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A Review of "Small-Scale Wind Turbines – Policy Perspectives and Recommendations for the Municipality of the County of Kings"

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1. Introduction

With rising world energy costs and increased reliance on energy imports from unstable regions of the world, the need for indigenous sources of energy, based upon renewables, has never been greater. This is particularly true in Nova Scotia, where almost all of the province's primary energy consumption is met by imported energy sources.

The Municipality of the County of Kings has proposed changes to their municipal Bylaws to allow the installation of "small-scale" wind turbines (i.e., those with capacities less than 100kW) for households and farms. The changes to the Bylaws were based upon a report, *Small-Scale Wind Turbines – Policy Perspectives and Recommendations for the Municipality of the County of Kings* by the Dalhousie School of Planning.

This paper reviews the Dalhousie School of Planning report (hereafter referred to as the "Report"), the proposed Bylaws, and makes recommendations with respect to how the County of Kings should proceed with encouraging the development of small-scale wind turbines.

1.1. Glossary

Customer-generator. A household or farm that operates an on-site, small-scale renewable energy system connected to the grid. The customer-generator is a "customer" when on-site generation is less than on-site demand and is a "generator" when on-site generation exceeds on-site demand.

Net-billing. A dual-register system that records the customer-generator's consumption and production in separate registers. In a net-billing system, the customer's electrical supplier pays the customer for any renewable energy generated.

Net-metering. A single-register system that records the customer-generator's consumption and production in a single register. In a net-metering system, the electrical supplier can pay for excess generation only. (Note that NSPI does not pay for any excess generation.)

Stand-alone system. A small-scale generator that is not connected to the provincial grid.

2. General comments on the Report

The Report makes a number of claims that need clarification as they can mislead readers; this section examines some of these claims (shown in *italics*).

> ***Large-Scale Wind Turbine:*** *Turbines with rated output capacities of greater than 300 kW. Large-scale wind turbines contribute electricity to the grid for resale and profit.* (Glossary, page 7)

It is unclear why this definition was chosen, as NSPI requires any turbine greater than 100kW to be interconnected with a contract signed by an independent power producer and treated as a "large-scale wind turbine". Furthermore, if the 300kW capacity is selected, there is a "grey zone" between 100kW (small-scale wind turbine maximum) and 300kW (large-scale wind turbine minimum) that is not defined.

> ***Off-grid:*** *A site that operates independently from the electrical grid, usually in rural environments. The wind turbine provides the primary source of power.* (Glossary, page 8)

Not all off-grid applications rely on wind as the "*primary source of power*". The choice of equipment is site and application specific.

> *Maximising the potential of its wind resources for energy generation proactively responds to meeting the green energy targets of Nova Scotia Power and the Kyoto Protocol, reducing the County's contribution to global climate change.* (Introduction, page 10)

Nova Scotia Power's "green energy targets" will do little to help reduce Nova Scotia's greenhouse gas emissions.

If one of the objectives for introducing small-scale wind energy into the County of Kings is to reduce "*the County's contribution to global climate change*", then it will be necessary to ensure that each approved installation maximizes the use of the wind. There is nothing in the proposed policy to approve sites based upon their output.

In short, will the County of Kings approve small-scale wind turbine applications on a first-come first-served basis, or will they be awarded based on greenhouse gas reduction potential?

> *As residential dwellings consume 8 kW annually and average farms use about 15 kW per year, one small-scale wind turbine can meet site specific power*

> *demands for these land uses.* (Section 2.2, page 16)

The unit of electrical consumption is the kilowatt-hour (kWh), not kilowatts (kW). The kilowatt is a measure of instantaneous demand. The document should state that the average annual residential consumption is roughly 10,000 kWh. The farm use should also be modified. Turbines should be sized to match the annual consumption of the property, not the instantaneous demand.

> *Small wind turbines can pose a threat to birds, but reports of bird deaths are rare. Siting a wind energy system away from migration routes or bird nesting and feeding sites minimises potential conflict.* (Section 2.5.9, page 21)

Turbine placement must take both bird and bats into account, as wind turbines have been found to cause bat mortality.

> *The public nature of activities within institutional zones makes them inappropriate for locating small-scale wind turbines.* (Section 4.1.2, page 30)

The purpose and reasoning behind this recommendation is unclear. Institutionally zoned land should be subject to the same regulations as commercially zoned land. Small-scale wind turbines have less chance of causing loss or damage than fuel tanks sited near institutional buildings, such as the one found near the road by the Annapolis Valley Regional Hospital.

The installation of security measures such as a simple wire fence around a tower's foundation would reduce the likelihood of unwanted activities taking place. As an example, in Iowa a school district has installed turbines to offset its energy bills and reinvested the savings into education programs; a picture of the installed turbines can be found at http://www.spirit-lake.k12.ia.us/%7Eapeck/bg/building.htm.

> *Currently, NSPI offers a small-scale net metering program to consumers who choose to develop small-scale wind turbines or other types of renewable energy. To qualify for the program the consumer's energy output must not exceed 100 kW.* (Appendix 5, Page 61)

This omits the fact that NSPI has a 10MW cap on the total installed capacity of net metering equipment being connected to the provincial grid, meaning that the sum of all nameplate capacities of renewable equipment cannot exceed 10MW. As shown in Table 1, the number of possible net metering installations depends upon the size of the

equipment; as the number of "large-sized" installations increases, the number of "small-sized" installations decreases.

Table 1: Sample combinations of renewable energy installations

Nameplate capacity	Maximum number of renewable installations
100 kW	100
10 kW	1,000
1 kW	10,000

NSPI's decision to have a 10MW cap on net metering installed capacity is province-wide, meaning that there will be a limit to the number of possible renewable energy installations in the County of Kings. If net metering gains in popularity across the province, potential installations that meet the County of Kings requirements may be barred because of this cap.

