

# Wind Power on Monhegan: Opportunity and Risk

Monhegan Island  
July 2, 2009

## Is a wind power project feasible on Monhegan?

- Technically?
- Environmentally?
- Financially?

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## Technical Feasibility

- Sustainable Energy Development
  - From a technical and logistical standpoint, transporting and erecting a wind turbine on Lighthouse Hill is possible
- Wind-diesel hybrid
  - Much of the control hardware already exists at the the MPPD power station
  - Upgrades needed
  - Some additional hardware and software to control the diesel generators

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## Remaining Technical Questions

- How sophisticated does the controller software need to be?
- Is it worth investing in short-term storage (battery or flywheel) to allow us to shut down the diesel generators more often in the winter?
- Should we invest in a smaller generator to use when the wind is blowing?

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## Environmental Feasibility

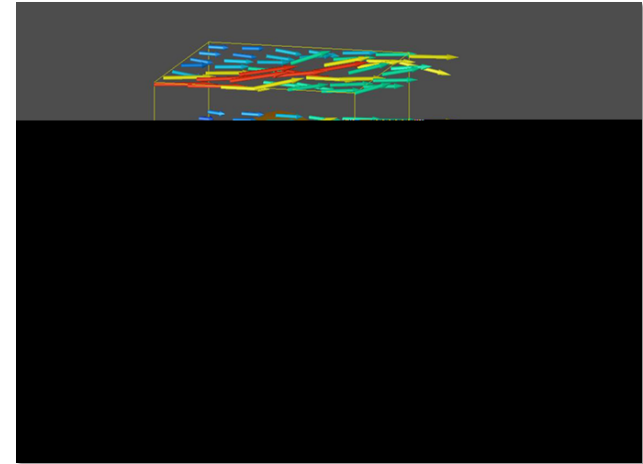
- Number one question: Avian Impact
- Sound impact
- Shadow flicker

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## Birds “Harvest” the Same Resource

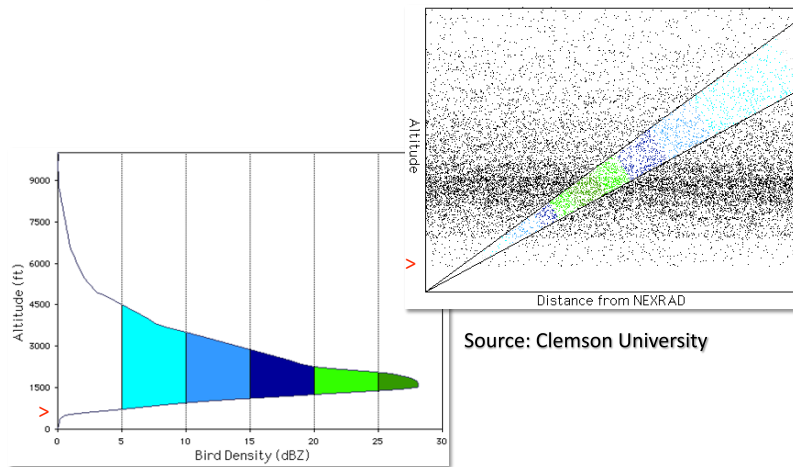


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## Bird Density Peaks at an Altitude of 1,500 feet (>=height of wind turbine @400 feet)



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## Effect of wind turbines on birds

Structure/Activity	Annual Bird Deaths
Glass Windows	100-900 million
Power Lines	174 million
Domesticated Cats	100 million
Vehicles	60-80 million
Communication Towers	4-50 million
<b>Wind Generation Facilities</b>	<b>10,000-40,000</b>

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## Monhegan Island Avian Study Update

### Field Surveys Update

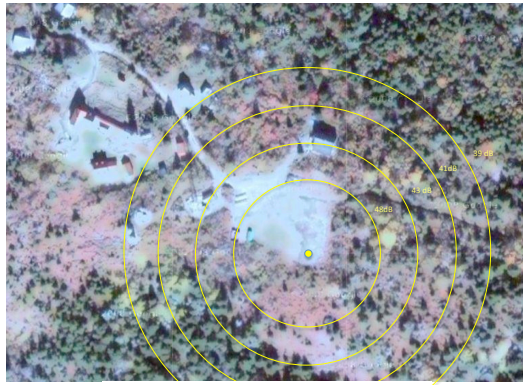
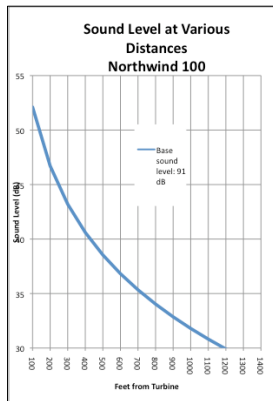
- Monthly surveys have been conducted from seven observation points on Light House Hill (LHH) Since November.
- All species of birds are recorded along with their height of flight.
- Results indicate that bird numbers and diversity are low on LHH relative to the rest of the Monhegan.
- Crows, grackles, herring gulls and pheasants are among the most abundant birds being observed on LHH.
- Very few eagles or other birds-of-prey have been observed flying over LHH.
- Risk of collision to all birds appears to be very low from a single, 100KW turbine sited on LHH.
- An auditory survey for bats will be conducted in August 2009.

