

Small Wind Turbines in New England



Presentation Outline

- Short technology overview
- Product listings
- US Residential Incentive Map
- Case Studies
- Noise Test Results
- Policy for small wind turbines

Small Wind Turbines

- **Configuration:** 2 or 3 blades, aimed into the wind by the tail
- **Blades:** Fiber-reinforced plastics
- **Over-speed Protection:** Furling (rotor turns out of the wind), no brakes
- **Generator:** Direct-drive, permanent magnet alternator (no brushes), 3-phase AC, variable-speed operation
- **Controller:** Electronic device that delivers
 - DC power for battery-charging
 - AC power for utility connection
- **Result:**
 - Simple, rugged design
 - Only 2–4 moving parts
 - Little regular maintenance required



Bergey EXCEL, 10 kW

Southwest Windpower

Flagstaff, AZ



AIR-X
300 W



Whisper
H40
900 W



Whisper 175
3 kW



503
500 W



Whisper H80
1000 W

Bergey Windpower

Norman, OK



Proven Engineering Products, Ltd.

Scotland, UK

WT600
600 W



WT2500
2.5 kW



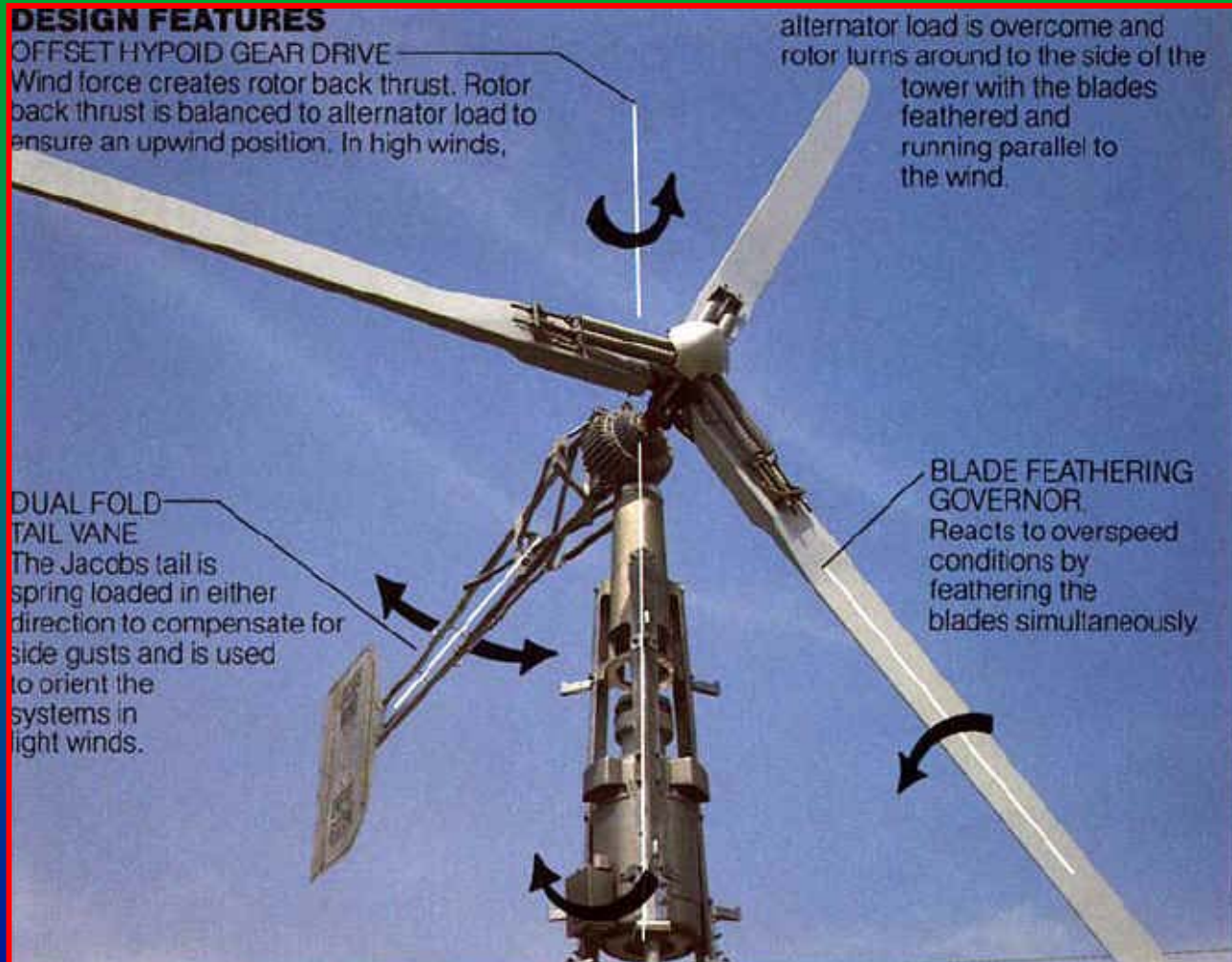
WT6000
6 kW



Wind Turbine Industries, Inc.

Prior Lake, MN

Jacobs
29/20
20 kW



Atlantic Orient Corp.

Norwich, VT

AOC 15/50
50 kW



