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### **WIND TURBINE AT SUTTON WATER POLLUTION CONTROL PLANT**

*(Regional Council at its meeting on January 22, 2009 adopted this report with the following addition:*

- 1. That the Regional Clerk forward a copy of this report to the local municipalities.)*

The Finance and Administration Committee recommends that Council adopt the recommendations contained in the following report dated December 10, 2008, from the Commissioner of Corporate Services.

#### **1. RECOMMENDATIONS**

It is recommended that:

1. The Region not proceed with installation of a wind turbine at the Sutton Water Pollution Control Plant at this time.

#### **2. PURPOSE**

The purpose of this report is to:

1. Inform Council of the findings from the Detailed Wind Energy Feasibility Study at the Sutton Water Pollution Control Plant.
2. Obtain Council's approval to continue investigating an approach towards achieving the benefits of supplying "green" generated power to Regional facilities.

#### **3. BACKGROUND**

The Region recognizes the impacts of its energy use and has been investigating the application of wind energy as one of the possible renewable energy sources for its municipal operations. The Region completed a Wind Pre-feasibility Study in the Towns of Georgina and Whitchurch-Stouffville, and prepared a wind map analysis for evaluation of wind speeds in York Region. These studies examined the wind resource quality, land use designations and constraints, as well as other factors affecting the viability of a wind energy project. Based on the results of these initial studies and mapping conducted at the

Sutton Water Pollution Control Plant (WPCP), this site was identified as preferred for potential wind energy development.

In January 2006, Regional Council approved proceeding with a Detailed Wind Energy Feasibility Study to determine the viability of installing a single wind turbine at the Sutton WPCP site. The objective of using “green” wind energy is to reduce the consumption from the power grid, hedge against rising energy costs and reduce emissions from traditional energy sources. Three turbine models were considered for this project with nameplate capacities of 50 kW, 600 kW and 2 MW. The Detailed Wind Energy Feasibility Study Report presents the wind resource assessment and energy yield analysis, technical and environmental constraints assessment, financial analysis and results of the public consultation session to determine project viability.

#### 4. ANALYSIS AND OPTIONS

The financial summary for the three turbines are summarized in Table 1. In all cases, net present value over the life of the turbine is negative, meaning a net cost to the Region over the long run.

Also shown at the bottom of Table 1 is the comparatively favourable cost of purchasing green power from third-party sources to offset the equivalent annual electricity generation.

**Table 1**  
Financial Summary of Green Power Scenarios

<b>Financial Parameter</b>	<b>Enercon E82</b>	<b>Fuhrlander FL-600</b>	<b>Entegritty EW50</b>
Nameplate Turbine Power	2 MW	600 kW	50 kW
Development Capital Costs	\$5.7 million	\$2.3 million	\$612,000
First Year Revenue	\$481,000	\$114,000	\$4,200
First Year Costs	\$91,000	\$68,000	\$8,800
First Year Net Cash Flow	\$390,000	\$46,000	-\$6,900
<b>Net Present Value</b>	<b>- \$1.2 million</b>	<b>- \$2.4 million</b>	<b>- \$840,000</b>
Alternative Green Power Purchase - Annual Costs	\$125,000	\$33,600	\$1,100
Alternative Green Power Purchase - Present Value	-\$1.5 million	-\$413,800	-\$13,700

Note:

- Turbine purchase outright (no financing).

