Falmouth Wind Turbine Noise Study
and Status Update

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Massachusetts Wind Working Group Meeting
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Study Area

- Existing Falmouth Wind 1 Turbine
- Notus/Webb Turbine Erected May 2010
- Falmouth Wind 2 Turbine Under Construction
- Existing Falmouth Wind 1 Turbine
Background

- Feasibility study conducted in 2005
  - No background noise measurements
  - Projected 42 to 44 dBA @ prop. lines from GE 1.5 or 2.5 MW
  - No significant noise issues expected

- March 2010 Vestas V82 turbine went online and community complaints started shortly thereafter

- Types of audible sound as a source of complaints
  - Loud “Bong” sound from tower occasionally (later, traced by Vestas to mis-aligned inertial damper and repaired)
  - “Swish-swish” sound – lower-wind conditions
  - “Thumping” sound – high-wind conditions
Commissioned Noise Study

- Measurements of existing conditions
  - Community locations - before, during and after Wind 1 maintenance shut-downs
  - Reference locations near turbine
- Modeling of noise from Wind 1 & Wind 2 operations
- Determine existing and future compliance with
  - Falmouth wind turbine ordinance – 40 dBA limit
  - Massachusetts DEP noise guidelines:
    - Not greater than 10 dBA increase in L90 background noise
    - No “pure tone” condition
- Community attitudinal survey forms distributed – concurrent with noise measurement survey
Frequency Characteristics and Pure Tone Evaluation

Comparison of Average Octave Band L90 Levels at LT-1: Midnight to 3:00 AM
June 20 with Turbine Running and June 25 with Turbine Shut Down

L90 Octave Band Sound Pressure Level (dB)

Octave Band Center Frequency (Hz)

- Turbine Off 6/25/10
- Turbine On 6/20/10
Low-frequency Sound Investigation

LT-1: 10-min L90 Octave Band values 4PM to 5PM on 6/24
Periods starting 4:00 to 4:20 - turbine on; 4:30 to 4:50 - turbine off
HMMH Reference
Sound Level Measurements:
Ground-plane Microphone near the Turbine
HMMH Reference Sound Level Measurements and Vestas Reference Data

Comparison of VestasV82 Reference Data and HMMH Measured/Estim. Sound Power Levels, based on Ground-plane Reference Measurements 6/18 and 6/28
Model Results – Wind 1 and Wind 2 Turbines:
Reference wind speed of 8 m/s at 10m (11 m/s at hub)
Turbine Sound Levels Relative to Background at Wind Speeds other than Reference
Key Findings – Presented to Falmouth Community

- The Town is very concerned about effects of turbines on neighbors, and interested in hearing ideas
- Background sound levels increase with wind speed
- Sound from Wind-1 does not cause violations of MassDEP noise guidelines, but sound levels approach the 10 dBA increase threshold on Blacksmith Shop Rd.
- With both Wind-1 and Wind-2 operating, modeling predicts no violations at any measurement positions, but there may be slightly greater than 10 dBA increases at two homes at the end of Ambleside Drive only:
  - During early morning hours when background is quietest, and
  - With wind speeds in the range of 5 to 6 m/s at turbine hub
Nighttime background sound levels with low wind measured in June 2010 are nearly the same as those measured in January 2008, suggesting minimal seasonal variation.

Reference measurements suggest the Wind-1 turbine is operating at or below the manufacturer’s noise specs.
Noise Control Engineering, Inc.

FIGURE 1: NCE measured data showing Aerodynamic Amplitude Modulation (AAM).
Study Update – 2011

- Letter from DEP SE Region (Jan.-Feb.)
  - One-hour periods
  - Lowest 1-hr L90 per wind speed
- Meeting with DEP to discuss study rationale (March)
- Follow-up meeting minutes from DEP
- HMMH reprocessing Falmouth data per DEP request