

A map of the New England Islands, including the Boston Harbor Islands, Nantucket, and the Cape Cod Islands. The map is overlaid with a grid and various colored lines (yellow, red, blue) indicating different regions or data points. The text is overlaid on the map.

Potential for Wind/Hybrid Power Systems on New England Islands

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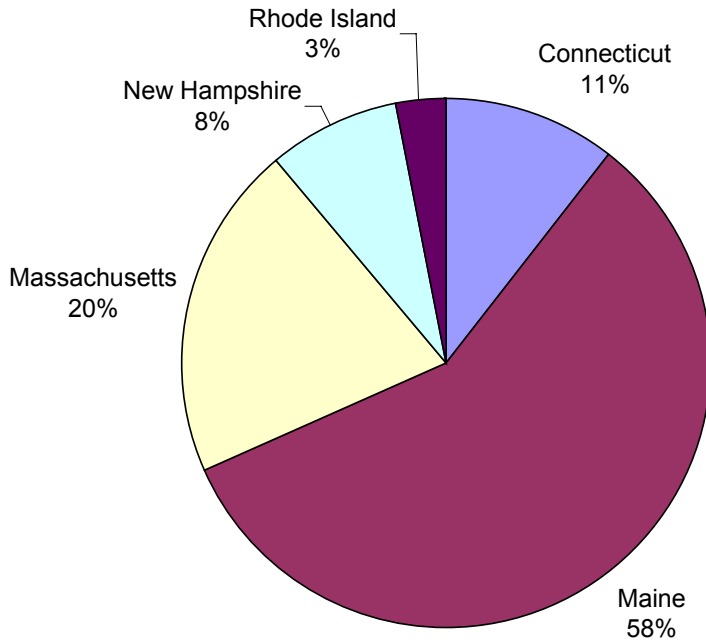
Scope of Work

- Island Inventory and Classification
- Wind Resources Estimation
- Current Energy Supply Status on Islands
- Power System Options
- Analytical Modeling of Potential Energy Systems
- Case Studies of Representative Islands
- Conclusions

