



A computer visualization of the soon to be installed turbine at IBEW Local 103 in Boston, MA.



The wind turbine in Hull, MA.



Renewable Energy Options for Water Works

Plymouth County Water Works Association
February 23, 2005

Larry Chretien, Executive Director of Mass Energy, will talk about renewable energy options for Water Works. To reduce financial and environmental costs of electricity use at water treatment facilities, there is great potential for renewable energy technologies that can be installed onsite.

www.massenergy.com



Mass Energy

- Non-profit organization, established in 1982
 - Partners with People's Power and Light in RI
- Mission: affordable, environmentally sustainable energy
 - > 7500 members in heating oil program
 - new product – biodiesel!
 - > 2000 members in green electricity program



Mass Energy

New England Green Start SM



New England Wind SM



The 660 kW Vestas wind turbine in Hull, MA.



Mass Energy

- Generously supported by:
 - Mass. Technology Collaborative
 - Renewable Energy Trust
 - John Merck Fund
 - Jessie B. Cox Charitable Trust



Benefits of Renewable Energy

- It's Clean – wind and solar = emission free
- It's Local/Domestic, not foreign
- No fuel costs mean a stable cost per kWh
 - Massachusetts becoming increasingly dependent upon natural gas which is short in supply and volatile in price



Wind Turbine Economics

- Avoid Utility Bill Charges
- Renewable Energy Certificate Value
- Federal Wind Production Tax Credit and/or Renewable Energy Production Incentive
- Mass. Technology Collaborative,
– www.masstech.org



Avoiding Utility Bill Charges

- Customer Charges
- Demand Charges (per kW)
- Energy Charges (all per kWh)
 - Transmission Charges
 - Distribution Charges
 - Transition Charges
 - Renewable Energy
 - Energy Efficiency
 - Supply/Generation



The Stakes

- Transmission, Distribution, Transition, Renewable Energy, Energy Efficiency:
 - About **4** cents per kWh for small commercial (G1) + medium commercial (G2)
 - G2 typically uses 1200 MWh
 - almost equivalent to one Hull Wind 1 turbine
 - About **3** cents per kWh for large commercial & industrial (G3)
 - Typically uses 6000 MWh
 - equivalent of four Hull Wind 1 turbines or 1.5 Hull Wind 2 turbines



The Stakes

- Supply / Generation Charge:
 - G2 (small commercial)
 - NSTAR = 7.325 cents
 - G3 (large C&I)
 - NSTAR = 8.7 cents



The Stakes

- For G2 and G3, when you add it all up:
 - About 11.5 cents per kWh, or \$115 per MWh

Annual Costs

- 250,000 kWh = \$ 28,750
- 500,000 kWh = \$ 57,500
- 1,000,000 kWh = \$115,000



Net Metering

- If generator < 60 kW, meter runs backward when output $>$ usage, but does not reduce customer charge or eliminate demand charge (if applicable)
 - Bergey makes < 60 kW turbines
 - <http://www.bergey.com/>
 - Might be good for small waterworks
 - <http://www.mass.gov/doer/programs/renew/sm-wind.pdf>



**South Mountain Company's 10 kW
Bergey wind turbine on Martha's
Vineyard.**



Other than Net Metering

- Facility would save 11 cents per kWh when wind is blowing **and** facility is using electricity:
 - And earn about 3 cents per kWh for “renewable energy certificates” (over long run)
 - And maybe up to 1.8 cents for federal tax credit or Renewable Energy Production Incentive
 - TOTAL about **15** cents per kWh
- If turbine produces more than facility uses at any time, facility will earn per kWh:
 - Wholesale Energy Value, about 4 cents
 - Renewable Energy Certificate Value, about 3 cents
 - Federal Tax Credit or Incentive Value, 0-1.8 cents
 - TOTAL about **8** cents per kWh



Matching Turbine to Facility

- Is the site windy?
 - # kW related to height
 - higher capacity factor = more kWh
- Is it possible to match a turbine of the “right” size to the facility’s load and load shape?
- Cost per kW lower with # kW



Turbine Sizes

<u>Turbine Manufacturer and Capacity</u>	<u>Hub Height/Rotor Height (feet)</u>
• Bergey 10 kW,	60/71
• Fuhrlander 100 kW,	108/151
• Fuhrlander 250 kW,	131/187
• Vestas 660 kW	164/243
• Fuhrlander 800 kW,	197/295
• Vestas 1.8 MW,	213/345
• GE 1.5 MW	213/345



A visualization of IBEW Local 103's proposed 100 kW wind turbine in Boston, MA.



Images of the Fenner Wind Power Facility in Fenner, NY. The project features twenty 1.5 MW GE turbines.



A visualization of the proposed Hoosac Wind project in Florida, MA. The project features twenty GE 1.5 MW turbines.



The Role of MTC

- Community Wind Program
 - Feasibility Studies
- Risk Mitigation
 - long-term contracts for energy and renewable energy certificates
 - maybe MTC can help secure more than 4 cents for energy and 3 cents for recs
 - Maybe 10 cents for sum rather than 7?



If Not Wind?

- Photovoltaic Panels
 - Solar Electric
- Microturbines and Fuel Cells
 - Biodiesel
 - Gas
 - Natural Gas
 - Digestive Gas



Current Examples

- 200kW micro-turbine Fuel Cell at Westchester County, NY wastewater treatment facility runs off of digester gas from the facility itself.*
- Bio-gas fueled micro-turbines in Lewiston, NY treatment facility provide 90% emission reductions.*
- Browning, Montana uses 4 10kW wind turbines to power 30% of the waste water treatment facility's power needs**
- Stelle, Illinois Wastewater treatment plant uses a 10kW wind turbine.

*Distributed Energy July/August 2004

**Missoula Independent 2/17/2005



Resources

- American Wind Energy Association,
<http://www.awea.org/>
- A Consumer's Guide to Small Wind Systems,
 - <http://www.mass.gov/doer/programs/renew/sm-wind.pdf>
- Mass. Technology Collaborative,
 - www.masstech.org



Consulting Resources

- Boreal Renewable Energy Development,
 - <http://www.boreal-renewable.com/>
 - <http://www.capecodcommission.org/windenergy/AssessmentofDGTechnology.pdf>
- Lorax Energy Systems,
 - <http://www.lorax-energy.com/serv03.htm>



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