



# City of Salem

## Winter Island Wind Proposal

*Mayor Kimberley Driscoll*





# City of Salem

## Winter Island Wind Proposal Project history

2007- Renewable Energy Task Force is formed

- 2007- A Wind Site Analysis completed by UMass Renewable Energy Lab (9 sites surveyed; 2 seriously considered- SESD & Winter Island)
- 2008- SODAR testing performed at SESD –data collected for 6 months
- 2009- “Met tower” installed with MA Clean Energy Center (MA CEC) grant
- 2010-2011- MA CEC-funded feasibility study using a year’s worth of wind data from the met tower



# City of Salem

## Winter Island Wind Proposal Site Selection

“Met tower”





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## Winter Island Wind Proposal Site Selection

Site selection factors:

- Available wind energy
- Noise (inc. proximity to residences)
- Airport proximity
- Environmental issues and permitting
- Component transportation & access
- Distance to electric transmission lines
- On-site electric load offset (study done before net-metering law)



# City of Salem

## Winter Island Wind Proposal

### Siting Considerations





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## Winter Island Wind Proposal Site Selection

Sites considered:

- SESD
- Winter Island
- The Willows
- Forest River Park
- Saltonstall School
- Bentley School
- Bertram Field
- SHS



# City of Salem


## Winter Island Wind Proposal

### Siting Considerations

Mean Wind Speed at 70m



Source: MassGIS ([www.mass.gov/mgis](http://www.mass.gov/mgis))

 Location of proposed Wind Turbine Generator



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## Winter Island Wind Proposal Site Selection

### WINTER ISLAND - MOST FEASIBLE

- Best Wind – meets Wind Requirements (within 1/4 mile)
- Greatest distance to residential structures
- Provides maximum fall zone (show-stopper at SESD)
- Close to available power distribution
- Most economically viable location (vs. offshore)





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## Winter Island Wind Proposal Economics

- Economics:
  - Estimated total revenues are \$586K/year (electricity plus “RECs”)
  - Estimated net revenues = \$167K/year until debt paid
  - Simple payback = 8 years
  - Revenue benefit in terms of avoided electric cost, which typically escalates over time
  - Once fully paid for, could offset up to 15% (\$700,000) of lost power plant revenue



# City of Salem

## Winter Island Wind Proposal Benefits

- Environmental Benefits
  - Helps City to achieve its Green Communities commitments
  - Provide's enough power for 300 - 500 homes (roughly equal to the Willows neighborhood)
  - Offsets nearly 80,000 tons of CO<sub>2</sub> during its 30 year lifespan



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## Winter Island Wind Proposal Benefits

Other benefits:

- Could become an iconic structure for a tourist hub like Salem
- Represents a vision for the future— Clean, Reliable, Secure energy
- Will become a navigation aid to boaters??

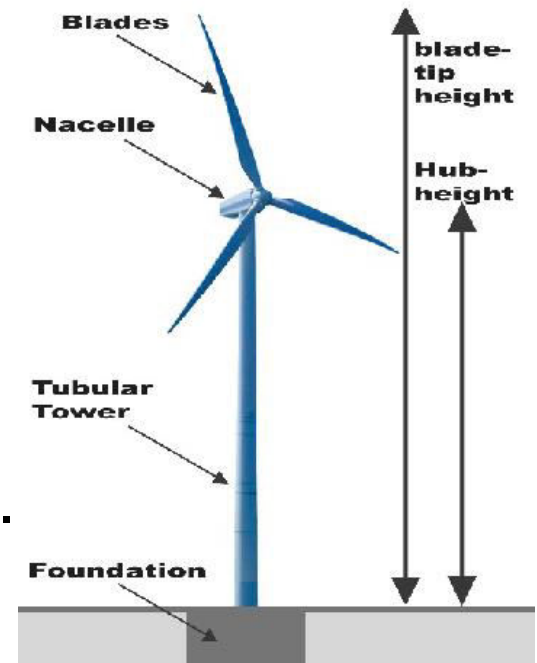


# City of Salem

## Winter Island Wind Proposal

### Project stats

- Proposed Project:
  - 1.5MW- GE Turbine
  - Height:
    - Hub (“Nacelle”)- 260ft.
    - Tip (top of blade-swept area)- 380ft.
  - Expected Life: 30 years
  - Power output: 3.6M kiloWatt-hours/ year
  - Cost: \$4.2M (plus possible contingencies)
  - Wind speed operating range- 8 mph (3.5 m/s) to 45 mph (20 m/s) operation