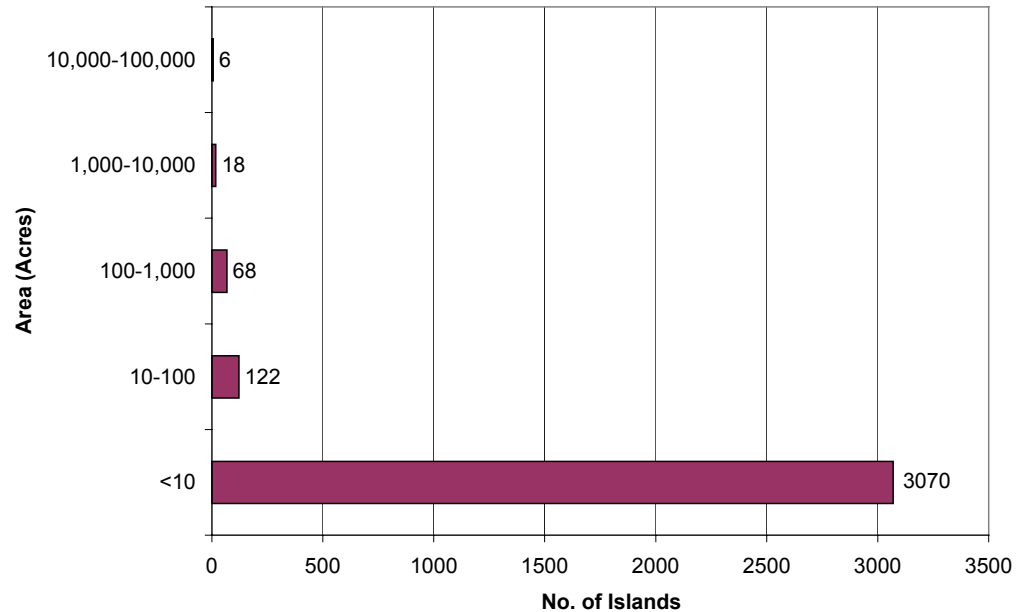
Inventory

Total: 3,284 Islands

Breakup by State

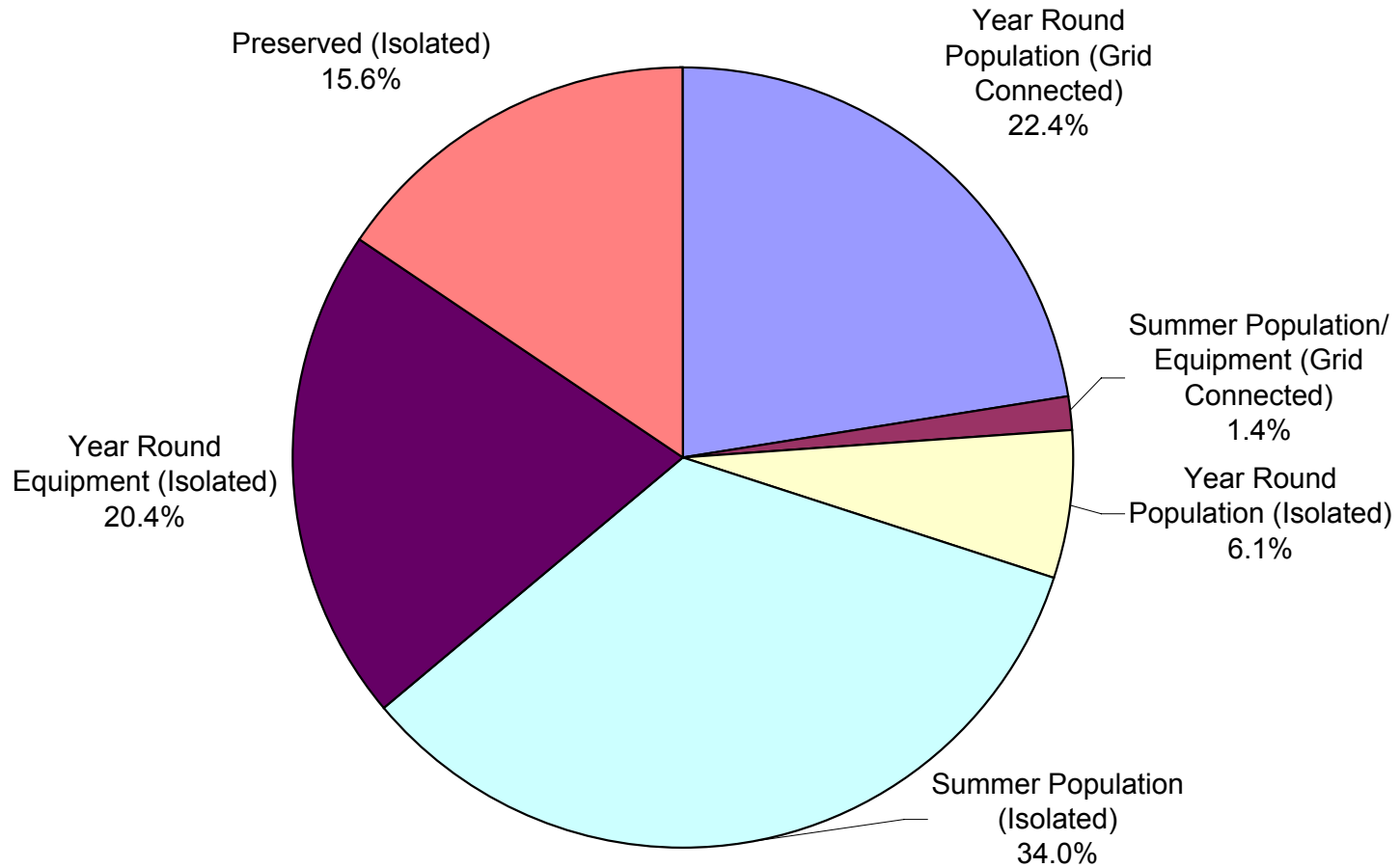


Area Distribution

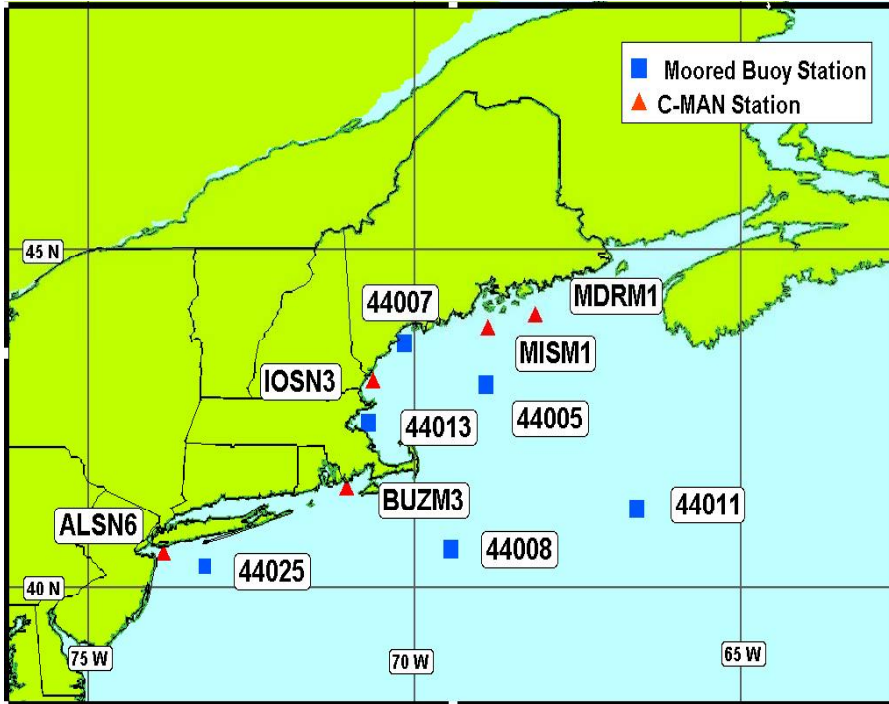


Classification

144 Energy Consuming Islands



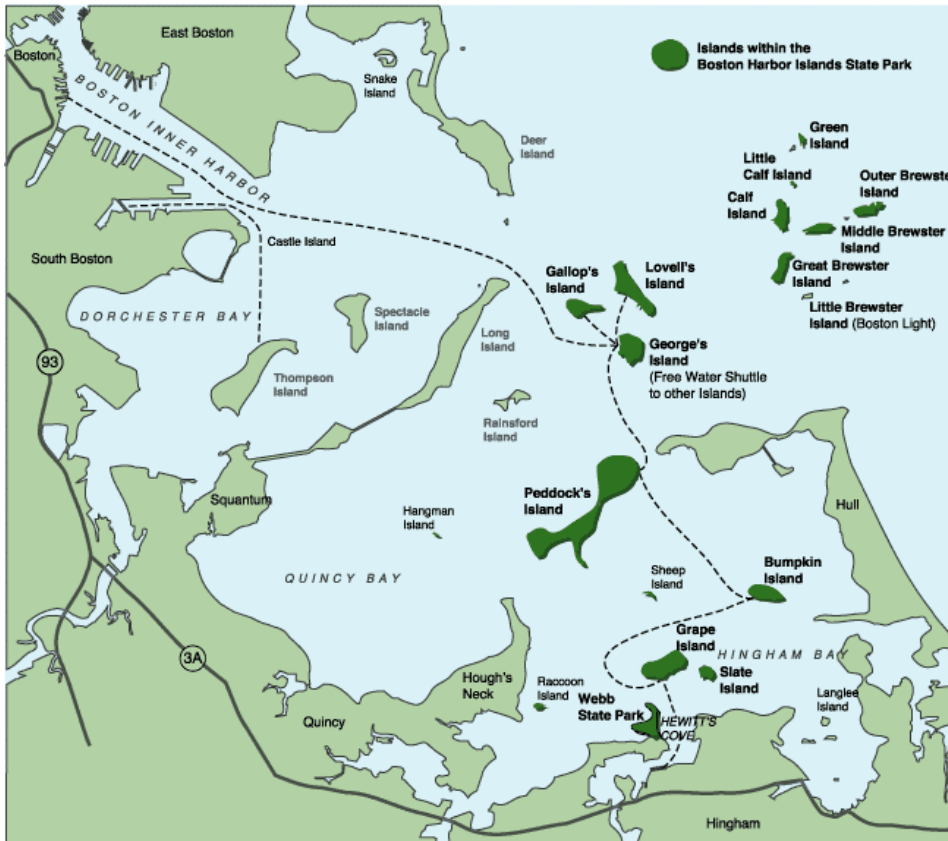
Wind Resources



Buoy/Station		Estimated 10-year Average at 50m Elevation (m/s)
Boston Harbor	44013	7.4
Buzzard Bay	BUZM3	8.4
Isles of Shoals	IOSN3	7.5
Matinicus Rock	MISM1	8.6
Mt. Desert Rock	MDRM1	8.5
Nantucket	44008	8.9
Portland	44007	6.8
Portsmouth	44005	9.0