## Monhegan Island Avian Study Update

### Regulatory Update

- Project management has been meeting with and keeping both state and federal regulators up to speed on the status of the LHH project.
- At a May 2009 meeting, regulators requested that we add more observations of peregrine falcons and bald eagles during the fall migration.
- Regulators indicated that they and their staff did not feel that radar surveys of night migrating birds would be of much value on LHH and project ornithologist agree with this.
- Project management will continue to communicate with regulators on a regular basis.
- Field ornithologists (Podolsky and DiGirolamo) are available to discuss any aspect of the bird and bat work with any interested parties.

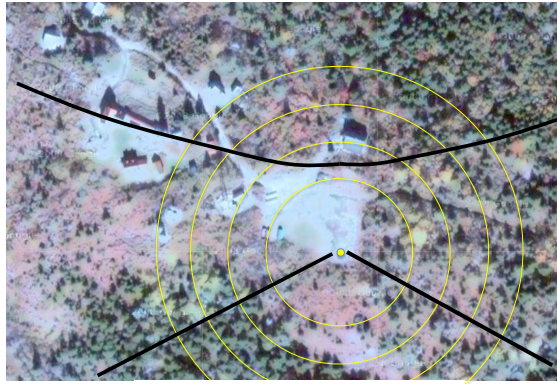
## Sound impact: very modest



## Comparison of Sounds & dB Levels

Sound	dB Level
0	Threshold of hearing
10	Leaves rustling
15	Quiet sound studio
20	Quiet whisper
25	Quiet auditorium
30	Country house
32	Very soft music
40	Very quiet radio at home
45	Minimum street noise
47	Average residence
55	Quiet residential street
57	Average office
60	Background music
67	Average automobile
90	10-hp outboard motor
120	Loud rock music (on stage)
130	Threshold of pain

## Shadow Flicker: minimal



## Economic and Financial Feasibility

- How much diesel will we save?
- How much will it cost?
- How can it be financed?
- What will happen to rates?

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## How large a wind turbine?

- Seasonality of load and wind resource
- Generate as much as we use, or more?
- What to do with the winter excess?

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## A 100 kw wind turbine

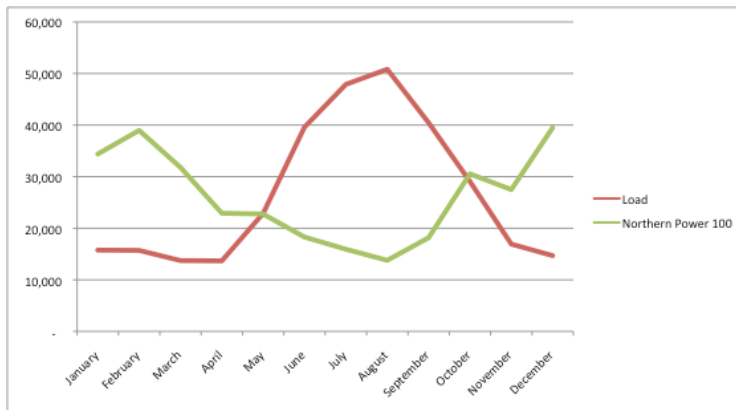
- Max output is 100kw
  - 1000 100 watt light bulbs
  - The island never uses this much energy
- Estimate output using modeled wind speed data from AWS Truewind
- Much more energy in the winter than in the summer

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## Seasonal Mis-match

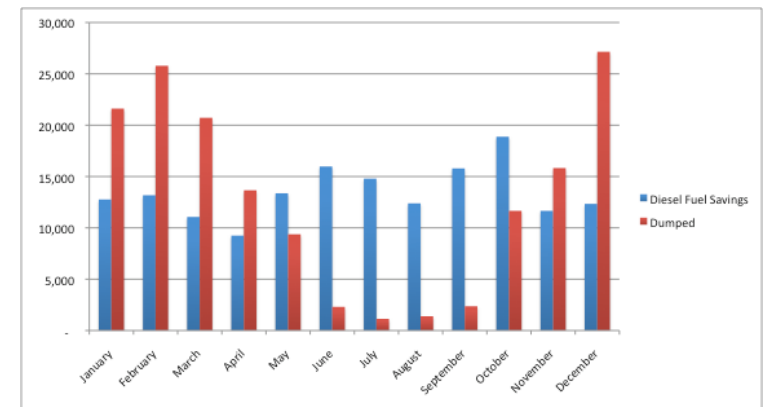


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## Need to “dump” 50% of what is generated by the turbine



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## What are the economics?

