# Green Power Opportunities for the GTA-CAC

The Clean Air PARTNERSHIP

December, 2003

**Green Power Opportunities for the GTA-CAC**

# Table of Contents









# Executive Summary

This report was commissioned by the Greater Toronto Area Clean Air Council (GTA-CAC) to identify green power opportunities available for research and implementation at the municipal level. The report is divided into 5 sections, described below, and 3 appendices.

Section 1 provides a context for several important issues for municipalities considering participation in Ontario's emerging green power industry. It outlines electricity generation in Ontario, gives an overview of green power and green tags, discusses green power technologies, and concludes by discussing current market conditions.

Section 2 illustrates the three primary options municipalities have for obtaining green power. Municipalities can purchase green power, purchase green tags or self-generate green power or green tags. Both of these options can be done individually or collectively with other municipalities. This section also explains why municipalities may choose one or the other option.

Section 3 highlights four innovative municipal green power projects being initiated in Canada. Additional case studies are included in the appendices in the report "Green Power Opportunities for the GTA-CAC: Appendices."

Section 4 discusses some of the steps that are required in the beginning stages of implementation depending on the option being chosen and it also explores why municipalities may want to work with community groups.

Section 5 highlights issues for further study and explores next steps.

## Key Recommendations

The key recommendations stemming from the report are as follows:

1. Members of the GTA-CAC should take an inventory of the various green power resources in their area (e.g., landfill, wind, micro-hydro) to determine which technologies are most appropriate for development.

2. GTA-CAC members should prepare for an end to the price cap before 2006, by studying the purchase or self-generation options for electricity from green projects, because the price cap is not financially sustainable. Municipalities can potentially hedge against increases in the price of electricity when the cap has ended by purchasing or self-generating electricity from green power projects.

3. The GTA-CAC should advocate for the Ontario government to build on and expand existing green power production incentives and credits.

4. The GTA-CAC should study the steps of municipal participation, at the individual level or collectively, in green power self-generation projects such as LakeWind.




5. When developing or participating in green power projects GTA-CAC members should partner with local groups such as green power co-ops in order to spread risk, decrease costs and involve the local community.

6. If purchasing green power or green tags, municipalities should ensure that they are generated from a facility classified as Type III under the EcoLogo draft guideline for Renewable Low Impact Electricity.

7. The GTA-CAC should commission or conduct further research in order to:
    a. Assess current and future green power/green tag supply in Ontario;
    b. Estimate savings from load shifting to take advantage of on and off-peak pricing;
    c. Develop an RFP for the purchase of green power/green tags; and
    d. Begin preliminary negotiations with green power generators and secure power purchase agreements (PPAs).




# Introduction

"Green Power Opportunities for the GTA Clean Air Council" provides the GTA-CAC with a description of green power options, ways of obtaining green power, examples of innovative municipal projects, and green power opportunities for the GTA. It is a component of the first phase of the Renewable Energy Portfolio Standard, one of the commitments in the "Toronto and Region 2003 Inter-governmental Declaration."

Through extensive research, interviews and consultation, the study team investigated a broad range of green power opportunities for potential application by the GTA-CAC (see Appendix A). This report is a valuable resource for municipalities in the GTA who desire to obtain green power and hedge against the potential of rising electricity costs and supply uncertainty over the next 20 years.

In each section of this report *key concepts* are italicized and are explained in further detail in the Glossary at the end of this report.

# Section 1: Context

This section provides background on several important issues for municipalities considering participating in Ontario's emerging green power industry. It outlines electricity generation in Ontario, gives an overview of *green power* and popular methods of producing it, and concludes by discussing current market conditions.

## 1.1 Electricity Generation in Ontario

The Province of Ontario introduced a competitive electricity marketplace on May 1 2002, ending the nearly one century old monopoly held by Ontario Hydro. Today, municipalities can continue to purchase electricity from their *Local Distribution Company (LDC)* or they can sign a contract with an *Independent Electricity Retailer (IER)* licensed by the Ontario Energy Board.

The Big 3 electricity sources in Ontario are nuclear (41.3%), coal (25.3%) and hydro (24.3%). These traditional sources of electricity have negative impacts on the environment and are referred to as *brown power*. Brown power sources cannot be replenished by nature within the human time scale and can generate harmful by-products such as radioactive waste (nuclear), *greenhouse gases* and *smog forming pollutants* (coal, oil, natural gas)[1]. Table 1 illustrates the electrical generating sources in Ontario and their environmental impacts.

[1] Large-scale hydro is considered brown power due to the negative environmental consequences associated with development. http://www.environmentalchoice.com/products.cfm?cat=1




**Table 1: Ontario Electricity Sources 2001**

| Electricity Source | Negative Impacts | Ontario Generation (%)* |
|---|---|---|
| Nuclear | Radioactive material generation & storage; security risks | 41.3 |
| Coal | Greenhouse gas (GHG) emissions, smog precursors, mercury | 25.3 |
| Hydro | Land loss, ecosystem changes | 24.3 |
| Natural Gas | GHG emissions, extraction leakages | 7.6 |
| Other | - | 0.9 |
| Oil | GHG emissions, smog precursors | 0.6 |

** Source: Ontario Energy Board, 2003*[3]

## 1.2 Green Power

The definition of green power varies from entity to entity. This study uses the Federal government's *EcoLogo* draft guideline for Renewable Low Impact Electricity (discussed in Section 1.4), which categorizes green power as electricity generated from natural sources that cannot be depleted and are self-replenishing. These sources can generally be replaced, will always be available, can be sustained indefinitely, and are essentially non-polluting.

