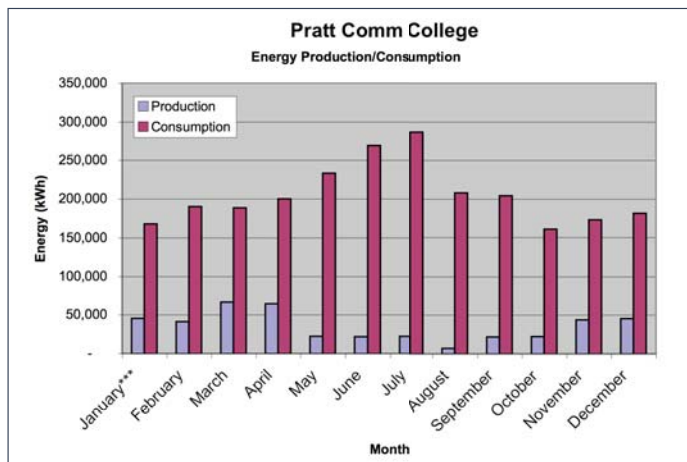
- Shallowater ISD, TX
  - 3 turbines
  - \$55K/year in energy savings
  - Additional revenues from sale of Green Energy
- Project Cost
  - 3 Turbines
  - \$140K/turbine
  - \$55K/installation



13



# Maximizing Value - Pratt Community College



3 Turbines Provide ~20% of the Facility's Annual Needs, \$46,000/year Savings

14



# Quinter ISD, Quinter, KS

- First commercial scale, distributed wind turbine installation in Kansas
- First wind turbine connected to MidWest Energy's grid
- >\$12,000/yr in savings plus additional revenue from sales of RECs
- Project Cost (\$225K)
  - Turbine w/Mono (\$165K)
  - Installation (\$60K)



15



## Installing a Wind Project - Step by Step

### **Step 1: Project Analysis**

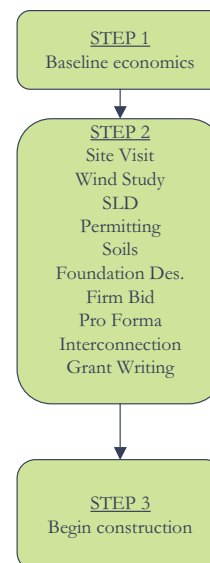
- Economic overview
- Preliminary Wind Assessment

### **Step 2: Site Feasibility**

- Site survey
- Investment Grade wind assessment
- Permitting requirements
- Preliminary pro forma
- Single-line electric interconnection diagram
- Geotechnical study
- PE-stamped foundation design
- Fixed, firm installation costs
- Final pro forma
- Grant application(s), as needed

### **Step 3: Equipment Deposit, Project Review and Installation**

- Allocate a turbine
- Secure permits and interconnection agreements
- Commence installation of infrastructure
- Ship the turbine and tower
- Construct and erect the wind turbine system(s)
- Commissioning each turbine



16





## Small Turbines - What is out there??

### Southwest Windpower

- Skystream 1.8 kW
- \$12k - 14k (10m tower)
- \$20k - 22k (20m tower)

[www.skystreamenergy.com](http://www.skystreamenergy.com)



17



## Small Turbines - What is out there??

### Windward Endurance Wind Turbine

- 5.5 m diameter; 4.25 kW; constant speed - 200 rpm
- Turbine System Costs \$34,995 (105'guyed tilt-down tower)

[www.endurancepower.com](http://www.endurancepower.com)



18



## Small Turbines - What is out there??

### Abundant Renewable Energy

#### Newberg, Oregon

- ARE442 - 10 kW
- Battery-Charging or Grid-Connect
- Cost = \$50,000 ,100' guyed tower

[www.abundantre.com](http://www.abundantre.com)



19



## Small Turbines - What is out there??

### Bergey Windpower

#### Norman, OK

- BWC Excel - 10 kW
- Turbine System costs of \$27.9k + \$9.2k (100' guyed tower )

[www.bergey.com](http://www.bergey.com)



20



# EW50 Wind Turbine

- 15-year history - Tested
- World Wide Installations
- \$125k + tower (\$15k - \$38k)
- Key Specifications
  - 50kW, Validated to 65kW
  - 80', 100' & 120' Towers
  - Monopole and Self-Support Lattice
  - 9 mph cut-in, 50 mph cut-out
- Distributed Energy Applications:
  - Commercial/Industrial sites
  - School and Colleges
  - Municipal Facilities