3. Comments on proposed amendments to Bylaw 75

The Report proposes a number of amendments to Bylaw 75, the County's Land-Use Bylaw. A number of these amendments need clarification; they are listed in *italics* and discussed below.

> *Power generating small-scale wind turbines primarily provide power for on-site usage; at minimum, 50 percent of generated power must be consumed onsite.* (1.130)

There is neither a scientific nor an engineering basis for requiring the customer-generator to consume a minimum of 50 percent of generation. Under ideal circumstances, a customer-generator would supply the grid with exactly the same amount of power as withdrawn from the grid, making the customer-generator's net annual consumption zero kWh. (It should be made clear that the customer-generator still pays a monthly connection charge to the utility.)

If the customer-generator consumes less than 50 percent of the electricity generated onsite, NSPI is not obligated to pay the customer-generator for this excess. Therefore, it is not in the customer-generator's interest to consume less, as the "excess" electricity is being supplied without cost to NSPI.

Furthermore, if such a requirement was put in place, it is unclear how it could be enforced because:

- The wind resource, and hence the turbine output, varies from year-to-year.
- The customer-generator's demand can vary from year-to-year.

Finally, without a dual-register meter, it is impossible to determine the volume of electricity supplied by the customer-generator to the grid. NSPI uses a single register metering system (i.e., when generation exceeds local consumption, the meter is rotated "backwards").

> *Climbing Apparatus - The ladder located on the turbine tower used for climbing and maintaining the turbine.* (1.130.1)

Many small scale turbines use a tilting mechanism to allow the tower to be raised and lowered; in these cases, there is no climbing apparatus required for the turbine. This requirement suggests that all turbines require a climbing apparatus, which is not true.

> *One small-scale wind turbine shall be permitted per lot.* (3.2.15a)

This is overly restrictive. In some cases, it may be more cost effective for a customer-generator to have multiple turbines, potentially of differing sizes, placed at different locations on the lot. Furthermore, permitting multiple turbines allows the customer-generator to add equipment as funds become available or as requirements change.

> *The total height shall not exceed 170 feet.* (3.2.15b)

This may be too restrictive and may require variances due to local circumstances.

> *The turbine shall not be mounted on or attached to any other structure.* (3.2.15g)

Some customer-generators may chose to attach their tower to the side or roof of their house, barn, or other structure. There is no obvious need for this clause.

> *Submit authorisation documents from Transport Canada and NavCan.* (3.2.15h)

NavCan and Transport Canada must be informed if a new tower exceeds 20 metres in height only. This fact should be reflected in the Bylaw.

> *Submit an Environmental Impact Assessment (only for sites located all or in part in an O2 zone).* (3.2.15h)

The Nova Scotia Department of Environment and Labour does not require Environmental Impact Assessments for wind generating equipment less than 2,000 kW (2MW). Unless the proposed wind turbine uses gear oil that could leak into a water supply, it is unclear why an EIA is required for the O2 (Water Supply) zone.

4. Other recommendations

4.1. Local environmental assessment

The size of most of these turbines means that their environmental impact will be quite limited. However, it would be worthwhile for the County of Kings to require the turbine installer to inspect the site for birds and bats.

4.2. Turbine oversizing

Although not the responsibility of the County, anyone submitting an application to install a turbine should be made aware that there are no financial gains to be obtained by using a turbine that generates more power than is consumed by the customer-generator annually.

4.3. Turbine classifications

The Report follows NSPI's net metering limits on turbine sizes (i.e., any turbines with a capacity less than 100kW), meaning that household-sized turbines with capacities of a few kilowatts (costing under $10,000) are aggregated with farm-sized or industrial-sized turbines of capacities approaching 100kW (costing upwards of $250,000).

It is recommended that any Bylaw create two classes of turbines:

- Turbines with capacity of 10kW or less, typically used for home power generation.
- Turbines with capacity greater than 10kW (with a ceiling of 100kW).

Turbines with capacity greater than 10kW should be subject to more scrutiny than those of smaller capacity, as their environmental impact can be considerably greater than the smaller turbines. If fees are to be charged for the registration of turbines, they should be allocated by size as well.

4.4. Stand-alone systems

Some households and farms may require a non-grid interconnected stand-alone system; for example:

- A cottage owner may not want to interconnect to NSPI.
- A battery-based electric-fencer can be powered from a small wind turbine.

In these cases, the installation is not connected to NSPI's grid. There is little said about these systems in the Report. The County should allow for this type of system and make provisions for it in the Bylaws.

4.5. County of Kings' wind atlas

The Report suggests that one of the reasons for encouraging the use of wind turbines is to reduce the County's contribution to global climate change. This is a laudable goal; however, in order that it be achieved, it will be necessary to maximize the output of any wind turbines installed that are installed in the County. It is recommended that data on wind speeds be collected throughout the County in order to develop a wind atlas. The atlas could be used to assist interested parties in determining the best sites for their turbines.

4.6. NIMBY, BANANA, NOPE, and POOL[2]

As has been seen in various jurisdictions around the world, the installation of almost any form of technology can result in a backlash from one or more special interest groups. In order to encourage the development of wind technology in the County of Kings, the benefits of wind generated electricity should be explained to the residents. For example, the installation of wind turbines helps to protect agricultural land from residential or commercial development.

Similarly, studies suggest that tourism does not decrease after the installation of wind turbines near scenic areas; for example, see http://www.bwea.com/pdf/mori.pdf.

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[2] NIMBY – not in my backyard. BANANA – build absolutely nothing anywhere near anything. NOPE – not on planet earth. POOL – please on our land.