- Each turbine model was assumed to have an equipment project life of 23 years
- Discount rate was assumed to be 6%
- Electricity value under RESOP at 11 cents/kWh plus 0.5 cents/kWh of Federal ecoEnergy funding for the first 10 years of the project. (Note: EcoEnergy funding of 0.5 cents/kWh may not be available at the time of project completion)
- Buying Green Power scenario used a premium of 3.0 cents/kWh

#### **4.1 Average wind speeds lower than anticipated at Sutton Water Pollution Control Plant**

As part of the Detailed Wind Energy Feasibility Study at the Sutton WPCP a 60 metre meteorological tower was erected for wind resource monitoring for one year. The wind resource assessment and energy yield analysis is to assess the unit to be installed for the site. The average wind speed for the 12 months of on-site wind monitoring is 5.1 m/s at a height of 60 metres. This is a significantly lower than the average wind speeds at commercially viable wind energy sites utilizing multiple turbines. A 6.5 m/s threshold is considered a reasonable lower limit for development of wind power projects in Ontario.<sup>1</sup>

The existing Sutton WPCP typically uses approximately 1,100 MWh of electricity in a given year. Table 2 outlines the estimated power generation per year for each turbine model and expresses the values as a percentage of Sutton WPCP existing consumption.

**Table 2**  
Total Estimated Annual Power Generation by Wind Turbine Model

<b>Turbine Model</b>	<b>Rated Power</b>	<b>Annual Generation (MWh)</b>	<b>Percentage of Energy Used by Sutton WPCP</b>	<b>Hub Height</b>	<b>Rotor Diameter</b>
Enercon E82	2 MW	4,168	379%	100 m	82 m
Fuhrlander FL-600	600 kW	1,121	102%	75 m	50 m
Entegreity EW50	50 kW	37	3.4%	36.5 m	15 m

#### **4.2 Technical constraints assessment conducted**

The technical constraints assessment investigated the electrical system integration, site access requirements and a preliminary conceptual layout and design.

Two physical electrical system connection configurations were investigated: direct connection to the local distribution grid and “behind-the-meter” (net metering) connection at the Sutton WPCP. Council approved in its January 2006 decision that the

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<sup>1</sup> Analysis of Future Wind Farm Development in Ontario by Helimax Energy Inc. for Ontario Power Authority, March 2006, accessed at <http://www.waterkeeper.ca/documents/2008-11-helimax2006.pdf> in December 2008; and the Ontario Wind Resource Atlas, accessed at [http://www.lio.ontario.ca/imf-ows/imf.jsp?site=windpower\\_en](http://www.lio.ontario.ca/imf-ows/imf.jsp?site=windpower_en) in December 2008.

Region limit its use of wind energy to behind-the-meter applications to avoid the provincial government's requirement to establish a municipal business corporation to generate power to sell to the grid. The disadvantage of this approach is that it limits the size of the wind turbine to what the facility can itself use. Because of this, the 50 kW and 600 kW turbines would be appropriate for behind-the-meter connection, but the 2 MW turbine is too large. The direct connection to the local distribution grid was included in the Study because the municipal corporation requirement is currently being revisited by the provincial government, and is expected to change.

### **4.3 Environmental constraints assessment conducted**

As the Sutton wind energy facility would have a nameplate capacity of 2 MW or less a provincial environmental assessment was not required. It is important, however, to ensure that environmental costs associated with the project are minimized and any potential negative effects are prevented through careful site selection or are mitigated before irreversible harm is done to the environment. The environmental constraints assessment investigated the potential interactions between the project activities, environment components and socio-economic and cultural issues. Environmental, socio-economic and cultural issues addressed for the Sutton WPCP wind turbine were identified through consultation with federal and provincial agencies, local residents, and through the informed professional judgement of the analysis team. The following areas were addressed: surface and groundwater quality, terrestrial environment, birds and bats assessment, tourism, archaeology, public safety network, aeronautical issues, telecommunications, current land use, noise assessment, visual assessment and permits.

### **Carbon Dioxide (CO<sub>2</sub>) offset of a wind turbine**

The amount of Carbon Dioxide (CO<sub>2</sub>) offset by each wind turbine was calculated. Table 3 outlines the annual amount of CO<sub>2</sub> that is predicted to be offset by each turbine model.