Purchasing green power to run their own operations is one way that municipal governments can promote sustainable energy and reduce air pollution, as the clean, green power they are buying displaces polluting sources of power like coal-fired generating stations.

The challenge is that once the electrons have been fed onto the grid, it is impossible to tell which ones come from "green" sources versus "brown", or polluting, plants, so green power consumers need a system which relates the energy that they use to the energy that a green power generator (wind turbine, solar panel, etc.) has fed onto the grid.

Currently in North America, there are three basic green power systems in operation. The Ontario versions of these systems include:

1. Purchasing a green power product (usually at a premium) from an *LDC* or Ontario Power Generation, who is then responsible for ensuring that they have bought or produced sufficient kiloWatts of power from EcoLogo-certified generators to match the total amount of green power purchased by their customers;

2. Buying "Green Tags" directly from the generator or through a third party. These tags are certificates transferring ownership of the environmental benefits (i.e. the quantity of pollution that is avoided by buying green power rather than conventional power) associated with a given quantity of green power to the purchaser. The owner of the generator then sells the power onto the grid as




regular, "brown" power, but the extra revenue from the sale of Green Tags allows these green generators to stay in business by covering their higher costs in recognition of the societal benefits associated with cleaner air and lower greenhouse gas emissions;

3. Purchasing or building an EcoLogo certified generator to meet part or all of the municipal electrical power requirements and feeding this power either directly into municipal facilities or onto the grid.

Note that if a municipal government intends to take credit for any of these actions in order to meet environmental or other commitments, it cannot re-sell any environmental benefits associated with purchasing green power, Green Tags or EcoLogo certified generators.

## 1.3 Green Power Certification

Determining which facilities should be classified as green power generators is very important. The Environmental Choice program, owned by Environment Canada and administered by an independent third party, has established stringent criteria for proposed green power generating facilities. Generators who meet the criteria are awarded the EcoLogo label of certification. EcoLogo generation facilities are classified as being either Type I, Type II or Type III. Type III facilities were built after 2001 and are the recommended source of green power. The Pembina Institute[ii] and the Ontario Sustainable Energy Association recommend green power purchases coming from Type III facilities as it encourages the development of new generation facilities.

Therefore, EcoLogo Type III generation facilities are the recommended source of green power or green tags (See Appendix B).

## 1.4 Green Power Technologies

Green power technologies take naturally occurring elements such as the sun, wind and water, and use them to generate electricity without creating harmful by-products. Currently, there are several forms of green power technology being used throughout Canada. The most common and cost-effective technologies for generating large loads of electricity are wind, *micro-hydro* and *biogas* (see Table 2 below and Appendix B).

This study focuses specifically on wind and biogas development in the GTA. This is because projects utilizing these technologies are already being developed (LakeWind, Thackeray landfill site). A primary example of wind technology is LakeWind, which allows municipalities with little or no ability to erect wind turbines in their community to participate in a wind farm development (see Section 3). In addition, both wind and biogas are cost-effective, proven technologies that are currently being utilized in the region. The following sections provide more detail on both wind and biogas.

In the long-run, green power technologies such as *micro-hydro* and *solar* may be attractive options for some municipalities in the GTA. Micro-hydro opportunities may be




especially attractive due to the low cost of generating power. However, at this time there is a lack of opportunities or projects to recommend for consideration by the GTA-CAC. As well, this study discovered a broad range of interest in solar power. However, previous research has shown that solar power is currently not a cost-effective generator of electricity on an industrial scale and is more appropriate for water and heating applications.[iii]

**Table 2: Common Forms of Green Power Technologies**

| Definition | EcoLogo Qualifying Criteria[iv] | Estimated Cost ($/kWh) | Project Lifetime (years) |
|---|---|---|---|
| Wind[v] | Protect birds | 0.08 - 0.12 | ~20 |
| Biogas[vi] | Maximum levels of air emissions and leachate controls in place | <0.10 | 15-20 |
| Micro-hydro[vii] | Small, run-of-river sites | <0.08 | >25 |
| Solar[viii] | Proper disposal of cadmium batteries | 0.15 - 0.20 | ~20 |

### 1.4.1 Wind

Wind turbines are mechanical systems that use blades attached to a drive shaft in order to capture the kinetic energy of the wind and generate electricity. Wind turbines are available in small operating units or as large *utility-grade wind turbines* (between 500 kW - 2 MW). A 750 kW wind turbine erected at Exhibition Place in Toronto, provides enough electricity for approximately 250 homes.[ix]

Turbine erection at Exhibition Place in Toronto. Courtesy of WindShare

**Proven Technology**

Utility grade wind turbines constitute the vast majority of wind power infrastructure in Canada. *Wind farms* are becoming increasingly more common, with installed capacity ranging from 9 MW to 200 MW. Canada had 238 MW of installed wind energy generating capacity at the end of 2002.[x]

**Cost: Competitive**

The cost of electricity from a wind turbine is dependent upon the wind resource of the area and the number of turbines built. Higher wind speeds and larger wind farms create greater economies of scale, and consequently lower electricity costs. In general, utility grade wind turbines generate electricity at a cost between 8 to 12 cents per kilowatt hour (kWh). Currently, traditional sources of electricity generation, such as fossil fuels and nuclear, produce power at a cost ranging from 3.5 to 7 cents/kWh.

