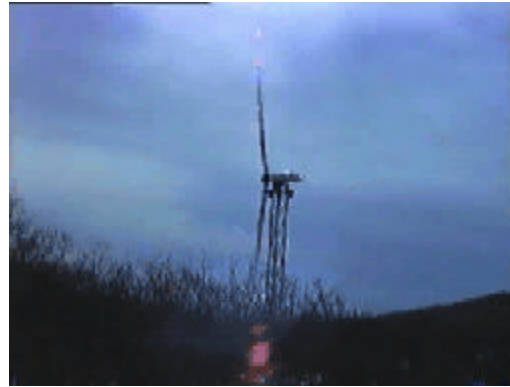


Status of Current and Future Wind Energy Development in New England



October 24, 2001

J. F. Manwell, Ph. D.

Director, Renewable Energy Research Laboratory

Dept. of Mechanical and Industrial Engineering

Univ. of Mass., Amherst, MA

Early History of Wind Energy in New England



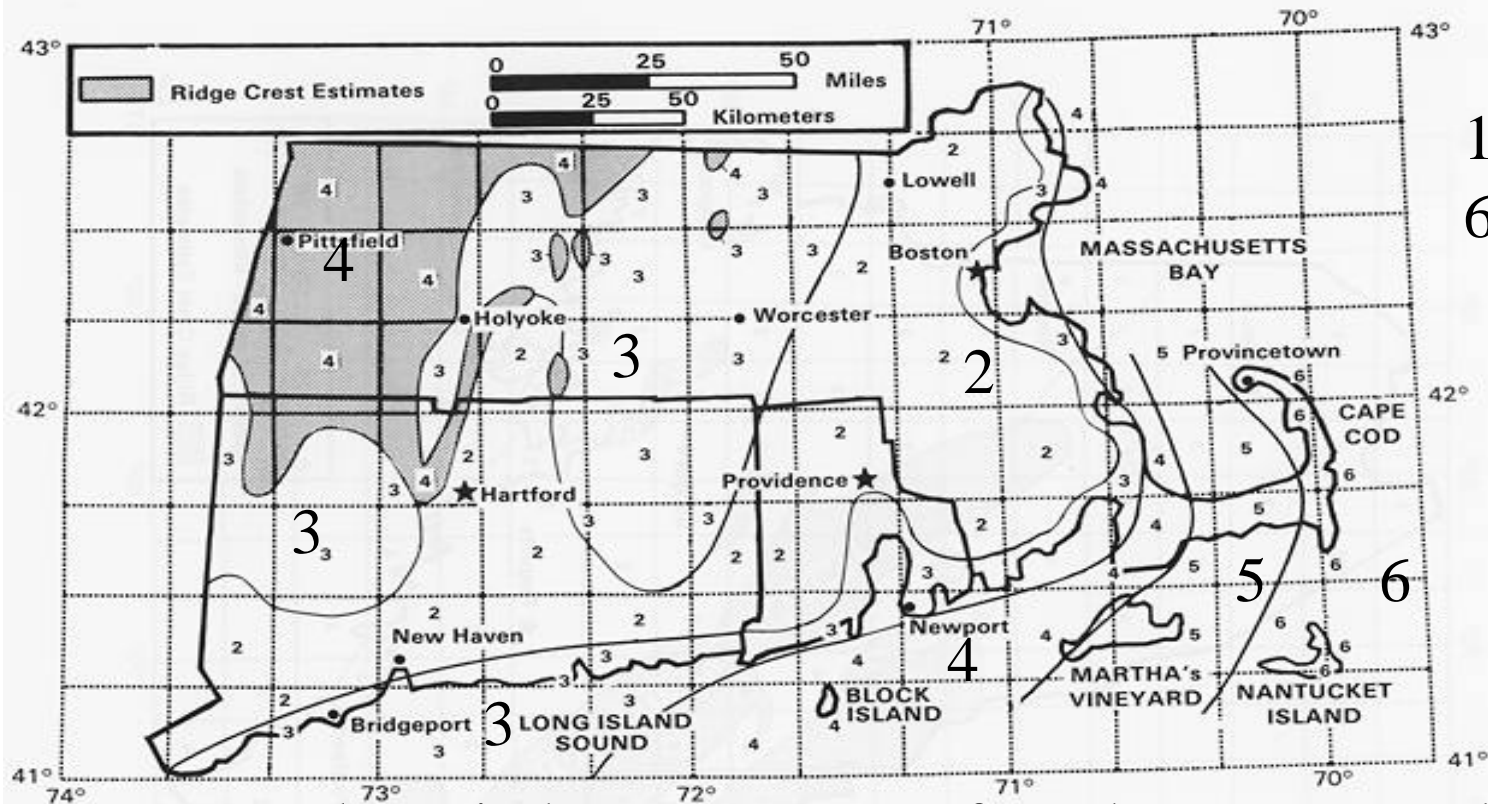
Transportation: Sailing Ships



Mechanical Power:
Windmill (Orleans, MA)

Where is New England Wind Resource?

- Mountains
- Coast
- Islands
- Offshore



Example: Wind resource map of southern New England

Typical Modern Wind Turbine



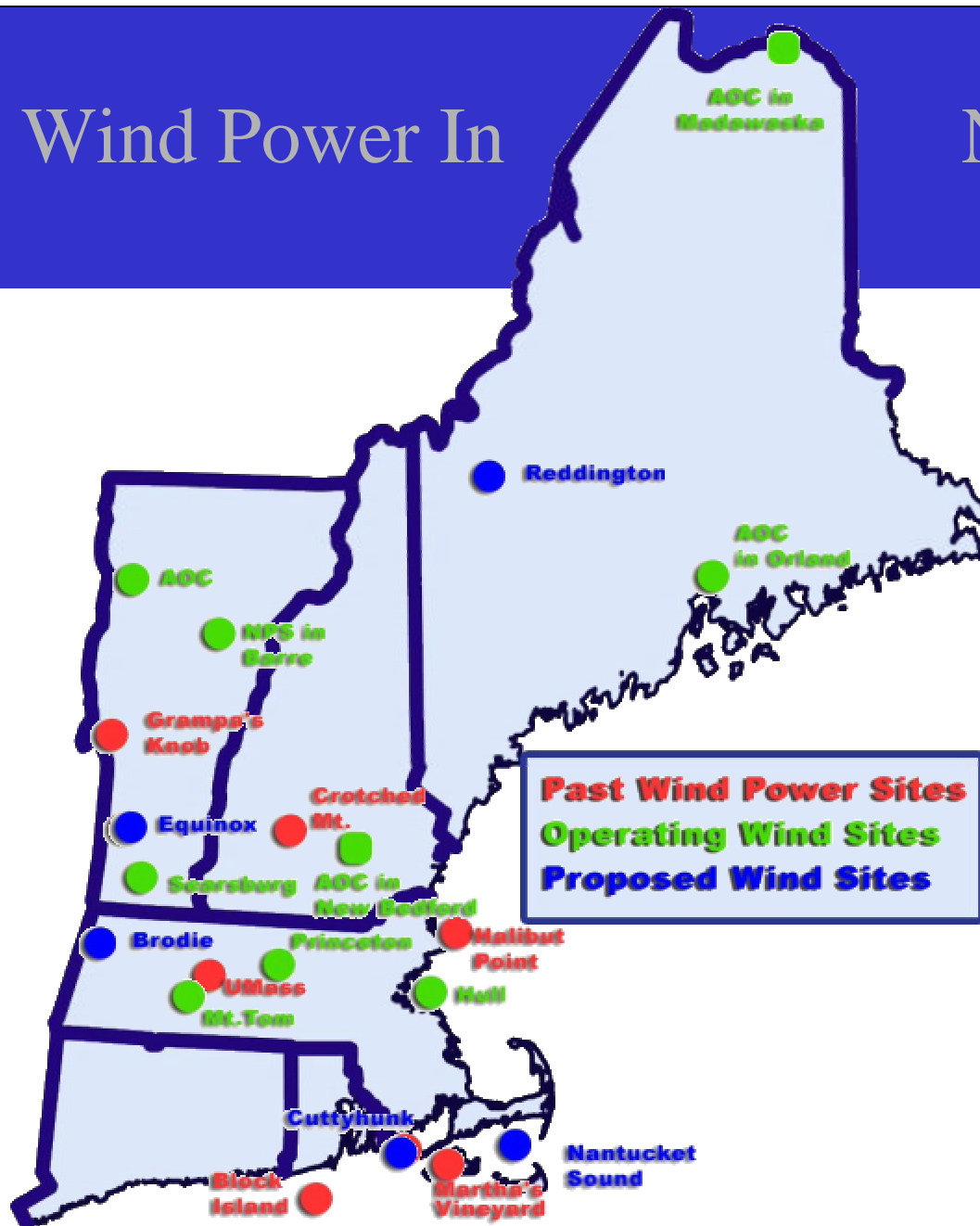
- Horizontal Axis Rotors
- Wind Turbine Size Related to Power
- Rated Power Up to 2,000+ kW
- 2-3 Blades, Up to 260 ft. Diameter
- Towers from 80 ft. to 200+ ft. (tubular or truss)