Source: National Oceanic and Atmospheric Administration

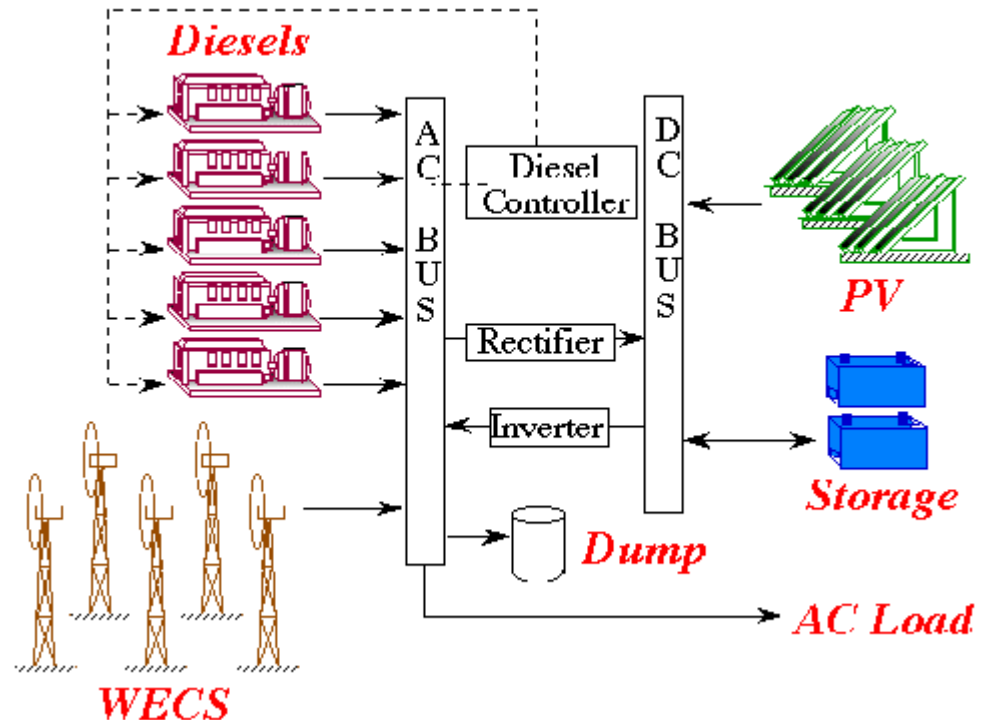
Boston Harbor Islands



- Total: 34 Islands
- Average Wind Speed: 6.5 to 7.5 m/s at 50 m height
- Wind Potential Assessments
 - Devonrue
 - RERL, UMass, Amherst
 - W.A. Vachon & Associates
 - UHI, UMass, Boston

Power System Options

- Grid Connected Systems
- Wind Diesel Systems
- Wind/Diesel/PV Systems
- PV/Battery Systems



Case Study I: Fox Islands, ME



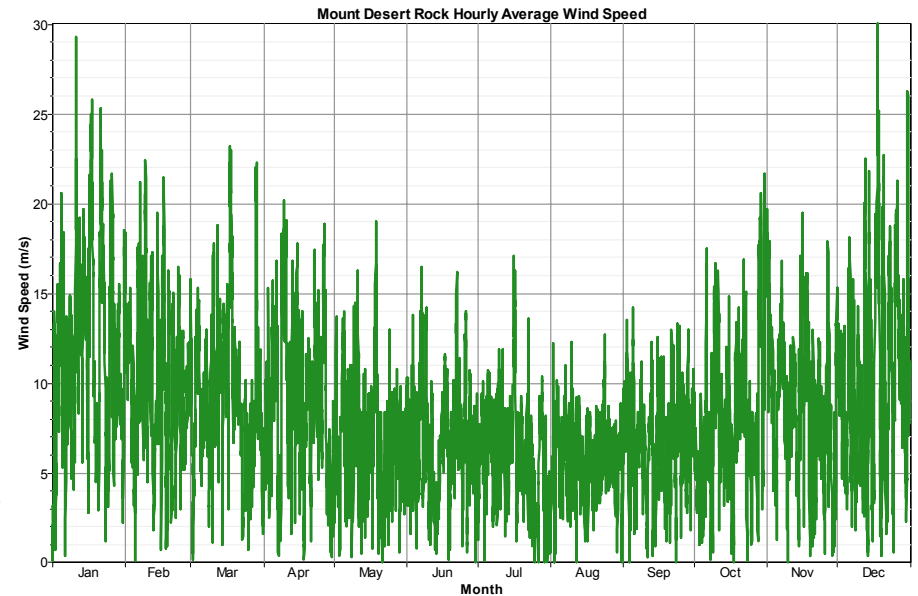
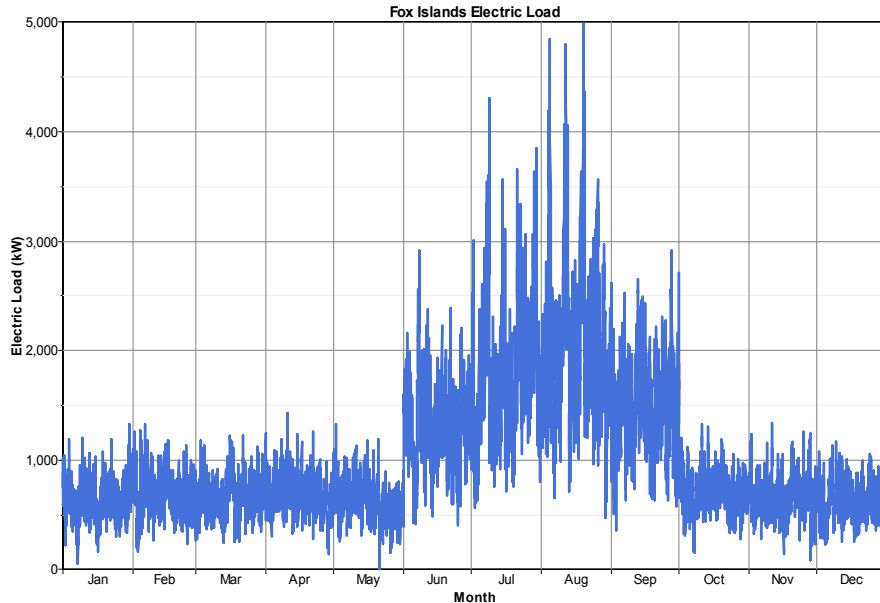
Vinalhaven