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## Winter Island Wind Proposal

### The new Salem skyline



View from Shetland Park



# City of Salem

## Winter Island Wind Proposal

### The new Salem skyline



Without Proposed Wind Turbine Generator



With Proposed 1.5 MW Wind Turbine Generator

**Winter Island – Salem, MA**  
**Before and After Photos**  
View from Winter Island Causeway, Salem



# City of Salem

## Winter Island Wind Proposal

### The new Salem skyline



Without Proposed Wind Turbine Generator



With Proposed 1.5 MW Wind Turbine Generator

*Winter Island – Salem, MA*  
**Before and After Photos**  
View from Cheval Road, Salem



# City of Salem

## Winter Island Wind Proposal

### The new Salem skyline



Without Proposed Wind Turbine Generator



With Proposed 1.5 MW Wind Turbine Generator

*Winter Island – Salem, MA*  
**Before and After Photos**  
View from Shetland Park, Salem





# City of Salem

## Winter Island Wind Proposal

### The new Salem skyline



Without Proposed Wind Turbine Generator



With Proposed 1.5 MW Wind Turbine Generator

*Winter Island – Salem, MA*  
Before and After Photos  
View from Salem-Beverly Bridge, Salem



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## Winter Island Wind Proposal

### Potential impacts

- Acoustics
- Flicker
- Fall Zone
- Site disturbance
- Property Values



# City of Salem

## Winter Island Wind Proposal

### Potential impacts

#### Acoustic impacts:

- 3 times hub height is rule-of-thumb for minimum distance to nearest residential structure
- Larger wind turbines generally produce less noise
- Noise produced is a function of wind speed
- Winds are generally highest during colder months, when windows and doors are shut
- At high wind speeds, sound from wind typically drowns out sound from turbine



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## Winter Island Wind Proposal

**Table 1: Average Wind Speeds (m/s)**

Month	Average Wind Speed (m/s) at 30m Height		
	MET Tower	Direct NCDC	Corrected NCDC
January	5.42	5.19	5.42
February	6.51	5.93	6.19
March	6.28	5.79	6.04
April	4.97	4.66	4.87
May	4.87	4.75	4.96
June	4.24	4.24	4.43
July	4.36	4.34	4.54
August	4.66	4.57	4.77
September	5.00	4.84	5.05
October	5.59	5.47	5.71
November	5.24	4.92	5.14
December	6.15	6.00	6.25
Average	5.27	5.06	5.28

Wind speed lowest during summer





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## Winter Island Wind Proposal

### Potential impacts

Acoustic impacts:

- **Difference between background noise and noise produced by wind turbine is key factor when considering impact**
- MA DEP guidelines allow maximum 10 decibel difference
- According to the American Wind Energy Association and a number of studies, the sound emitted by wind turbines “is not unique”.



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## Winter Island Wind Proposal

Site Address	Distance	Predicted Turbine Leq dB(A)	Background Leq dB(A)	Total Leq dB(A)	Difference dBA
Plummer Home	1300 ft. >3x hub height	39	40	43	3
Closest Residence on Winter Island Rd.	1690 ft. >3x hub height	37	34	39	5
Fort Avenue and Winter Island Road*	~2000 ft. >3x hub height	40	34	41	7
Harbormaster's Office+	N/A	53	34	53	19

\* Conservative estimate; actual background levels likely higher

+ Not a Residence



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## Winter Island Wind Proposal

### Potential impacts

#### Comparative Sound Levels:

142 decibels - Small outboard engine

104 dB - Surf

96 dB - Power mower

80 db - Garbage disposal or dishwasher

70 dB - Noisy restaurant; heavy traffic; Radio or TV audio at home

60 dB - Conversation in restaurant or office; A/C unit at 100ft.

55 to 85 dB - Rain

**55 dB - Proposed wind turbine –falling off with distance; 34 dB at 3,000 feet from turbine**

50 dB - Quiet suburban background noise, daytime

34 - 43 dB - Measured nighttime background levels near WI homes

32 dB - Quiet suburban background noise, nighttime, typical

Sources: Industrial Noise Control, Inc; Marinepolicy.net; Howard Quinn



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## Winter Island Wind Proposal

### Potential impacts

#### Shadow flicker impacts:

- Less than 20 hrs per year total
- Mostly falls on the water
- Similar to shadows when driving down a tree lined street.