**Used in GTA**

A highly visible 750 kW wind turbine was erected in December, 2002 at Exhibition Place in Toronto through a joint venture by WindShare, a local renewable energy co-operative and Toronto Hydro Energy Services Inc (THESI). As well, Ontario Power Generation (OPG) erected a 1.8 MW wind turbine at the Pickering Nuclear Generation Facility.



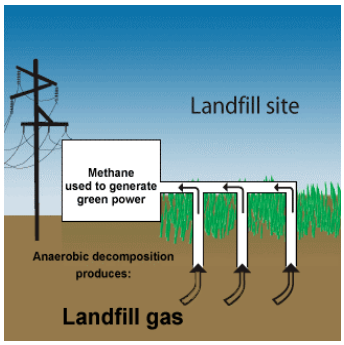

**Projects in Development**
WindShare and THESI have options to develop a turbine on land located at the Ashbridges Bay Treatment Plant in Toronto, Ontario. OPG has the potential to erect more turbines in Pickering and elsewhere within the GTA. The Ontario Sustainable Energy Association (OSEA) is developing a project called LakeWind (described in Section 3.4) which will allow municipalities in the GTA to participate in a wind-farm project.

**EcoLogo Certification**
EcoLogo certification requires wind farm developers to protect birds, which may be killed by the spinning blades of the turbine. However, numerous studies have shown that the number of birds killed per turbine per year is far lower in comparison to other man-made structures such as office towers and vehicles.[xi]

**Negatives**
Wind turbines are limited to areas with good wind resources, therefore not all regions in the GTA are suitable for development. Negative perceptions regarding turbines among the public (such as noise, bird mortality rate and aesthetic appeal) also need to be considered. However, public consultation and transparency among developers can mitigate these problems.

### 1.4.2 Biogas

Biogas is the product of anaerobic digestion of waste matter. The combustion of methane and carbon dioxide, produced by the anaerobic decomposition, can generate electricity. If allowed to escape into the atmosphere, these potent greenhouse gases have significant global warming impacts. Instead, biogas facilities convert these harmful gases into electricity.



The biogas process. Landfill gas is captured and burned to create electricity. Courtesy of THESI

The majority of biogas facilities are located at landfill sites, which generate the majority of methane and carbon dioxide emissions within the first 20 years of land filling.[xii] The capture and combustion of landfill gases for power creates *virtually no emissions* and displaces coal-fired electricity, further reducing greenhouse gas emissions and air pollution.

**Proven Technology**
Electricity generation from landfill gas combustion is a proven technology used extensively throughout North America and Europe. Furthermore, Ontario regulation 232/98 requires all large landfill sites with a volume greater than 2.5 million tonnes of waste to capture gas emissions.[xiii]

**Cost: Competitive**
Landfill gas capture is one of the most cost-effective methods of generating electricity, second only to micro-hydro. Electricity production from Toronto's landfill gas facilities generates $2 million/year for the City, in addition to providing an acceptable rate of return to the energy contractors.[xiv]




**Used in GTA**
Toronto generates 56 MW of electricity from three landfill sites - Keele Valley, Brock West and Beare. The electricity produced serves the needs of 36,000 homes and reduces the amount of GHG being emitted by approximately 100,000 tonnes annually.[xv]

**Projects in Development**
Toronto Hydro Energy Services Inc. (THESI) in conjunction with the City of Toronto has performed feasibility studies on landfill gas capture at the Thackeray Landfill site in Toronto. Thackeray is the fourth largest landfill site in Toronto. Municipal governments within the GTA are encouraged to take stock of the landfill resources within their jurisdiction to determine the opportunities for biogas production.

**EcoLogo Certification**
EcoLogo certification sets stringent criteria for maximum levels of emissions of air pollutants and leachate management from landfill sites recapturing biogas.[xvi]

**Negatives**
Trace components of hydrogen sulphide, mercaptans and non-methane organic compounds may be present in landfill gas. The combustion of these gases may create nuisance odours.[xvii] THESI has indicated that open dialogue and transparency with the community reduced opposition. Stressing the environmental benefits of capturing landfill gas can also be effective.

## 1.5 Electricity Pricing, Conservation and Supply Act, 2002

On December 9, 2002 the Ontario government passed the *Electricity Pricing, Conservation and Supply Act, 2002.* This legislation caps the commodity price of electricity at 4.3 cents per kilowatt-hour for municipalities until 2006, retroactive to May 1, 2002. Therefore, if a municipality has agreed to purchase from an *LDC* or *IER*, they will pay the cap rate of 4.3 cents per kilowatt-hour.

It has been argued that the *Act* affects the supply of electricity by artificially depressing its true cost thereby removing the incentive to reduce consumption. It has cost Ontario taxpayers $1.03 billion from May 1, 2002 to Feb 26, 2003 to keep electricity costs artificially low[xviii] and according to the IMO, the average cost of power in the first year of the market being open was 6.2 cents per kilowatt-hour. The provincial government has had to pay the difference between the true cost of electricity and the price cap.

It has also been argued that the creation of a price cap has limited private development and new investment into renewable generating facilities. Therefore, although municipalities may wish to purchase green power, the price cap does not make it cost effective for retailers to offer it. As well, the price cap has caused *IER*s (e.g., Direct Energy) and *LDCs* (e.g., Toronto Hydro Energy Services Inc.) to cut back their green power retail programs.