- Population
 - Summer: 6,000
 - Year Round: 1,300
- Area: 54 Sq. Miles

North Haven

- Population
 - Summer: 2,000
 - Year Round: 350
- Area: 9.8 Sq. Miles

Fox Islands

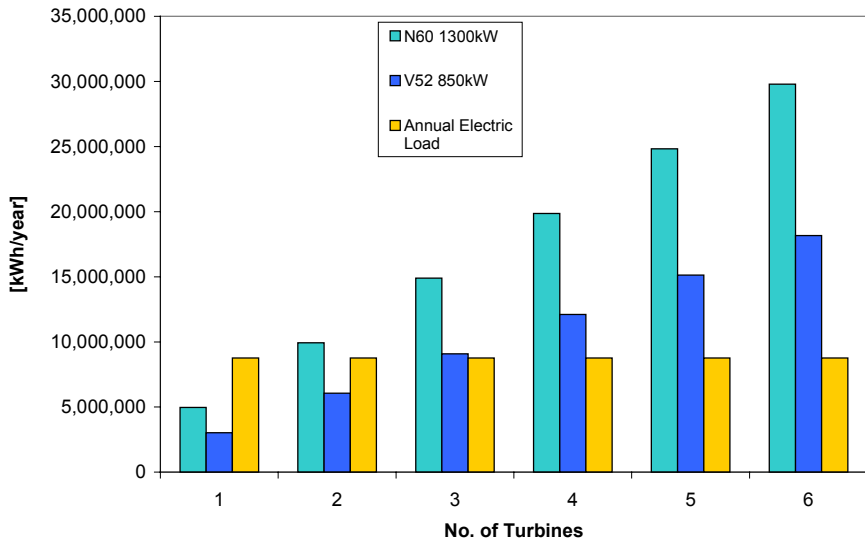


- Electricity: 8,500,000 kWh
- Grid Connected
- High Summer Load

- Mt. Desert Rock Island Data
- Excellent Wind Resource (8.3 m/s at 50m)
- Relatively Low Wind in Summer