Northern Power Systems

Waitsfield, VT

Northwind 100
NW 100/19
100 kW



AWS Scientific site - Webster, NY



- Bob Bechtold's house in Webster, NY
- Bergey Excel
- Grid Connect
- Commissioned June 2001
- As of September 30, 2002
 - 96% availability
 - Turbine produced 13,184 kWh
 - average hub height wind speed 5.1 m/s

GM Blueberry Processing Facility - Orland, ME



- G.M. Allen Blueberry Processing Facility, Orland, ME
- AOC 15/50, 100' tower
- Turbine commissioned February 14, 2001
- Net Energy Billing contract from Central Maine Power June 12, 2001
- As of February 27, 2002, turbine ran for 16,310 kWh
- No other data to date

Offshore Services - Block Island, RI



- Bergey Excel
- Off-grid house/electric car
- Ford Ranger being charged by wind turbine
- Commissioned on June 2, 2000
- Turbine produced 7,324 kWh as of 7/1/01



Windward Engineering - Spanish Forks, UT



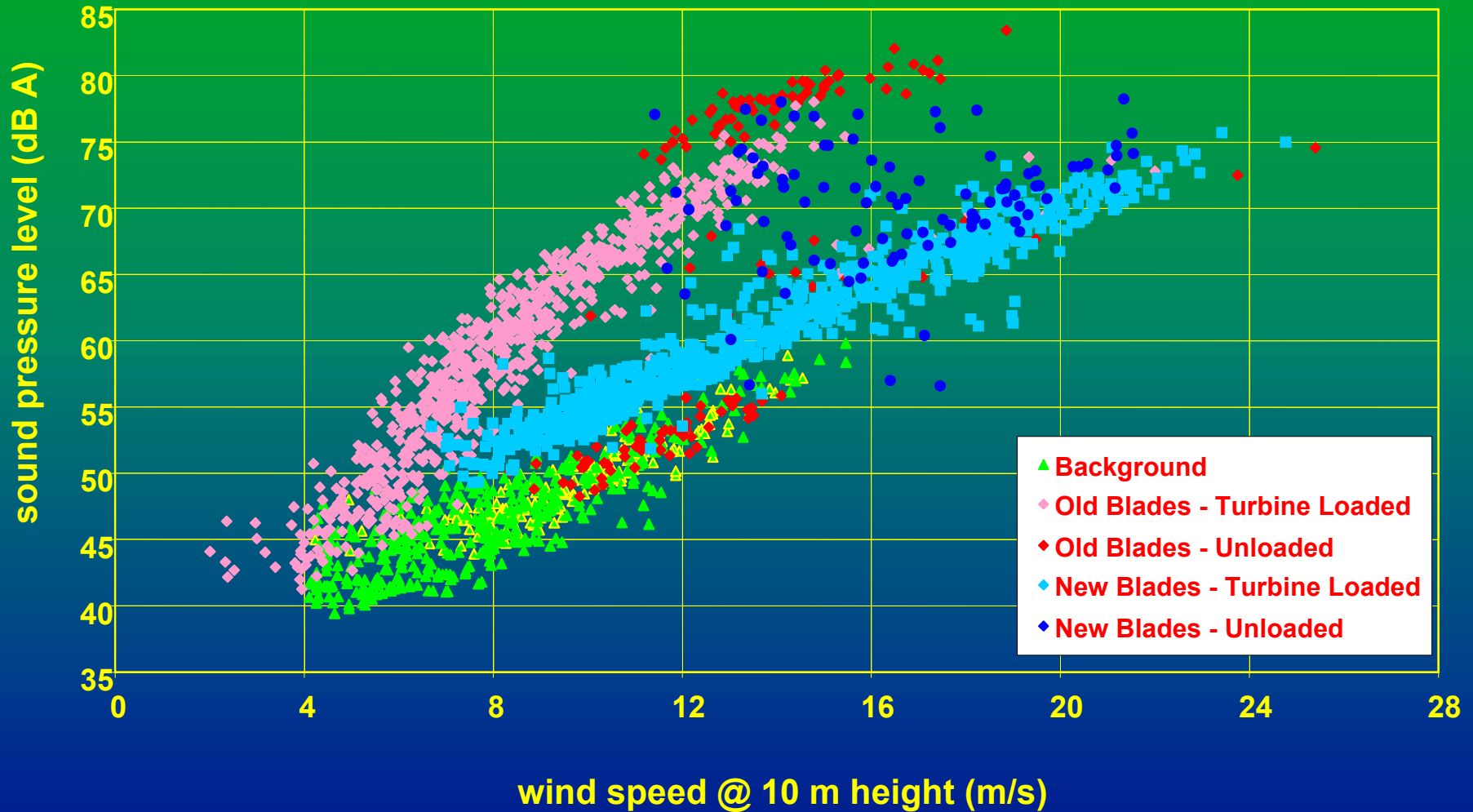
- **Whisper H40 (900W)**
- **Grid Connect application**
- **ADAMS Modelling + yaw, furl and RPM data collection**
- **Turbine Commissioned February 26, 2000**
- **As of June 30, 2002**
 - **Produced 2,749 kWh**
 - **Turbine System availability - 100%**