## 1.6 Relative Costs of Electricity

Although fuel sources for green power are free (e.g., wind, solar, hydro), it costs more per kilowatt-hour to generate electricity from these sources than it does from traditional brown power sources. This is due to the higher capital cost of constructing green power facilities versus similarly sized brown power facilities. However, it should be noted that the coal and nuclear industries have received $17.5 billion dollars in subsidies over the last 50 years.[xix]

For example, electricity generated by non-renewable sources of power generation such as coal and nuclear costs approximately 3 to 4 cents/kWh in Ontario (up to 7 cents/kWh). Newer, renewable power sources such as wind and biogas can generate electricity at a cost between 8 to 12 cents/kWh.

To make green power more cost competitive with non-renewable forms of power generation, the Ontario government would need to implement production incentives and credits that complement those already created by certain Federal government programs and to support the construction of green power generators. This would create a more level playing field given the subsidies that are currently provided to brown power generators.

## 1.7 Funding & Incentives for Green Power

There are existing sources of funding and incentives for municipalities to develop and construct new green power projects. Both opportunities are described briefly below. See Appendix B for a more detailed discussion.

### 1.7.1 Funding

A common source of funding for municipal green power projects is the Federation of Canadian Municipalities (FCM). The FCM has two streams of funding that are available:

**Green Municipal Infrastructure Fund (GMIF)**

Through the GMIF, a municipal government can borrow at the preferred interest rate of 1.5 per cent below the Government of Canada bond rate. Public and private sector partners of municipal governments are also eligible for loans at attractive rates. GMIF finances up to 15 per cent (25 per cent in exceptional circumstances) of the capital costs of a qualifying project.

**Green Municipal Enabling Fund (GMEF)**

The GMEF is a $50 million Fund that provides grants to support feasibility studies until 2007. Grants cover up to 50 per cent of eligible costs to a maximum grant of $300,000. The application process to the GMEF is open year-round.

### 1.7.2 Incentives

The Federal government administers the $250 million Wind Power Production Incentive (WPPI) program, which pays wind power generators between 0.8 to 1.2 cents/kWh. The program is intended to cover a portion of the cost premium associated with wind power




generation. As well, the Canadian Renewable and Conservation Expense (CRCE) under the *Income Tax Act* provides significant tax benefits to wind developers.

**Current Ontario Programs Supporting Green Power**

Existing Ontario tax incentives for clean generation include:

- a 100% income tax write-off for assets that are used to generate clean, renewable energy,
- sales tax rebate on building materials purchased that are incorporated into facilities that generate electricity from clean, alternative or renewable energy sources,
- ten-year property tax holiday on eligible facilities that generate electricity using clean, alternative or renewable energy sources,

In addition, emissions reduction trading incentives mean that renewable energy projects, which displace electricity produced from coal or oil-fired plants, are eligible for an award from the annual Set-Aside Allowance. In 2002, Ontario awarded 1 tonne of nitric oxide and 3 tonnes of sulphur dioxide to the Port Albert Wind Farms.

## 1.8 Recommendations

The following are a list of recommendations for GTA-CAC members when considering participating in green power initiatives.

1. Members of the GTA-CAC should take an inventory of the various green power resources in their area (e.g., biogas, wind, micro-hydro) to determine which technologies are most appropriate for development.

2. GTA-CAC members should prepare for an end to the price cap before 2006, by studying the purchase or self-generation options for electricity from green projects, because the price cap is not financially sustainable. Municipalities can potentially hedge against increases in the price of electricity when the cap has ended by purchasing or self-generating electricity from green power projects.

3. The GTA-CAC should advocate for the Ontario government to build on and expand existing green power production incentives and credits.

4. If purchasing green power or green tags, municipalities should ensure that they are generated from a facility classified as Type III under the EcoLogo draft guideline for Renewable Low Impact Electricity.




# Section 2: Ways of Obtaining Green Power

It is not possible to track the flow of a unit of electricity once it has been fed into the grid. All electricity purchased from the electricity pool or grid and the bulk of this energy comes from a pool of conventional and a limited number of green power stations.

However, every megawatt-hour of green power that is contracted results in a megawatt-hour of electricity supplied into the grid from a renewable resource. The result is one less megawatt-hour of energy generated from conventional sources. Customers who choose green power are supporting their environmental commitments in this way

Municipalities have three basic options for obtaining green power. This section explains these three options in greater detail.

The goal of all three of these options is to use municipal government procurement to ensure that new EcoLogo-certified green power facilities are built and are putting "green" electrons onto the grid to replace "brown power". These options are simply different means of accomplishing this goal.

## 2.1 Option 1: Purchase Green Power

A municipal government can choose to buy a green power product from an electricity retailer or directly from a generator. In either case, the seller is responsible for ensuring that they meet the requirements of EcoLogo certification and that they have purchased or generated sufficient EcoLogo-certified low-impact, renewable energy to meet or exceed their customers demand. In Ontario, a green power supplier's obligation to inject electricity from renewable resources into the grid on behalf of customers is subject to third-party tracking, verification, and, if required, audit by the Independent Electricity Market Operator.

The retailer or generator will charge a premium on top of the regular cost of electricity for this green power product. The example below highlights an existing possibility for buying green power, but other green power products are expected once the provincial rules governing the electrical system have been clarified.