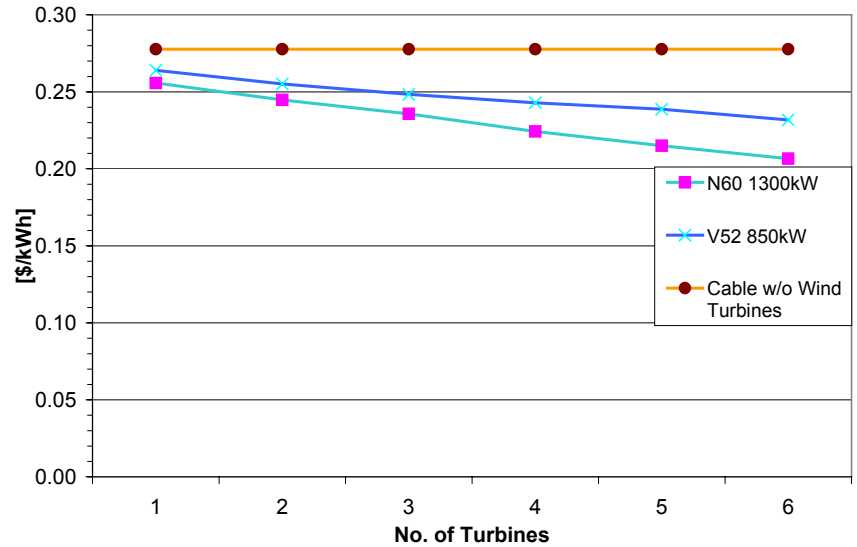
Fox Islands

Wind Energy Production

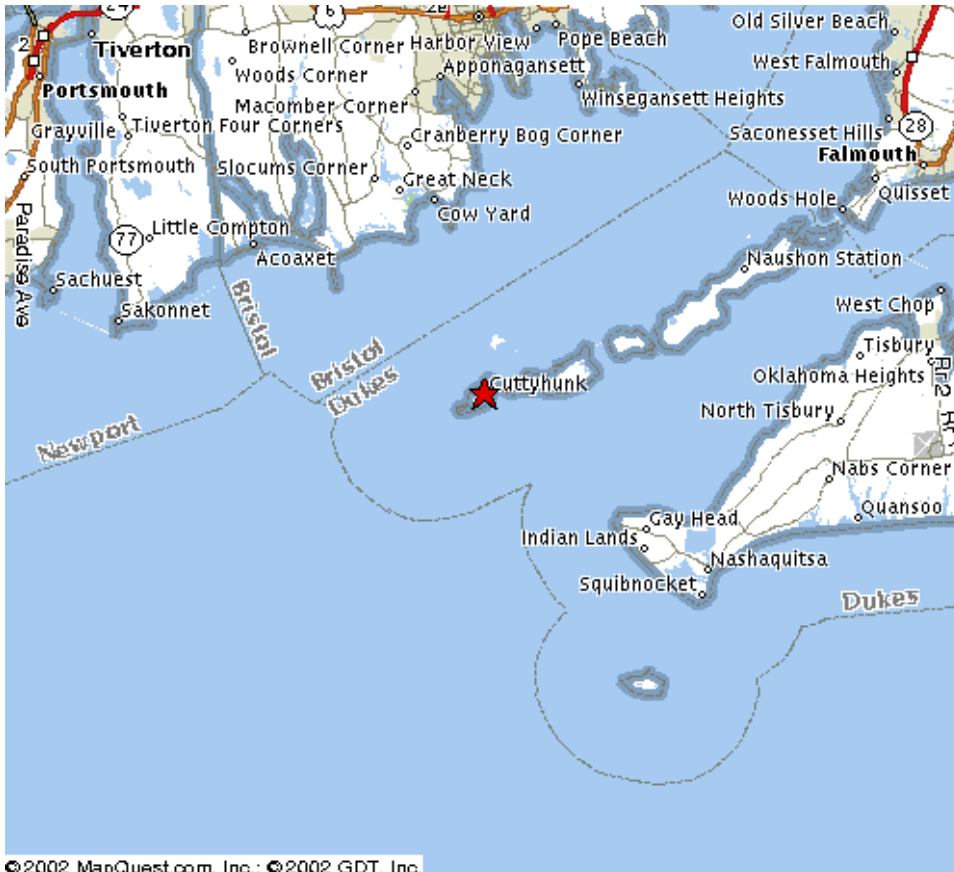


Net Cost of Energy

with new underwater cable
Grid electricity price: \$0.08 per kWh

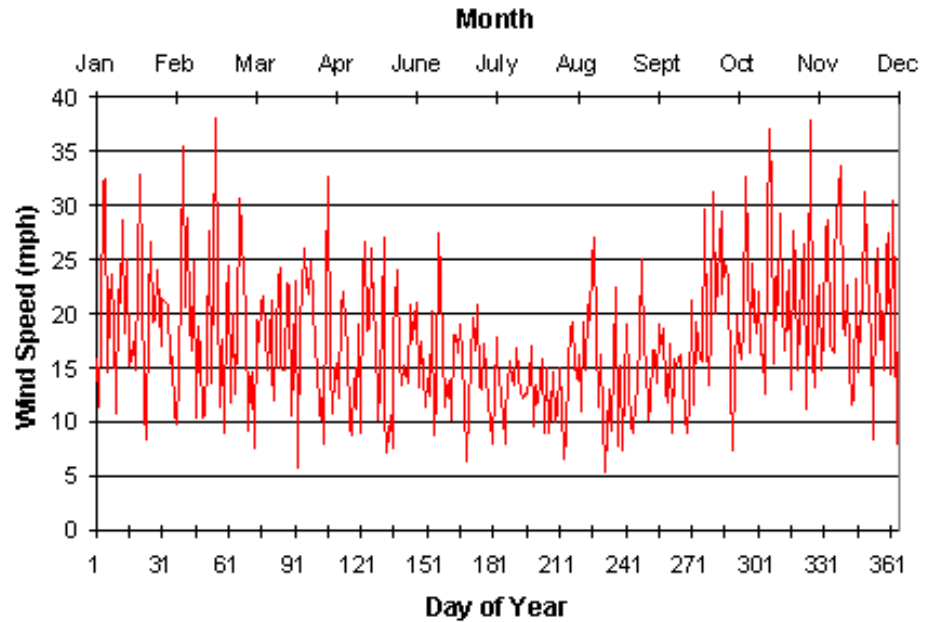
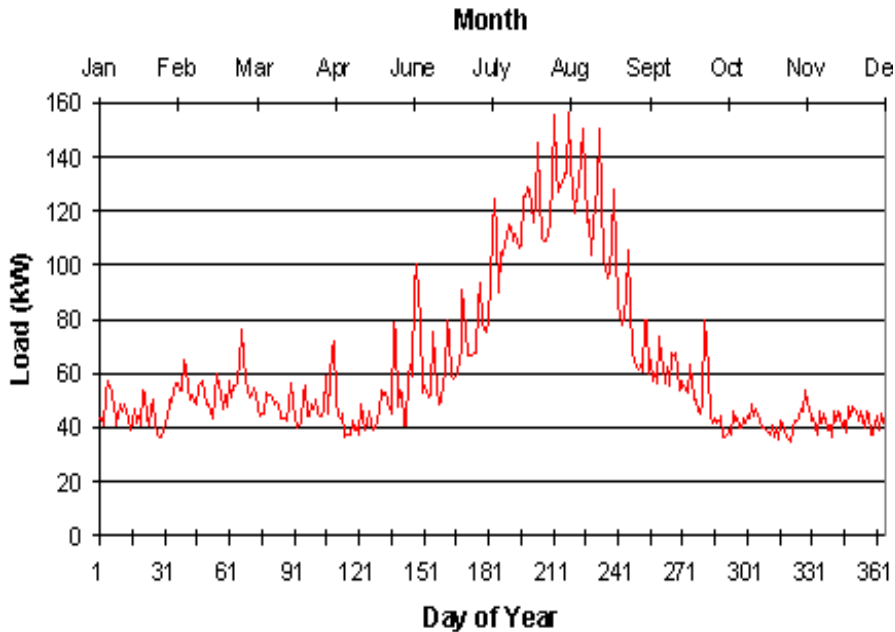