Offshore Service site - Block Island, RI

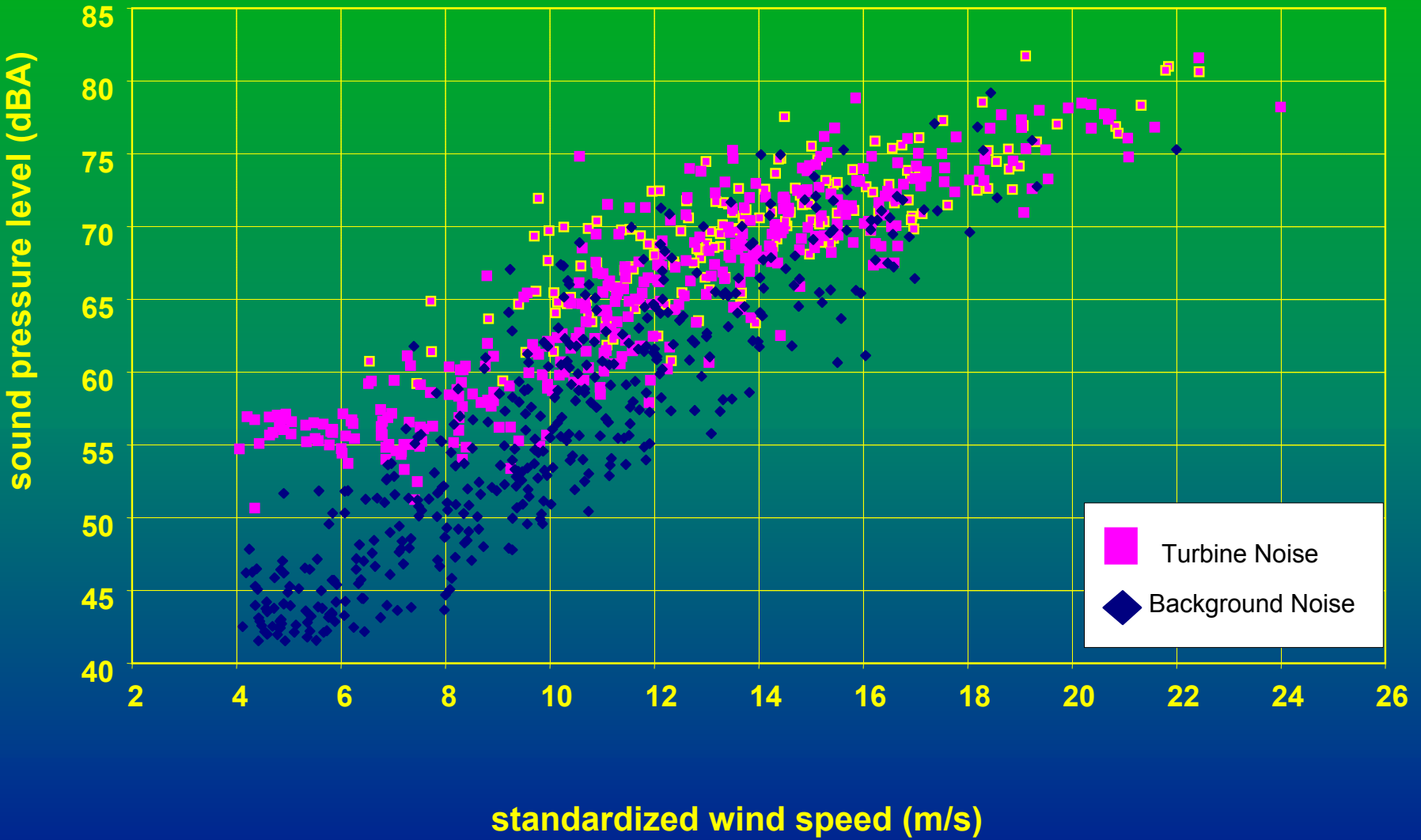


- Evans house - Block Island, RI
- Bergey Excel
- Grid Connect
- Commissioned August 23, 2000
- As of December 31, 2001
 - Turbine produced 3,474 kWh
- Issues around turbine noise

NWTC Noise Test Data -Bergey XL



NWTC Noise Test Data - Whisper H40



Policy Options for Small Wind

- Investment Incentives (rebates, buy-downs, grants)
- Investment Tax Credits
- Net Metering
- Sales Tax Reductions/Exemptions
- Property Tax Reductions
- Uniform Zoning Requirements
- Low Interest Loans
- Line Extension Policies
- Strategies for Supporting Wind Energy, A Review and Analysis of Policy Options, <http://www.nationalwind.org/pubs/strategies/default.htm>



Compliance with Zoning Ordinances

- ❖ Land is classified or “zoned” by primary use:
 - ❖ R1 – RX: Residential, by population density or property size
 - ❖ C1 – CX: Commercial; different types
 - ❖ I1 – IX: Industrial; light, medium, heavy, etc
 - ❖ Lots of Misc. Categories & Blends
- ❖ Each zoning category may have local Code restrictions on height of structures, noise, etc.
- ❖ Overarching historical or conservation districts may impose additional restrictions
- ❖ Most common problem is **height restrictions**: Typically 35’ in residentially zoned areas
- ❖ Permission to exceed the normal height restriction requires a “variance” or a “special use permit”
- ❖ A few building codes specifically allow small wind systems and taller towers – “permitted use”

