Challenges to Wind Development
Review of Representative Wind Projects
&
Wind Project Siting Concerns

Massachusetts Wind Working Group Meeting
Wednesday, October 17th, 2012
Held At Aeronautica Windpower
11 Resnik Road
Plymouth, MA
Atlantic Wind Project Overview

To date we have been involved in the siting analysis, permitting and design of over 50 wind turbine project sites throughout New England. Atlantic has developed in-house skills for effective wind turbine project assessment, permitting and construction.

Projects with installed/operating turbines include:

- Mount Wachusetts Community College, Gardner, MA – (2) Vestas V-82 Turbines
- Norfolk County Correctional Institute, Gardner, MA – (2) Vestas V-82 Turbines
- Narragansett Bay Commission, Providence, RI – (3) Goldwind 1.5 MW Turbines
- U Maine, Presque Isle, ME – (1) RRB 600 Turbine
- UMass Dartmouth, MA – (1) Elecon 600 Turbine
- Fairhaven WWTP, Fairhaven, MA – (2) Sinovel 1.5 MW Turbines
- Barnstable WWTP, Barnstable, MA – (2) Northwind 100 Turbines
- Deer Island WWTF, Winthrop, MA – (1) FloDesign Demonstrator Unit 100 kW turbine
- Camelot Wind, Plymouth, MA – (1) Goldwind 1.5 MW Turbine
- Scituate Wind, Scituate, MA – (1) Sinovel 1.5 MW Turbine
Camelot Wind Turbine
Permitted projects currently in the final design/construction phase include:

- Technology Drive, Falmouth, MA- (1) Aeronautica Wind 225 Turbine
- Future Generation Wind, Plymouth, MA- (3) Nordex 2.5 MW Turbines
- Jericho Mountain, Berlin, NH- (3) –Vestas 3.0 MW Turbines
- Colony Place, Plymouth, MA- (1) 750 kW Aeronautica Wind Turbine
- Varian Semiconductor, Gloucester, MA – (1) Kenersys 2.5 MW Turbine
- Future Generation, Plymouth, MA- (1) Nordex 2.5 MW Turbine
- Equity Industrial Partners, Gloucester, MA – (2) Gamesa 2.0 MW Turbines
- Russell Municipal Light Department – (3) GE 1.6 MW Turbines
Varian Semiconductor
Gloucester, MA
Representative Project Site Plans

- Camelot Wind Project – Plymouth, MA
- Holiday Hill Wind Project – Russell, MA
- Future Generation Wind – Plymouth, MA
- Scituate Wind Project – Scituate, MA
Representative Project Site Plans

Camelot
Wind
SITE PLANS
FOR THE
SCITUATE COMMUNITY WIND PROJECT
SCITUATE, MASSACHUSETTS
DATE: JANUARY 22, 2010

Representative Project Plans

Scituate Wind Project
Massachusetts CEC Acoustic Study Methodology

- Must use ANSI Type 1 Sound Level Meters or equivalent ISO or IEC standard
- On-site wind speed measurements by either an on-site MET tower or at 10-meters above ground level and extrapolated to hub height using the appropriate on-site wind shear
- Locations selected for long-term monitoring to represent the nearby residence with the lowest ambient sound levels
- Long-term and short-term measurements
  - Long-term Measurements:
    - Must be completed for 14 consecutive days during reasonable meteorological conditions
    - L90 and Leq must be determined in dB(A) for 10-minute intervals
  - Short-term Measurements:
    - Must be completed during the 14 day monitoring period, must be taken at least once during the day (6a.m. and 10p.m.) and once between the hours of 1a.m. and 4a.m.
    - Must be completed simultaneously with long-term measurements
    - Must document audible sound sources during entire monitored period
Shadow flicker from wind turbines is the effect resulting from the shadows cast by the rotating turbine blades on a sunny day. Shadow flicker is most commonly measured in terms of the "hours per year" during which a receptor would be exposed to flicker from a wind turbine.

Shadow flicker modeling is performed using the software WindPRO, version 2.7, developed by EMD International. This modeling uses geometry and site specific data to estimate the number of hours per year that shadows could be cast on general areas, as well as specific locations or "receptors", surrounding the site.
Photosimulations are used to accurately depict what an installed turbine would look like from specified areas surrounding the proposed site. They are meant to provide a fair representation of the visual impact of the project on the surrounding neighborhoods.

The procedure involves superimposing an object, such as a wind turbine, onto a photograph at the proper scale, location and elevation to provide a visual representation of what the proposed turbine would look like from the specific location where the photograph was taken.

The purpose of a balloon test is to properly orient the photographer in the direction of the proposed turbine and to provide an object in the photograph that can be used during the photosimulation process as a reference point, from which the scale and height of the proposed turbine can be accurately depicted.
COLONY PLACE WIND PROJECT
PROPOSED CONDITIONS WITH (1 65M TOWER)
LOCATION 'A' - COLONY PLACE BUS STOP
(LOOKING NORTH)
SCITUATE COMMUNITY WIND PROJECT
PROPOSED CONDITIONS WITH (1 80M TOWER)
LOCATION 'I' - 47 MOORELAND ROAD
(LOOKING WEST)
CAMELOT DRIVE WIND PROJECT
PROPOSED CONDITIONS WITH 80M TOWER
LOCATION ‘C’ - REGISTRY OF DEEDS/ COURT HOUSE
(LOOKING SOUTH)
MITIGATION OPTIONS

• Noise
• Shadow
• Visual
• Environmental
Noise Reduced Modes

Possibility to curtail wind turbines according to 4 parameters:

- Time of the day
- Wind direction
- Wind speed
- Power output
Mitigation plan is programmed into the project Control System to operate only at production levels that maintain noise compliance.

<table>
<thead>
<tr>
<th>ANGULAR SECTOR</th>
<th>TIME of DAY</th>
<th>WIND SPEED</th>
<th>SEASON</th>
</tr>
</thead>
<tbody>
<tr>
<td>ANGULAR SECTOR</td>
<td>Night</td>
<td>Curtailment</td>
<td>Off Summer</td>
</tr>
<tr>
<td></td>
<td>10:00 PM - 6:00 AM</td>
<td>for winds Greater than 5 m/s</td>
<td>Nov - Apr</td>
</tr>
</tbody>
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Shadow flicker can impact residences/structures during certain identifiable time periods during the year. The effect can be precisely calculated to determine whether a flickering shadow will fall on a given location near a wind turbine and the time of year, duration and total hours in a year it will do so.

Mitigation measures include:

- **Computer modeling** – Control modules programmed in the turbine for shutdown times to minimize shadow flicker.

- **Outdoor Plantings** such as vegetated buffers, fences, window coverings, or screening barriers
Mitigation measures to prevent and/or minimize visual impact from turbines may include:

- Design of wind turbine according to the site characteristics and with sensitivity to the surrounding landscape.
- Maximizing the distance of wind turbines from the nearest property line.
- Selection of wind turbine design (tower, color) according to landscape characteristics.
- Selection of neutral color and anti-reflex painting for towers and blades.
- Underground cables.
- Screening such as fencing/treelines can provide partial or full visual mitigation.