

Town of Falmouth

Wind Energy Project

Summer 2010

The Town of Falmouth has undertaken a Wind Energy Project that consists of two turbines known as Wind I and Wind II. The turbines will operate at Falmouth's Wastewater Treatment Plant (WWTP) off Blacksmith Shop Road. They will generate electricity to provide energy for treatment plant and other operations for the next 20 years and to offset energy usage at other Town-owned facilities and buildings. Any additional revenues from sales of renewable energy credits will be paid to the Town. The project will help the Town meet its commitment to reduce greenhouse gas emissions by 10% below FY 2001 levels by 2010 and offset energy costs, saving taxpayers money. Wind I began commercial operation on March 23, 2010. Wind II is currently being constructed, with commissioning planned for Fall 2010. Falmouth is working with the Massachusetts Department of Environmental Protection (MassDEP), the Massachusetts Department of Energy Resources (DOER) and the U.S. Environmental Protection Agency (EPA) on this project. This fact sheet addresses questions frequently asked about wind power and Falmouth's wind turbine installation.

What is the role of wind power in Falmouth?

Falmouth has been a leader in embracing sustainable practices and renewable energy. With community support, the Energy Committee began studying the option of wind power in 2002. The preferred path to a sustainable energy future for the community is targeted uses of renewable energy sources, which includes powering specific Town facilities that use the most electricity, such as the Wastewater Treatment Plant. This approach offsets operations costs by generating needed energy and reduces the Town's carbon footprint by using clean energy instead of fossil fuels.

Why was wind chosen over other renewable sources?

The Town elected to install wind turbines at the WWTP because they have a smaller footprint than an array of solar panels needed to generate the same amount of electricity. In addition, there are other planned uses for the WWTP site. Wind turbine technology is also more cost-effective than photovoltaics, translating into greater electricity generation for the Town and responsible use of the grant funding provided under the American Recovery and Reinvestment Act (ARRA). The location of the second turbine (Wind II) is based on spacing needed to minimize interference due to potential turbulence between towers, favorable elevation and use of existing open space at the site (which limited any required clearing).

How were the site and technology chosen?

Once the community committed to reducing carbon emissions, the Energy Committee began a three-year feasibility analysis. In 2004, the Massachusetts Renewable Energy Trust (MRET) erected a meteorological (MET) tower on the Blacksmith Shop Road WWTP site to measure wind speed, direction and other factors to determine the viability of the treatment plant site. Factors supporting the location were the distance between the site and the closest residential properties; the favorable topography; and vegetative cover. The data collected from the MET tower indicated excellent wind resources at the site. Key factors in evaluating wind resources are the wind's consistency and velocity. The process culminated in November 2005 with a financial analysis and feasibility study that recommended using the WWTP for a permanent installation.



Wind I turbine under construction.



Preparation of nacelle (generator) prior to placement on top of the tower.

Wind I and II *Fast Facts*

- Two 1.65 megawatt Vestas V82 turbines
- Tower heights – 262 feet
- Rotor diameters – 269 feet
- Overall heights – 397 feet
- The turbines supply electricity credits for Town-owned buildings and facilities
- Revenue from excess energy generated is paid to the Town by the utility
- Wind 1 produces 3.1 to 4.2 million kilowatt hours annually; with Wind II on line, the turbines will offset existing and future electrical energy demands for the wastewater treatment plant and facilities located throughout the Town through virtual net metering
- Wind I and Wind II will meet about 60% of Town-owned facility energy needs
- Estimated carbon dioxide offset of more than 1.5 metric tons annually (808 lbs/MWh from ISO-NE at 4,200 MWh annually)
- Goal: reduce greenhouse gas emissions below FY 2001 levels by more than 10% by 2010

How is the project funded?

Wind I was funded by a mix of general obligation bonds, grants and advanced payments on renewable energy credits, which are known as RECs. RECs are generated when carbon-neutral electricity is produced; they are then sold on the market. Wind II is being funded entirely by the ARRA through the State's Clean Water State Revolving Fund (SRF) grant/loan program.

How do the turbines work?

Modern wind turbines use their blades to collect the wind's kinetic energy. The aerodynamic design of the blades causes a lifting effect, just like an airplane wing, which enables the blade to capture the wind's energy and turn. As the blades rotate, they turn a shaft connected to a generator that creates electricity. The nacelle is what the rotor (blades and hub) attaches to on top of the tower. It houses the generator and other mechanical equipment needed to generate electricity from the wind. Most modern turbines are upwind machines that need to turn or "yaw" into the wind in order to capture its energy. The turbine will adjust its blades and direction constantly to maximize its ability to generate electricity from the ever-changing velocity and direction of the wind. In high wind events, turbines furl their blades and turn out of the wind in order to protect themselves. Wind I cuts out at 20 meters per second (around 45 MPH). The larger the swept area of the blades (think collector area), and the higher and more consistent the wind speeds, the more electricity the turbine can produce.

What impacts could turbines have?

Wind turbines are large industrial pieces of equipment. Falmouth's turbines are located at the Wastewater Treatment Plant, which is in the Public Use zoning district. The property is surrounded by trees and the towers were sited where they would capture the most wind while remaining as unobtrusive as possible.