Case Study II: Cuttyhunk, MA



- Population
Year Round: 25
Summer: Few hundred
- Area: ~2 Sq. Miles
- Site of 200 kW prototype
wind turbine in 1977

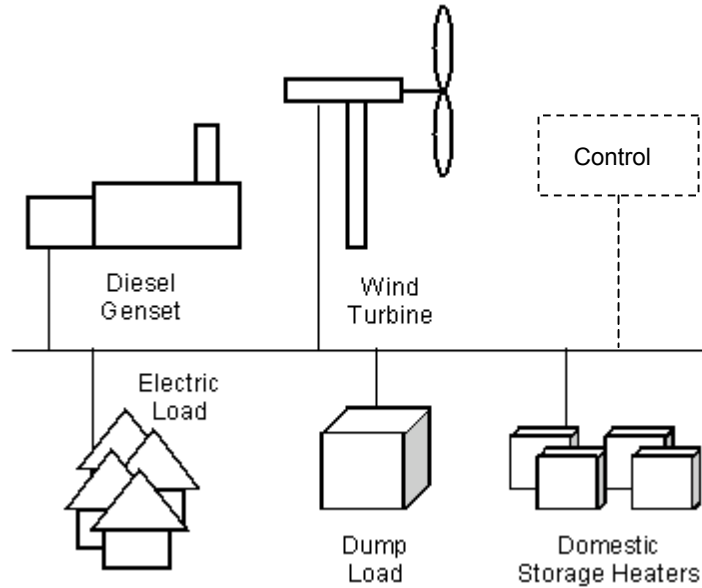
Cuttyhunk



- Electricity: 500,000 kWh/yr
- High summer load
- Installed diesel generators
- Winter heating: Fuel oil

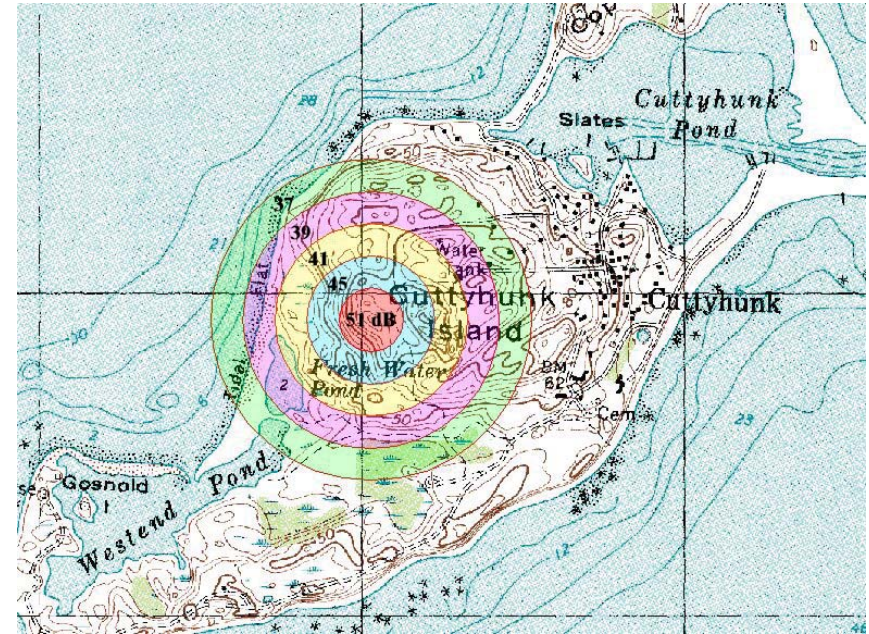
- Wind Speed: 7.9 m/s at 60 ft.
- Seasonal variation