**Table 3**  
**Annual CO<sub>2</sub> Offset by Each Turbine Model**

<b>Turbine Model</b>	<b>Tonnes of CO<sub>2</sub></b>	<b>Equivalent to Cars/Light Trucks</b>	<b>Equivalent to Litres of Gasoline Consumed</b>
Enercon E82 (2MW turbine)	1,009	202	410,663
Fuhrlander FL-600 (600 kW turbine)	270	54	109,890
Entegreity EW50 (50kW turbine)	9	2	3,663

Should a carbon trading market evolve, there would be financial value to the CO<sub>2</sub> offset. Typical average values in established markets are about \$25 per tonne. However, this is insufficient to have a significant impact on the business case for the Sutton WPCP wind turbine at this time.

## **Adjacent residential development impact**

No prohibitive environmental impacts of a single wind turbine at the Sutton WPCP were identified at the existing site, but there is the potential for future land-use conflict. The Sutton Secondary Plan identifies that the neighbouring sites are all low density residential development areas. See Attachment 1.

### **4.4 Public consultation on the Detailed Wind Energy Feasibility Study**

An open house style public consultation centre for the Detailed Wind Energy Feasibility Study was conducted on September 3, 2008 in the Town of Georgina. The purpose of the meeting was to provide community education on the project and to solicit input. Feedback from the public was solicited during the meeting and through a questionnaire. Many of the comments received were in support of wind energy development.

Regional staff have also engaged knowledge sharing with the Executive Director of the Windfall Ecology Centre, a local environmental community group, about the proposed 20-megawatt wind farm on Georgina Island (Pukwis Community Wind Park) being developed as a joint venture with the Chippewas of Georgina Island First Nation. The Sutton WPCP project area is approximately 9 kilometres southwest of the proposed Pukwis Community Wind Park.

Regional staff has been informed that the Town of Georgina has received correspondence from the Georgina Environmental Advisory Committee on their support for the proposed wind turbine at Sutton WPCP. Town Council received this correspondence with interest and has extended an invitation for the Region to make a presentation to Georgina Council concerning the proposed wind turbine project.

### **4.5 Alternative Green Power Options**

Wind projects have elicited interest from both local municipalities and other stakeholders wishing to commend the Region for showing leadership in the field. Below are options to consider that continue to support green power initiatives to demonstrate leadership and promote environmental initiatives.

#### **A. Purchasing more green energy through the electrical grid**

The Region could consider entering into an agreement to purchase clean, emission-free electricity for the Sutton WPCP through a green energy provider, such as Bullfrog Power. York Region in 2008 announced an agreement with Bullfrog Power for two facilities: York Region Administrative Centre and York Region Household Hazardous Waste Depot. The power purchased would be generated from emission-free wind and low-impact hydro generators right here in Ontario, that have met the federal government's

EcoLogo<sup>M</sup> standard for renewable electricity. The electricity purchased is injected into Ontario's electricity grid.

It is interesting to note from Table 1 that the purchase of green power would be comparable in cost or even *less* in cost than constructing our own wind turbine, while incurring less risk.

## **B. Support other local wind projects**

To support local wind projects, the Region could investigate entering into a public-private partnership or community cooperative membership with other local wind projects that are more viable such as the proposed Pukwis Community Wind Park on Georgina Island. Potential benefits include a more favourable allocation of risk, a collaborative approach and a large resource base to bring the project on-line.

## **C. Continue investigating renewable energy technologies at Regional facilities**

As a further option, the Region could continue investigating renewable energy technologies (i.e. solar, geothermal, wind) and monitor incentives to offset the cost of the installation of a renewable energy system. The feasibility of installing a wind turbine should be revisited in the future based on improvements in technology, changes to the Renewable Energy Standard Offer Program (RESOP), changes to maintenance and capital costs to install a turbine, and changes to identified constraints. The other candidate sites identified in the pre-feasibility studies for wind energy development that had more viable wind regimes recorded could be revisited to review if the identified land use constraints still apply. Regional staff are to review the presence of land use constraints by following up with the Ministry of Municipal Affairs and Housing on a request to amend the Oak Ridges Moraine Conservation Plan to include wind energy turbines as permitted uses and by investigating proposing an amendment to the Greenbelt Plan to allow electric power generation and transmission for renewable energy systems.