Typical wind turbine sound is best described as "swooshing." This is an aerodynamically generated sound that comes from the rotation of the blades in the wind. In addition, mechanical sounds from the nacelle also produce sound. However, the "swooshing" aerodynamic noise is the likely dominant source of wind turbine sound. Turbines need to be maintained like any piece of equipment and sound can also result when elements of the turbine need to be adjusted.

The Town, with community input, took great care in siting Wind I to minimize the potential for adverse

public health impacts. Wind energy is relatively new to the public health field. There are not yet any definitive studies on potential health impacts of wind power facilities. The Town is taking residents' recent concerns about sound related impacts very seriously and will continue to work to address them.

How is the Town responding to recent complaints regarding sound from the turbine?

Since Wind I began operations there have been sporadic reports of noticeable sounds from the turbine from several property owners near the facility. The Town takes residents' concerns very seriously. Upon first hearing about potential sound issues, the Town immediately notified the manufacturer and the turbine operation was restricted so it would not operate at wind speeds of 22 miles per hour or above. The manufacturer then evaluated the machine's systems and operations during a planned shutdown to ensure it is operating within the manufacturer's standards. Any problems identified during the manufacturer's evaluation will be corrected. The restriction on Wind I's operation was lifted after the review.

In early June, the Town hired an acoustical engineering firm to perform a sound study and staff met with interested property owners to discuss the proposed study. The scope of work was shared with the residents and their consultants to get input on various study elements, including the duration of, and locations for taking measurements. In early July, an update was mailed to residents within a half-mile of Wind I and Wind II and emailed to a contact list to let residents in the area know about study progress and next steps. The update was also posted on the Town's website. When completed, the Sound Study Report will be published on the Town's website and shared with abutters. Updates will continue to be distributed and posted as the Wind Energy Project progresses, including updates on the construction of Wind II.

How are the sound impacts being assessed?

To address potential turbine sound impacts, the Town directed its engineering firm for the project, Weston & Sampson, to hire an acoustical engineering firm. Harris Miller Miller and Hanson (HMMH) of Burlington, MA, was retained in June to conduct the study. In collaboration with Wind I neighbors and their acoustical engineering consultant, Noise Control Engineering, the Town and its consultants developed a scope of work for the sound study. Sound monitoring took place at locations within a half-mile radius of Wind I and Wind II between June 18 and June 28. The study included:

Continuous sound measuring microphones placed at:

- 211 Blacksmith Shop Road
- 124 Ambleside Drive

Short term sound measurements were taken periodically, and microphones placed at:

- 161 Blacksmith Shop Road
- 27 Ridgeview Drive
- Intersection of Research Road and Thomas B. Landers Drive
- Cul-de-sac at the end of Durham Road

In addition, to correlate sound measurements the following data were collected:

- Near surface wind speed and direction at 10-meters above ground
- Wind speed and direction at the hub of the turbine (80 m above ground)
- Power output data log
- Alarm conditions and logs

To supplement the sound measurement data collected, the Town sent log sheets to approximately 230 property owners within a half-mile of Wind I and



Wind I turbine completed.



Wind II. Neighbors were asked to record their perceptions of sounds from the turbine during and after the sound measurements were being taken. This anecdotal information will be compared with data collected by the microphones and will be helpful in correlating the sound levels on the recordings with the neighbors' experiences.

During the 11-day monitoring period for the study, the turbine operated through a range of wind conditions from below the cut-in wind speed of 7.8 MPH to the rated capacity of more than 26.8 MPH. This allowed the team to capture a variety of wind speed conditions.

The results of the sound study will be shared with the public once the report is completed. The Town anticipates this will be in mid to late August.

How can I stay informed?

If you would like to receive updates by email, please send an email to falmouthwind@gmail.com with *subscribe* in the subject line. You may also visit the Town's wind website by visiting the Home page at www.falmouthmass.us and following the link to the Energy Committee under the Departments listing. Monthly updates of energy production and carbon offsets are available at the PowerDash website – www.powerdash.com/systems/1000160.

Glossary

Cut-in Wind Speed: The wind speed at which a turbine starts to operate and produce electricity. Wind I's cut-in speed is 3.5 meters per second (7.8 miles per hour).

Kilowatts (kWh) and Megawatts (MWh): The kilowatt hour is a measure of energy equal to 1000 watt hours (energy in watt hours is the multiplication of power in watts and time in hours). The kilowatt hour is most commonly known as a billing unit for energy delivered to consumers by electrical utilities. Megawatt hours are often used for metering larger amounts of electrical energy to industrial customers and in power generation.

Nacelle: The housing for the generator and other turbine components of a wind turbine, it sits on top of the tower.

Renewable Energy Certificates, or RECs: also known as Green tags, Renewable Energy Credits, are tradable, non-tangible energy commodities that represent proof that 1 megawatt-hour (MWh) of electricity was generated from an eligible renewable energy resource. These certificates can be sold and traded or bartered, and the owner of the REC can claim to have purchased renewable energy. These have value of \$40 to \$45 per MWh (\$0.04 to \$0.045 per kWh) to the Town of Falmouth, based on contracts with the Cape and Vineyard Electrical Cooperative and Massachusetts Clean Energy Center (formerly Mass Renewable Energy Trust).

Virtual Net Metering: Part of the MA Green Communities Act of 2008, net metering allows excess electricity generated by Wind I and Wind II to be credited to the Town's aggregate electricity accounts.

WWTP: The Town of Falmouth's Wastewater Treatment Plant, which is located off Blacksmith Shop Road.