- Even dumping 50% of the energy generated...
  - Cut the amount of electricity needed from the generators by 50%
  - Save almost \$50,000 on fuel purchases (at \$3/gal)
  - Reduce noise and pollution from the generators
    - 187 tons of CO<sub>2</sub>
    - 1.2 tons of SOx
    - 3.7 tons of NOx

## What would it cost?

- We do not yet have hard estimates of what the turbines and the construction would cost
- Northwind 100: \$330,000
- Construction: \$200,000?
- Pre-development: \$150,000
- Total: \$680,000

## How would we pay?

- Stimulus package has created substantially higher tax incentives for renewable energy projects
  - In order to access these, we would need to find a “tax equity investor”
  - Might contribute up to 40% of the cost of the project
- Rural Utilities Service loan
  - 20 years
  - 4.5% interest rate

## Potential Rate Reduction

- Savings on fuel purchases: \$50,000
- Principle and interest payments: \$31,000
- Translates into an 5.5¢ per kwh reduction (about 8%) in rates
  - Plus a reduction in:
    - Diesel fuel used
    - CO<sub>2</sub> (and other) emissions
    - Particulates

## What to do with the winter surplus?

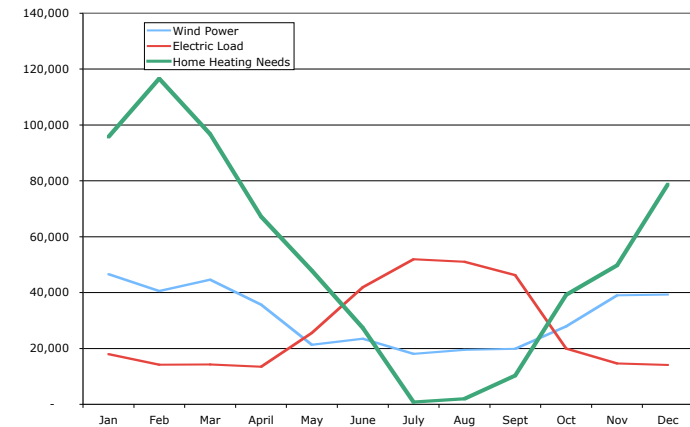
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## What to do with the winter surplus?

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## Potential savings: Home heating

- Electric space heaters controlled by MPPD-controlled switching modules
  - Heat with electricity only when the wind is blowing
  - Requires almost no capital expenditure
  - Potential savings: 20-30% of the island's heating bill (~\$100,000 per year)

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## Could the project meet more of the island's energy needs?

- Store the winter excess to supply electricity in the summer
- Home heating uses as much energy as MPPD
- The fishing fleet uses this much again

*Meeting these energy needs would require a larger turbine, and a way to store the energy*

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## Potential savings: Ammonia to Electricity

- Ammonia for the generators
  - Use Haber-Bosch process to turn water, nitrogen, and electricity into ammonia
  - Store it in the winter for use in the summer
  - Assume 25% efficiency
  - Savings: additional \$12,000 per year (3.5¢/kwh)

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## Potential savings: Ammonia to the fleet

- Ammonia for the lobster fleet?
  - Use Haber-Bosch process to turn water, nitrogen, and electricity into ammonia
  - Use it right away in fishing fleet
  - Winter excess would generate the equivalent of 3500 gallons of diesel fuel per year
    - Over 15% of what the fleet uses in a year

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## Should we explore these?

- These ideas involve emerging technologies
  - That are not yet “commercially viable”
- They have great potential, but are uncertain and untested
  - Don’t want to experiment with essential needs
- Would have to get someone else to pay
  - Grants from foundations or government agencies
- These ideas would suggest a larger turbine

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## Three-phase approach

1. Feasibility Assessment
  - Technical
  - Environmental
  - Economic/Financial
2. Pre-development
  - Financing
  - Permitting
3. Construction and Operations

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## What is the decision process?

- Meetings with the community this spring and summer
- Learn what issues are important to the community, and seek answers
- Spend as little money as possible
- Have a vote in August about whether to proceed to the pre-development stage