These initiatives align with York Region's commitment to reduce its ecological footprint and increase its environmental stewardship towards supporting locally generated "green" energy development. The initiatives support further green energy development, help reduce the environmental impacts of conventional electricity generation and increase the nation's energy independence.

## **5. RELATIONSHIP TO VISION 2026**

Implementation of the Wind Energy Study findings supports Goal 2 in Vision 2026 which includes "investigating and promoting alternative energy sources".

## **6. FINANCIAL IMPLICATIONS**

The economic viability of a wind project is heavily dependent on the wind resource quality. The Sutton WPCP site was identified as the site with the best wind resource that also met other important criteria established in the pre-feasibility studies. The financial analysis as part of the Detailed Wind Energy Feasibility Study report investigated the electricity cost savings, capital costs, operating and maintenance costs, financing options and an economic analysis of installing the three identified wind turbine models under several applicable scenarios. An analysis performed on the impacts of a potential annual carbon credit on the business case of purchasing a wind turbine presented that there was a marginal impact.

The preferred financial arrangement is to enroll in the RESOP. The Ministry of Energy has established the RESOP to help Ontario meet its renewable energy supply targets. Renewable wind energy generators are eligible to connect to the local distribution grid under RESOP and receive a preferential price of 11.08 cents/kWh for all electricity generated with an inflation index of 20 per cent of the contract price increases by the Consumer Price Index. This is currently almost twice the value of the offset electricity.

As noted in Table 1 in Section 4 the net present value for all scenarios over the life of the turbine is negative, meaning a net cost to the Region over the long run. Further, a sensitivity analysis demonstrated that none of the scenarios were sufficiently positive to justify moving forward with the project.

## **7. LOCAL MUNICIPAL IMPACT**

Green generated power supplied to Regional facilities would have a range of benefits to the local community. One of the main advantages includes improvements in Regional air quality and reduced combusting emissions of carbon dioxide and other pollutants that result from electricity made from fossil fuels such as coal, oil, or gas. Green generated power supplied to Regional facilities would help the Region meet its clean air requirements.

Locally generated power, or 'distributed generation', means less wires/infrastructure and associated upgrades, as well as greater electrical grid reliability and stability in the Region.

A "green" generated power project would be highly visible to the public and would demonstrate the Region's commitment to Vision 2026, Corporate Clean Air Strategy and Sustainability Strategy.

As noted in Section 4.3 and Attachment 1, there is the potential for future land-use conflict between the wind turbine and possible residential development in neighbouring areas.

## **8. CONCLUSION**

The installation of a single wind turbine at the Sutton WPCP was evaluated for environmental constraints, technical constraints, wind resource, and financial feasibility. Three different turbine models that represent a wide range of common commercial wind turbines were specifically investigated under two connection configurations and two purchase scenarios where applicable.

Unfortunately, the wind resource at the Sutton WPCP is insufficient to feasibly and comfortably install a single wind turbine at current electricity prices. Proposed development in the neighbouring area around the Sutton WPCP site presents additional constraints on the installation of the wind turbine models evaluated for the site.

The feasibility of the Region installing a wind turbine will be revisited should conditions change substantially, especially if the RESOP price increases or other revenue streams become available, e.g. carbon trading, or if wind turbine technology or costs improve.

Regional staff will continue to investigate other renewable energy technologies for Regional facilities as well as purchasing more green energy from third-party suppliers and supporting other local green energy projects. This would allow the Region to demonstrate commitment to reduce its emissions in Regional activities and operations and demonstrate environmental leadership by becoming a part of the solution towards promoting “green” energy.

For more information on this report, please contact Barry Crowe, Director of Property Services at Ext. 1684.

The Senior Management Group has reviewed this report.

*(The attachment referred to in this clause was included in the agenda for the January 8, 2009 meeting.)*