Massachusetts Financial Incentives for Residential Small Wind

- Renewable Energy State Income Tax Credit
 - Personal Tax Credit
 - 15% tax credit for state income tax
 - maximum of \$1,000
 - credit can be carried over if the credit is greater than one's income tax liability
- Renewable Energy Equipment Sales Tax Exemption
 - exempts wind from state sales tax
 - only applicable for an individual's principal residence
 - MA sales tax rate is 5%
- Net Metering
 - 60 kW maximum cap - Residential, commercial industrial, utilities
 - Net excess generation credited at average monthly market rate
 - Law applies to distribution companies - Massachusetts Electric Company, Boston Edison Company, Fitchburg Gas and Electric Light Company and Western Mass
 - For more information www.state.ma.us/doer

For More Information on Small Wind

- AWEA Web site - have a small wind turbine section
 - www.awea.org
- Home Power magazine
 - www.homepower.com
- Interstate Renewable Energy Council - Database for State Incentives for Renewable Energy (DSIRE)
 - www.irecusa.org
- Books by Paul Gipe, Chelsea Green Publishing Company
www.chelseagreen.com
 - Wind Energy Basics, Wind Power for Home and Business
- Videos and articles by Mick Sagrillo (writes for Home Power magazine, AWEA Wind Energy Weekly, etc.)
- Wind Powering America
 - <http://erendev.nrel.gov/windpoweringamerica/>
- Field Verification Project
 - <http://nreldev.nrel.gov/wind/fvp/index.html>