## 2.2 Option 2: Purchase Green Tags

Green Tags are certificates transferring ownership of the environmental benefits (i.e. the quantity of pollution that is avoided by generating electricity from a green power source rather than conventional power) associated with a given quantity of green power to the purchaser.

The owner of the generator then sells the power onto the grid as regular, "brown" power, but the extra revenue from the sale of Green Tags allows these green generators




to stay in business by covering their higher costs in recognition of the societal benefits associated with cleaner air, lower greenhouse gas emissions and no radioactive wastes.

Green Tags can be purchased directly from the generator or through a third party.[2] A single Green Tag is usually attached to a block of 1,000 kiloWatt hours (or 1 megawatt hour) of green power; to put this in perspective, the average home in Ontario uses about 800 kiloWatts per month.

It is important to note that the owner of a green power generator such as a windmill has to choose between selling their electricity as green power (Option 1 here, where the electrons and the environmental benefits are "bundled" and sold together) or as brown power plus Green Tags (Option 2 here, where the electron and the environmental benefit are "unbundled" and sold separately).

The principal advantage of Green Tags is that they require relatively little administrative infrastructure to start selling and can be offered to individuals as well as to large consumers such as municipalities. Purchasing green tags is also useful to municipalities for policy reasons. If municipalities have made the commitment to reduce air emissions (for example through the Mayor's Megawatt Challenge or Partners for Climate Protection), purchasing Green Tags can support and further this goal.

The principal disadvantage is that, since each Tag is essentially a one-time donation to a green power producer to recognize that the existing pricing system doesn't value the environmental benefits of non-polluting power, they don't necessarily ensure the long-term support required for investment planning.

Green power purchasing and Green Tags (options 1 and 2) are not mutually exclusive; however, it may mean buying the environmental benefit of a given kilowatt of green power twice. Green Tags, for instance, can offer a flexible pool of potential green power resources to complement long-term green power purchasing contracts. Section 3.3 discusses how the AUMA are using green tags to "top-up" their green power purchases.

## Green Tags and Emissions Trading

The federal government has not yet established a national carbon trading system, although one is expected.

Ontario has established an emission trading system for nitric oxide and sulphur dioxide emissions under the Environmental Protection Act through Ontario Regulation 397/01. According to the Emissions Trading Code, emissions reductions from renewable energy projects do not qualify for the creation of Emission Reduction Credit, but they may qualify for "Set Aside Reductions" (see section 4.10 of the Emissions Trading Code).

Green Tags are not currently a part of the emissions trading system. Purchasers of Green Tags could apply to the Ministry of the Environment for a set aside reduction

[2] Across North America, non-profit environmental group often act as the third party in this transaction. In Ontario, Green Tags Ontario (www.greentagsontario.com) is currently playing this role.




credit, but it is not certain that this application would be accepted nor would it likely be cost-effective. According to estimates contained in Regulation 397/01, set aside allowances and the associated emission reduction values specify as much as a 1.1 kg/MWh reduction in nitrogen oxide, 3.6 kg/MWh of sulphur dioxide, and 890 kg/MWh reduction in carbon dioxide; while the market for emissions credits in Ontario and Canada are still very new, prices achieved on similar markets in other jurisdictions are below the cost of the current price of a 1 MW Green Tag.

It is important to note that if all or part of the environmental benefits associated with the Green Tag is re-sold, then the environmental benefits associated with it cannot be claimed by the seller, i.e. a municipality cannot legitimately buy a Green Tag, resell some or all of the environmental benefits and still claim to the Tag for meeting environmental commitments.

### 2.1.1 Reasons for Purchase

Municipal purchasing of green power is a low-risk method of obtaining *emission offsets*. Emission offsets are important because they help municipalities achieve policy goals for healthy air, as well as Kyoto Protocol commitments. Municipal purchasing can also serve as a hedge against the potential of rising electricity costs over the length of the contract. Compared to self-generation (discussed in Section 2.2), purchasing green power requires a lower initial investment, although the cost of power per kWh is higher than self-generation.

The *Electricity Pricing, Conservation and Supply Act* has deterred private development and led to a limited supply of green power for retail. The OPG Evergreen program and GreenTags Ontario are the only retail programs of green power/green tags operating in Ontario. Another option for municipalities is to create an RFP for green power to attract third party sources. This is discussed in Section 3.3.

## 2.3 Option 3: Self-Generate Green Power

Municipalities also have the opportunity to generate their own green power. They can do this in one of two ways:

A) Self-generate green power and retire the green tags
B) Sell the power and retire the green tags

### Option A: Self-generating Green Power

Under this scenario an individual municipality generates its own green power, creating both electricity and green tags for its own consumption. Section 3.1 shows how the City of Kingston intends to self-generate green power by partnering in a wind farm development.

### Option B: Self-Generating Green Tags

In this scenario a collective of municipalities owns a green power generating facility and sells the electricity to the *spot market* or through *a power purchase agreement (PPA)*. The municipalities retain the green tags and retire them, taking credit for reducing their greenhouse gas emissions. Section 3.4 explores in more detail an example of this model, the LakeWind project.




### 2.3.1 Reasons for Self-generating Green Power

Municipal self-generation is proving to be a popular method for municipalities to obtain green power. There are several reasons for this:

**The Electricity Pricing Conservation and Supply Act**

The *Act* has deterred private development and led to a limited supply of green power. Therefore, municipalities are generating their own green power to overcome this.