Near Term Opportunities for Wind in New England

- Locations (where the wind is)
 - Inland mountains
 - Coastal/Islands
 - Offshore
- Types
 - Bulk power: large machines
 - Municipal utilities: medium to large
 - Customer owned generation: small to medium

Wind Power In

New England



Early Electricity from Wind in New England



Grandpa's Knob, VT (1940's)



Cuttyhunk, MA Wind/Diesel (1970's)

Early Research and Commercialization in New England



WF-1 25 kW,
UMass, 1975



World's 1st Wind Farm: U.S. Windpower
(MA), Crotched Mtn, NH ~1978)

Operating Turbines in New England

- Searsburg, VT (11 x 550 kW)



Operating Turbines in New England

- Searsburg, VT (11 x 550 kW)
- Mt. Tom, Holyoke, MA (250 kW)



Operating Turbines in New England

- Searsburg, VT (11 x 550 kW)
- Mt. Tom, Holyoke, MA (250 kW)
- Barre, VT (100 kW)



Barre, VT Northern
Power Systems

Operating Turbines in New England

- Searsburg, VT (11 x 550 kW)
- Mt. Tom, Holyoke, MA (250 kW)
- Barrie, VT (100 kW)
- Orland, ME (50 kW)

Atlantic Orient
Corp. 15/50



Operating Turbines in New England

- Searsburg, VT (11 x 550 kW)
- Mt. Tom, Holyoke, MA (250 kW)
- Barrie, VT (100 kW)
- Orland, ME (50 kW)
- Princeton Municipal Light Co., MA
 - 7 x 40 kW; 1 x 50 kW being added
- Block Island, RI (4 x 10 kW + others)

Turbines Under Construction

- Hull, MA
 - Municipal Light Co. Project
 - 660 kW turbine
 - Replacement for 40 kW turbine



photosimulation

Some Projects in Planning

- Nantucket Sound, MA offshore (425 MW)
- Brodie Mtn., MA (7 –11 MW)
- Reddington, ME (30 MW)
- Equinox Mtn, VT (2 MW)
- Cuttyhunk, MA (0.25 MW- wind/diesel)

New England Commercial Wind Industry

- Turbine manufactures
 - Atlantic Orient Corp. (VT)
 - Northern Power Systems (VT)
- Developers
- Installers
- Utilities

New England Public Entities Involved in Wind Activities

- U.S. DOE Region 1
- State Energy Offices
- State Energy Funds
- State Environmental Offices
- University Research and Education Programs

The Future

- Small wind farms on inland ridges
- Customer owned “behind the meter” turbines
- Islands
- Offshore

A New Turbine for Cuttyhunk?



photosimulation

A Model for Coastal New England?: Copenhagen Harbor



Under construction



One turbine completed

Conclusion

- Wind energy has important history in Massachusetts
- Inland mountains, coasts, and offshore offer significant opportunities
- Siting turbines involves many issues
- European offshore experience highly relevant to Massachusetts

EXTRAS FOLLOW!

Magnitude of NE Wind Resource

- Significant onshore resource – difficult to quantify
 - For example, inland MA resource estimated at 12-70% of MA energy use in 2009
- Offshore resource is large: It could supply all of MA electricity

Existing NE Projects

- Princeton, MA Wind Farm
 - Small farm, being expanded
 - Owned by municipal utility
- Mt. Tom Wind Turbine
 - Single research turbine
 - Local environmental issues
- Searsburg, VT
 - Utility
 - Largest so far
- Coastal: Hull
 - Municipal ownership
 - 660 kW turbine to be installed this fall