21



# EW50 Wind Turbine

- IEA/IEC - Development of Standards
- NREL - Golden, CO
- RISO - Roskilde, Denmark
- AWTS - PEI, Canada
- CRES - Athens, Greece
- ENEA - Italy

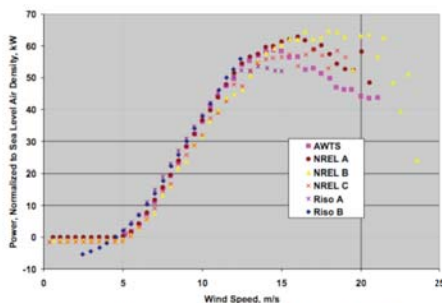
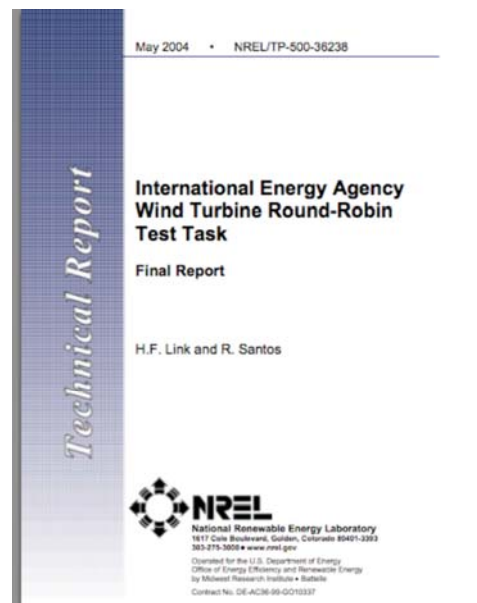


Figure 9. Power curves from all Participants using all valid data.



# Distributed Wind Energy:

## A Smart Choice for Controlling Energy Costs

### More information:

National Renewable Energy Laboratory:  
[www.windpoweringamerica.gov](http://www.windpoweringamerica.gov)

American Wind Energy Association:  
[www.awea.org](http://www.awea.org)



23



Thank you!!!

Mark Boumansour

303.440.8799

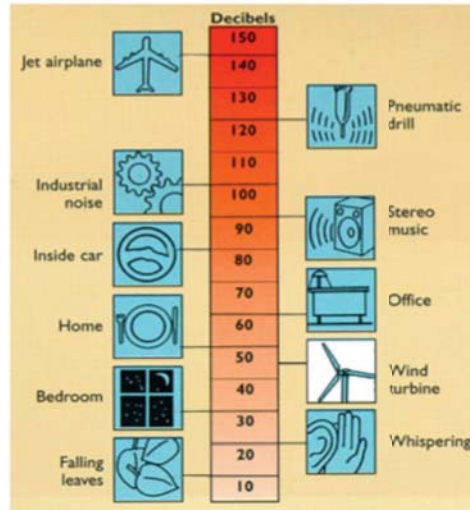
Mark.B@EntegrittyWind.com



24



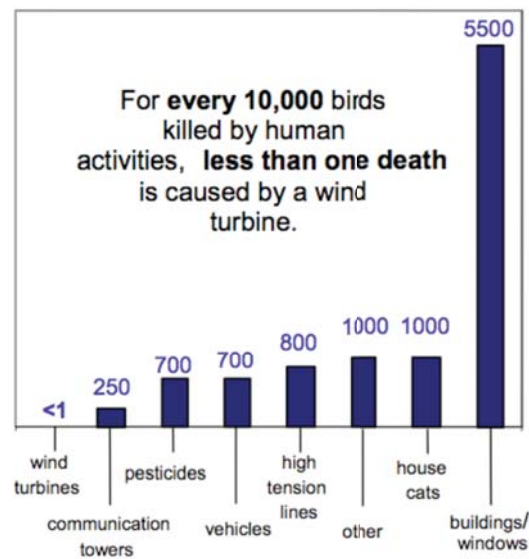
## Additional Info: Turbine sound



25

## Additional Info: Bird Interaction:

- Bird kills are rare
- Use common sense when siting



26