**Price and Power Stability**

Self-generation guarantees a stable source of electricity in Ontario's unstable electricity market. It also provides a buffer against the potential of rising electricity costs over the lifetime of the project.

**Ownership**

There is a general preference to have ownership control in green power projects. Ownership allows self-generating municipalities (e.g., Kingston, Sudbury etc.) to internalize as much of the economic and environmental benefits of production as possible.

## 2.4 Recommendations

1. The GTA-CAC should study the steps of municipal participation, at the individual level or collectively, in green power self-generation projects such as LakeWind.




# Section 3: Municipal Case Studies

The following section highlights four innovative municipal green power projects being initiated in Canada. In addition, this section looks at why municipalities may choose to partner with community organizations. Additional case studies are included in Appendix C.

## 3.1 Greater Kingston Trade Winds Project

The Greater Kingston Trade Winds Project is a 36 MW wind farm development on Wolfe Island, Ontario. The project features a unique example of co-operation between government, industry, co-ops and institutions. Construction is expected to commence in the summer of 2004.

**Project Highlights:**
- 36 MW Wind Farm

**Estimated Cost:**
- $70-80 million

**Location:**
- Wolfe Island, Ontario

**Participants:**
- The City of Kingston
- Municipality of Frontenac Islands
- Hearthmakers Energy Co-op
- Federation of Canadian Municipalities (FCM)

**Funding:**
- Development money from FCM GMEF

### Participants

The City of Kingston, the Municipality of Frontenac Islands, Hearthmakers Energy Co-operative Inc., and the Federation of Canadian Municipalities are partners in the project.

### How it Works

Hearthmakers is available to perform *energy efficiency audits (EEA)* of residences, and *Industrial, Commercial and Institutional (ICI)* sector buildings. Participants of the EEA can then channel money saved from the energy efficiency retrofits towards purchasing green power from the project or use the savings to pay off the capital investment of the retrofit. For example, the City of Kingston intends on using money saved from the retrofit to purchase green power from the project.

### Selling the Power

The green power is expected to be sold via *power purchase agreements (PPAs)*. The exact structure of this is still being determined. The intent is to sell two thirds (2/3) of the green power to the *ICI* sector and the remaining one third (1/3) to the City of Kingston.

### Financing

The project is expected to cost between $70-80 million, with financing coming from a variety of sources, including: industry investors, Hearthmakers co-op members, the FCM GMEF and GMIF, and the City of Kingston.




## 3.2 Sudbury Wind Farm Project

The Sudbury Wind Farm Project is a proposed 50 MW wind farm to be developed near the City of Sudbury. The project is currently at the feasibility stage. Preliminary work includes the study of interconnection issues, completing *wind resource assessments (WRA)*, developing the business case, costing engineering estimates, and planning project deployment.

**Project Highlights:**
- 50 MW Wind Farm

**Estimated Cost:**
- $86 million

**Location:**
- Sudbury, Ontario
- Manitoulin Island

**Participants:**
- The City of Sudbury
- Northland Power Inc.
- REpower Wind Corp.
- Federation of Canadian Municipalities (FCM)

**Funding:**
- $100 000 from FCM

### Participants

The City of Sudbury, Northland Power Inc., and REpower Wind Corp.

### How it Will Work

The City of Sudbury has established a joint venture partnership with Northland Power Inc. for the development of green power projects. In addition, the City of Sudbury partnered with German company REpower Systems AG. and incorporated a subsidiary firm, REpower Wind Corp., within Sudbury. REpower Wind Corp. is currently establishing an office with assembly and marketing operations for the construction of turbines to be used in the wind farm.

The project is expected to consist of sixty six (66), 750 kW wind turbines constructed by the end of 2004. The choice of turbines and project rollout will depend on feasibility studies currently underway. Sites on Manitoulin Island, and near the City of Sudbury are under consideration.

### Selling the Power

The objective is to sell the power via *PPAs* to the *ICI* sector, including the City of Sudbury. Northland Power is negotiating with buyers for the green power and managing the contracts. In addition to PPAs, other mechanisms for selling the green power are under investigation, such as selling green tags to residences and small businesses. The joint venture intends to partner with an *IER* to market and retail the power.

### Financing

Construction of the turbines is estimated to cost $86 million. The City of Sudbury received $100,000 from the FCM GMEF to produce a business plan for their wind farm. The project partners are also planning to use the FCM GMIF to partially fund implementation of the project. In addition, Northland Power is planning to apply for the Wind Power Production Incentive (WPPI) as well as the Canadian Renewable and Conservation Expenses (CRCE).




## 3.3 AUMA Electric Aggregation Program

The *Alberta Urban Municipalities Association (AUMA)* Electric Aggregation Program is a pooled purchase of green power by 180 member municipalities. This project is a leading example of how municipalities can use their collective bargaining power to purchase green power.

**Project Highlights:**
- Municipal pooled purchase of green power
- On and off-peak pricing
- Green tag "top up"

**Estimated Cost:**
- N/A

**Location:**
- Province of Alberta

**Participants:**
- Alberta Urban Municipalities Association (AUMA)
- ENMAX

### Participants

Alberta Urban Municipalities Association and ENMAX, the LDC owned by the City of Calgary.

### How it Works

In late 2000, prior to Alberta deregulating the market, electricity prices were climbing and continue to climb. Municipalities wanted stable budgets and stable electricity prices. AUMA responded by developing a request for proposal (RFP) for a pooled purchase of electricity over 3 years for its members, including 2% green power. ENMAX won the RFP and has supplied 8,000 MWh of green power/year generated from wind farms.