Cuttyhunk



System	Wind Power kW	Annual Diesel Savings \$	Savings in Cost of Energy \$/kWh	Installed System Cost \$/kW
Diesel - on	250	32,000	0.020	2,300
Diesel - on/off	250	42,000	0.038	2,600

Cuttyhunk



- Expected noise level within permissible limits
- Reduction in noise expected due to reduced diesel generator operation

Case Study III: Matinicus Rock, ME



- No human population
- Owned by US Coast Guard
- Area: 30 Acres

Matinicus Rock



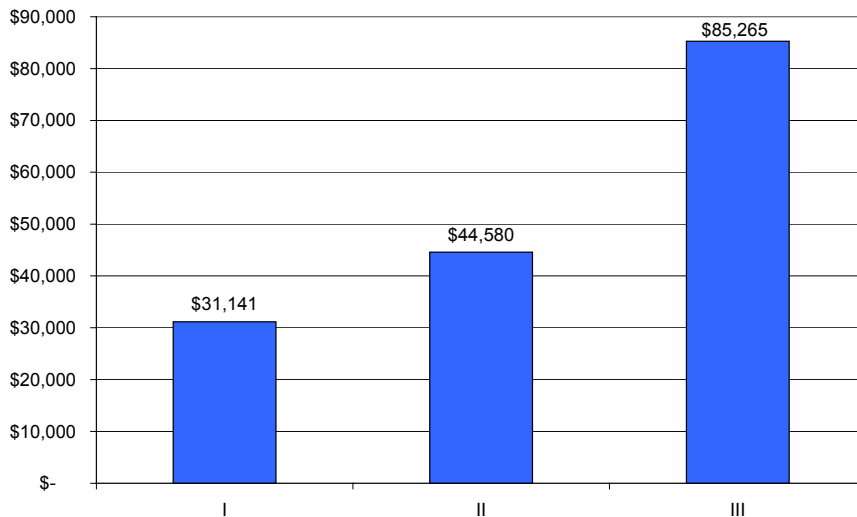
- Electricity: 15 kWh/day
- Peak Load: 3.5 kW
- Steady Load
- Installed PV array
- Average yearly wind speed at 50 m: 8.6 m/s

Matinicus Rock

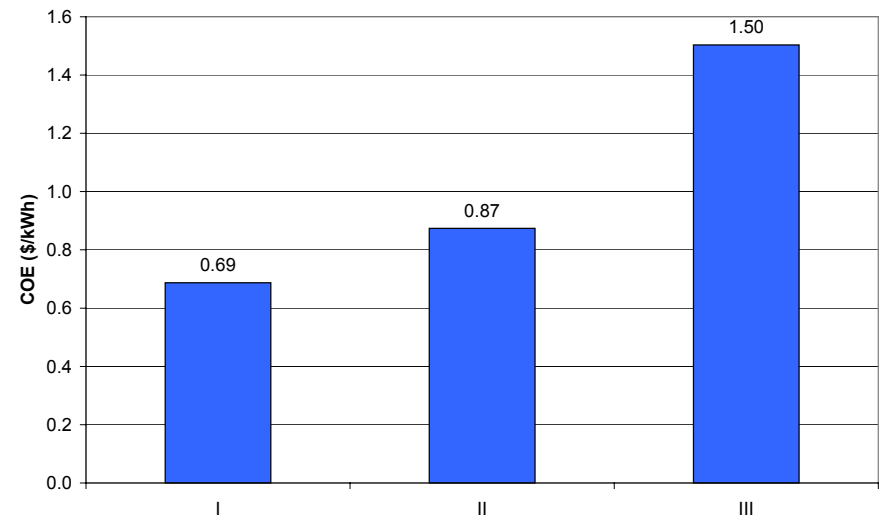
Proposed Systems

I	II	III
2.4 kW PV Array	3 Bergey BWC 1.5 kW Wind Turbines	10.5 kW PV array
2 Bergey BWC 1 kW Wind Turbines	55 kWh Battery Bank	65 kWh Battery Bank
25 kWh Battery Bank	Dump Load	3.5 kW Inverter
3 kW Inverter	Supervisory Control	

Total Capital



Cost of Energy



Conclusions

- Excellent potential for wind on NE islands
- Encouraging economics for all cases studied
 - Detailed study for a few islands recommended
- Wind on grid connected islands may have economic and reliability benefits
- Wind/diesel systems attractive for remote islands
- Use of excess energy for heating is appealing
- Public acceptance issues remain to be addressed
 - Begin permitting to identify concerns