Memorandum

To:

Sam Saltonstall, Peaks Island Environmental Action Team

Tim Vrable, Deputy Director, Efficiency Maine

From:

Mick Womersley, Associate Professor, Unity College

CC: Other partners, community members and UC supervisors

February 18th 2009

Report of a preliminary wind power site assessment at Peaks Island, February 17th, 2009

1) Peaks Island Environmental Action Team has been holding discussions with Peaks Island Council and Portland City authorities about the possibility of a wind power installation on various sites owned by the City. A request was made for assistance with wind assessment and planning. Unity College has a nascent program in Community Wind Assessment, is interested in partnering with Efficiency Maine on community and small wind project incubation and agreed to provide advice and possibly anemometry services to Peaks Island, subject to site details, preliminary assessments, and permissions being worked out.
2) Accordingly after an exchange of telephone calls and emails, a delegation from Unity College consisting of the lead faculty on the Community Wind Assessment program, Dr, Michael Womersley, Mr. Cody Floyd, a student who is learning wind assessment science, and accompanied by Katharine Roux, Environmental Educator working in community outreach for Efficiency Maine, together visited the island to perform a preliminary assessment of anemometry sites and possible turbine sites, meet with PEAT members and Peaks Island councilors, and to give an introductory public talk on wind power and wind assessment.
3) The basic physical situation of Peaks Island makes it a good option for community or commercial wind power development. The land mass is relatively low-lying in Casco Bay. It is open to the bay and the Gulf of Maine to the east. To the west lies the City of Portland. The height of land is 25-30 meters ASL. The primary land use is residential and vacation homes. The winter population is around 900, but the summer population may be as high as several thousand. The soils are thin, gravelly in places, and primarily found in small pockets with ample

ledge. Those areas without housing appear to be primarily second growth forest with a high proportion of conifers.

4) These data indicate that the wind shear (roughness) factor at the height of land, open to coastal winds, is somewhat more than the coastal standard of 0.1, somewhat less than the open farmland factor of 0.2.
5) According to the most recent wind energy resource map of Maine published by the National Renewable Energy Laboratory in 2007, Peaks Island has a coastal Class 3 wind resource of 6.4 -7.0 meters/second average annual wind speed. Taking a Weibull distribution of a lower bound Class 3 wind speed (6.4 m/s) on a coastal situation, with Weibull K of 2 and a near-coastal wind shear factor of 0.15, the following theoretical wind speed distribution is produced:

Wind Speed Bin (m/s)	*Wind Probability (f)*
1.00	0.05257
2.00	0.09697
3.00	0.12708
4.00	0.14025
5.00	0.13748
6.00	0.12258
7.00	0.10067
8.00	0.07673
9.00	0.05454
10.00	0.03627
11.00	0.02263
12.00	0.01327
13.00	0.00732
14.00	0.00380
15.00	0.00186
16.00	0.00086
17.00	0.00037
18.00	0.00015
19.00	0.00006
20.00	0.00002

6) These data from a projection should be validated by anemometry before making a significant wind turbine investment, and matched to a specific proposed turbine make and model to determine annual and monthly (for net metering) KWH output and economic feasibility, but the immediate conclusion is that it may be worth proceeding to the anemometry study phase.