On and off-peak pricing, which charges consumers cheaper rates for electricity during low demand times of the day, is included in the current agreement and allows cost savings of up to 2 to 3 cent/kWh by shifting some electrical loads from on-peak to off-peak times. The next RFP, which is under development for release in 2004, is also expected to allow municipalities different participation levels. For example, some municipalities may purchase 10% green power while others only purchase 3%. This will require ENMAX to offer power blends with different percentage levels of green power built in, or offer green tags to "top-up" green power purchase levels.

### Selling the Power

ENMAX signed *PPAs* with each of AUMA's 180 member municipalities at agreed upon rates and terms. Current PPAs will expire at the end of 2003 and AUMA is currently working on an RFP for the next 3 years. AUMA is confident it can get agreement from member municipalities to increase the green power component to 5-10% in the next RFP. This is due to a declining premium price for green power, and rising public support for municipal purchases of green power.

### Cost

Initial objections to the premium price of green power were overcome by showing its insignificance in a blended power product with 1% green, which was then increased to 2%. In 2000, the premium price of green power was 6 cents/kWh, which has now dropped to 2 cents/kWh due to higher power *pool prices* in Alberta[3], economies of scale and additional external market factors.

[3] The higher pool price of electricity in Alberta (8-9 cents/kWh) compared to Ontario's ~6 cents/kWh means the green price premium is smaller.




## 3.4 LakeWind

LakeWind is a unique community-owned wind farm project that is being developed by the Ontario Sustainable Energy Association (OSEA). It offers a truly innovative, cost effective and *turnkey* option for municipalities to participate in green power projects and meet their greenhouse gas reduction targets.

**Project Highlights:**
- Community-owned wind farm project
- 10 - 20 MW

**Estimated Cost:**
- N/A

**Location:**
- Ontario

**Proponents:**
- Ontario Sustainable Energy Association
- Toronto Renewable Energy Co-op
- Toronto Atmospheric Fund

**Funding:**
- $25 000 from TAF

### Proponents

LakeWind is being developed by the Ontario Sustainable Energy Association in consultation with the Toronto Renewable Energy Co-operative. The Toronto Atmospheric Fund is also supporting the development of the project. Feasibility studies have been completed and site selection for the wind farm is currently underway.

### How it Will Work

LakeWind is a proposed 10 - 20 MW wind farm to be owned 50% by an investment co-op and 50% by participating municipalities. The investment co-op plans to offer shares to investors to finance its half of the project. Participating municipalities would finance the other half.

The co-op is responsible for developing and running the wind farm, making LakeWind a turnkey facility for municipalities. LakeWind also allows municipalities that would otherwise not be able to initiate a green power project of their own to participate (e.g. communities that have poor wind regimes). See Appendix C for more details.

### Selling the Power

Power generated from the wind farm would be sold either directly to the spot market or to a consumer through a *PPA*. The investors in the co-op and the participating municipalities would receive a modest financial dividend from the sale of the power. This revenue stream would continue for 20 - 25 years over the projected life of the project. The cost of the project includes decommissioning of the turbines at the end of their expected lifetime.

Financial modelling done by OSEA has shown that self-generating in this way is the most cost effective method of obtaining green tags (see Appendix C). Participating municipalities can retire the green tags to fulfill greenhouse gas emission reduction obligations under programs such as the FCM's *Partners for Climate Protection.*

### Financing

Municipalities will finance their investment in the project through low cost financing offered by the FCM's Green Municipal Investment Fund (GMIF). Development money will also be provided through the FCM's Green Municipal Enabling Fund (GMEF). LakeWind could also apply to the Federal WPPI program to further increase the profitability of the project.




# Section 4: Steps to Begin Implementation

Once a municipality has chosen between the options of buying or self-generating green power, there are some decisions to make regarding implementation. This section explores these issues and also looks at the benefits of working with community groups.

## 4.1 Purchasing

Municipalities, acting individually or collectively, can issue an RFP for either green power or green tags. It is our recommendation that municipalities interested in an RFP, model it after the Alberta Urban Municipalities Associations successful green power project described in Section 3.3.

### 4.1.1 Issuing an RFP

When issuing an RFP for green power or green tags, members of the GTA-CAC could consider the following:

- The appropriate percentage of electrical requirements to be generated from green power based on local conditions and the experiences of other municipalities;
- The appropriate contract length and the price per kWh as well as the option to renew;
- The potential for individual municipalities to purchase green power by offering green tags as a "top-up"; and/or
- Allowing on and off-peak pricing for municipalities to shift their electrical load and reduce their costs.[4]

## 4.2 Self-generating

Municipalities, acting individually or collectively, can develop or participate in green power self-generation projects. The self-generation opportunities are summarized below.

### 4.2.1 Green Power

An individual municipality can self-generate its own green power similar to projects being developed by the City of Kingston and the City of Sudbury. A self-generation project could incorporate the following components:

- Wind or biogas facility located within municipal boundaries;
- Joint venture with local co-op, developer, *ICI* sector;
- Project development performed by co-op: *turnkey* operation;
- Use money saved from energy efficiency retrofits to cover financing cost/green power purchase; and/or

[4] These recommendations are based upon the AUMA example and their successful program, which is described in section 3.3.