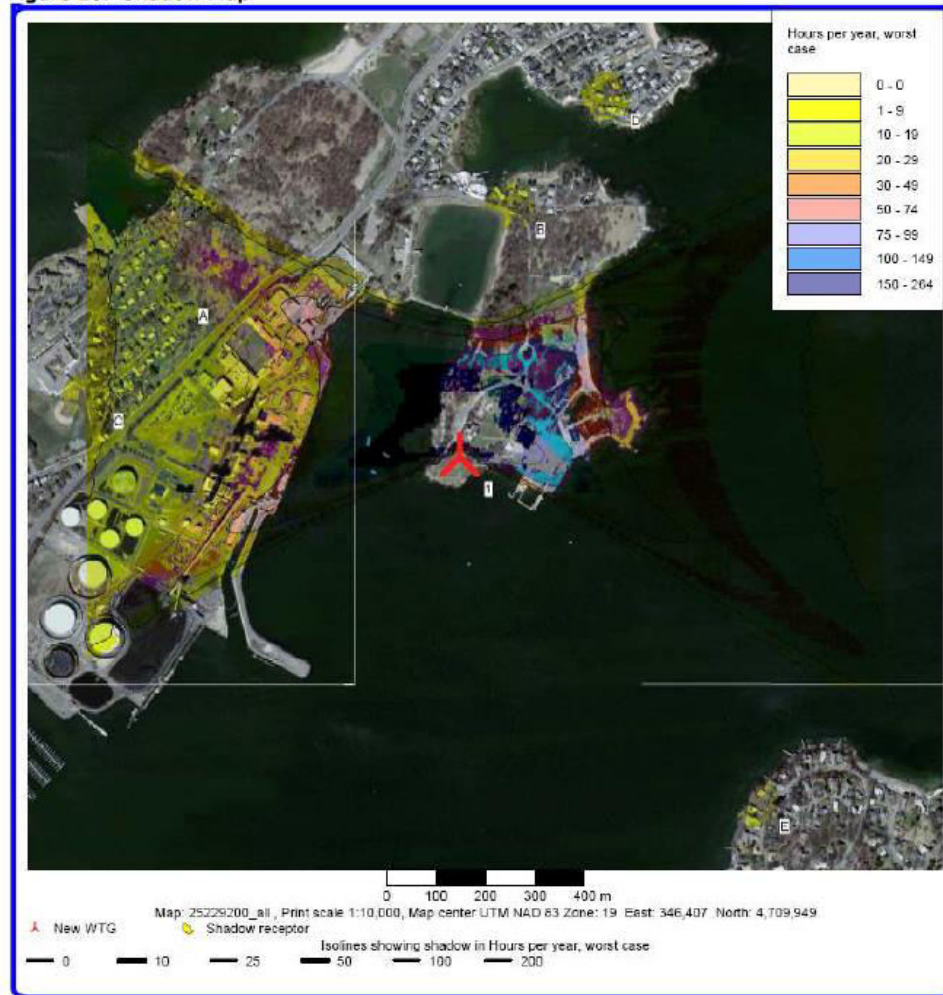


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## Winter Island Wind Proposal

### Potential impacts

Figure 16: Shadow Map





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## Winter Island Wind Proposal

- **Property Disturbance:**
  - During construction-
    - Possible power line upgrade along WI Rd.
    - Creation of temporary access points
  - At Completion-
    - Diameter of monopole base- Approx. 15 ft.
    - Diameter of foundation pad – Varies; ~25 ft. in Ipswich
    - Fenced area- Optional; ~50 ft. x 50 ft. in Ipswich



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## Winter Island Wind Proposal

- Property Values
  - No comprehensive studies to date in U.S.
  - Hull experience



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## Winter Island Wind Proposal Potential Timeline

- **Early August:** MA Clean Energy Center grants announced
- **August 2nd:** 1<sup>st</sup> public hearing on proposed project
- **Late August:** MECA grant determination (award timing not official)
- **Summer/ Fall 2011:** Initial design and engineering; continue public hearings and stakeholder engagement
- **Fall 2011 through Spring 2012:** Complete engineering & design; Secure necessary permits, approvals and financing
- **Summer 2012:** Break ground
- **Fall 2012:** Project completion



# **City of Salem**

## Winter Island Wind Proposal Questions?

**Q & A**



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## Winter Island Wind Proposal

### The Hull, MA Experience