7) The PEAT, with a small number of other members of the Peaks Island community, is currently considering a small to medium scale grid tie wind turbine in the 50-100 KW range suitable for net metering of municipal and other public building electricity consumption, organized in accordance with Maine PUC rules found in Title 3, chap 313, Chap 315, and, depending on the form of the organization set up to own and manage the turbine, possibly the PUC provisional rule on shared ownership (Docket 2008-410). Net metering provides for an economy to small scale that may make such an installation cost effective, subject to a fuller analysis being performed after the anemometry stage data is collected and analyzed. The island's relative lack of 3-phase electricity distribution lines in suitable height-of-land locations either constrain the location of such a turbine, or are likely to add the cost of an extended 3-phase supply line to the cost of installation.
8) Less likely, but still possible, is that the island community might consider a larger scale turbine in the 100KW-1.5MW or larger range. The island has an underwater power transmission line, presumably of relatively high capacity sufficient to service the many residential accounts, and to connect a larger scale turbine to the terminal of this transmission line would appear relatively easy compared to other sites currently in consideration, or already commissioned, for large scale wind power in Maine. The economies to large scale with such an installation might make the cost of connection a less significant factor than it is with the 50-100KW range machine in 7) above. The best incentive for such a turbine might be found in the sale of Renewable Energy Credits.
9) The Peaks Island Environmental Action Team (PEAT) represents a community group likely to be capable of organizing community support for either option 7) or 8) above. Significant amounts of community outreach and organizing would be required. The PEAT has a number of retired professional people capable of organizing this support.
10) The PEAT and supporters and Peaks Island councilors present at the community meeting on February 17th now understand that any of choices 7) or 8) above represent a wind turbine likely taller than the existing height of land of the island, and clearly visible from all directions, including the view from portions of the City of Portland. This viewshed disruption is the primary negative environmental effect of either option.
11) Together, Peaks Island Council, the City of Portland and PEAT appear collectively capable of planning and managing the installation and commissioning of a wind turbine, assuming professional wind assessment and planning help are available, and assuming the use of contractors and company technical representatives at the installation and commissioning phase.
12) An excellent anemometry study site is available, consisting of an approximately 80-foot (24 meter) tall World War Two-era naval watchtower at or close to the height of land. The site is at 43 degrees, 39 minutes, 38.59 seconds north latitude, 70 degrees, 11 minutes, 17.38 seconds west longitude. The tower is of sturdy concrete construction with a staircase in reasonable repair leading to the roof. A set of solid, quite new, galvanized steel brackets are already attached to the building, these having been abandoned after the decommissioning of a cable TV

receiver dish. The tower belongs to the City of Portland. From the top of the tower, an unimpeded 360-degree view of Casco Bay and the open sea is permitted. This existing tower thus sits directly in the relevant air mass to perform an anemometry study for Peaks Island.

13) To set up this excellent site for a full-blown anemometry study is relatively inexpensive. The following rig would suffice, and allow for a full set of wind speed data and wind rose data to be collected over the course of one year (recommended for turbines under 100KW), or two years (recommended for larger turbines):
    a. Fabricate a small (roughly thirty-foot) galvanized steel tube anemometer tower, taking the height to 40 meters
    b. Attach a standard NRG lightning conductor to the top of this tower
    c. Attach two banks of double NRG #40 anemometers (total four) and two directional vanes at the 30 and 40 meter AGL height respectively, on standard NRG anemometer brackets to avoid wind shadow
    d. Assemble the galvanized steel tower to the existing brackets on the top of the naval watchtower
    e. Ground the lightning conductor with 6-gauge braided copper cable to a 6 foot ground rod, or several 4-foot ground rods, in soil at the base of the tower. Use heavy-duty lightning conductor p-clips to attach the ground cable to the tower
    f. Place the computer logger in the upper storey of the watchtower building. A hole already exists to run the anemometry wires
    g. Unity College already has most of this equipment available, once retrieved from current sites and serviced for re-use. A small expense is required to provide the necessary small galvanized steel tower, transportation, and incidentals. We would "rob" a much larger 60-meter anemometer tower to provide some, although not all of the equipment. If a community wind assessment site requiring the original tower were to emerge, some top-up equipment would be needed at that point.
14) The data from such a study, especially a two-year study, would go some ways to validating offshore wind maps for this section of the Maine coast, and would thus be relevant to any future offshore wind power development in the wake of the Governor's Ocean Energy Task Force report expected this year.
15) Because of the value of this data to the state, and the ease and small expense of its collection, we recommend that such a study be undertaken by Unity College with support from Efficiency Maine, at the Peaks Island site, assuming permission from the City of Portland to use the site, whether or not a Peaks Island wind development goes ahead on it's own.
16) Unity College would also undertake to analyze the data collected for any future Peaks Island turbine project, and to make all data available to the state, the federal National Renewable Energy Lab or other agencies, and the general public on request.

This concludes this preliminary site assessment.

Please refer any questions to

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