- Development money from the FCM GMEF, capital loan from FCM GMIF.

### 4.2.2 Green Tags

Municipalities can collectively self-generate their own green tags. Section 3.4 discussed the LakeWind project being developed by OSEA.

- Wind or biogas facility located in Ontario;
- Sell the green power to the spot market or through a PPA, retire the green tags;
- Joint venture with other municipalities, local co-ops, developers, *ICI* sector;
- Use money saved from energy efficiency retrofits to cover financing cost; and/or
- Development money from the FCM GMEF, capital loan from FCM GMIF.

## 4.3 Working with Community Co-ops

Key municipal supporters in the development of green power projects throughout Canada have been local co-ops, as illustrated in Section 3. In general, co-ops are excellent joint-venture partners with municipalities for several reasons:

**Similar Rate-of-Return Requirements**
Co-ops require only marginal rates of return on their investments, in contrast to private developers. The main priority of green power co-ops is to develop green power projects, bringing environmental and economic benefits to their communities.

**Active Participation by the Community**
Co-ops allow citizens in the community to become members and participants in the development of green power projects. This increases community support and recognition of municipal efforts in being leaders of green power development.

**Spreads Risk & Decrease Costs**
By involving investment partners, such as investment co-ops, it diversifies the risk of the project and decreases the size of the investment required by participating municipalities.

**Turnkey Operation**
Green power co-ops in the GTA have the professional experience and expertise to fully develop and maintain turnkey projects for municipalities. This simplifies project management, and reduces financial and resource investment for municipalities.

## 4.4 Recommendations

1. The GTA-CAC should commission or conduct further research in order to:

    a. Assess current and future green power/green tag supply in Ontario;
    b. Estimate savings from load shifting to take advantage of on and off-peak pricing;
    c. Develop an RFP for the purchase of green power/green tags; and
    d. Begin preliminary negotiations with green power generators and secure *PPAs*.




2. When developing or participating in green power projects GTA-CAC members should partner with local groups such as green power co-ops in order to spread risk, decrease costs and involve the local community.

# Section 5: Next Steps

Co-ordinated and concerted action to further research and implement the recommendations outlined in this study can substantially improve the environmental performance of municipalities in the GTA at a reasonably low cost. Prompt implementation will provide members of the GTA-CAC with significant long-term environmental, social and economic benefits.

There is a growing number of municipalities in Canada in the process of developing their own green power projects. Municipalities are showing that they have the resources and the expertise to become leaders in the development of green power in Canada. As a result, municipalities are generating substantial environmental and economic benefits for their communities.

## 5.1 Issues for Further Study

This report to GTA-CAC members has identified several issues for members that require further research:

- Contractual agreements or arrangements between municipalities and *LDCs* need to be analysed to determine the steps to purchasing green power/green tags from 3rd parties.
- Analysis of *Municipal Act* and relevant legislation to determine steps to municipal self-generation.
- Determination of steps to a city self-generating its own electricity to acquire a generators license.




# Glossary

**Brown Power (BP)**
Any type of power that is generated using a non-renewable resource, causes pollution, or upsets the ecological balance in any way. This includes nuclear, coal, and hydroelectric (requiring damming and flooding).

**Biogas**
The production of energy through the combustion of naturally occurring gases (e.g., landfill gas).

**Demand-side management (DSM)**
Activities that affect the magnitude and/or timing of customer electricity usage.

**Demand-side resource or demand-side management resource**
Activities that result in reductions in electric generation, transmission, or distribution capacity needs or reductions in energy usage or both.

**EcoLogo**
The official symbol of certification for green power sources under the Environmental Choice Program.

**Electricity**
A manufactured form of energy, produced by generators. Electricity is generated whenever a conductor moves through an electric field.

**Emission Offset**
A green power product, such as a green tag, which is used to reduce the amount of emissions attributed to a particular entity (e.g., city or business).

**Emissions**
Pollutants released into the air, land or waterways from industrial processes, household activities or transportation vehicles and other sources.

**Energy Efficiency Audits**
On-site tests which determine areas of improvement in energy use.

**Gigawatt (GW)**
A unit of energy equal to one thousand megawatts, or one billion watts.

**Greenhouse Gases (GHG)**
The altering of the earth's atmosphere is a result of the emissions of carbon dioxide, methane, water vapour and/or nitrous oxide, which are all greenhouse gases.




## Green Power Opportunities for the GTA-CAC

**Green Power (GP)**
Electricity generated from non-polluting, renewable resources including wind, solar, and water.

**Green Power Procurement Policy**
A commitment to purchase a specific quantity of total energy requirements from green power sources.

**Green Tags**
A program where consumers purchase the 'green' attributes (environmental benefits) of green power production.

**Geothermal**
Energy generated from utilizing the natural heat of the Earth.

**Independent Electricity Retailer (IER)**
Private company that is a retailer of electricity.

**Industrial, Commercial and Institutional Sector (ICI)**
This sector comprises industries, business, and institutions such as museums.

**Independent Market Operator (IMO)**
Hub of electricity wholesale market, responsible for the day-to-day operation of Province's electrical system.

**Kilowatt (kW)**
One thousand watts.

**Kilowatt-hour (kWh)**
Amount of electrical energy produced or consumed by one kilowatt unit for one hour (one thousand watt hours).

**Local Distribution Company (LDC)**
A local retailer of electricity to businesses and consumers.

**Megawatt (MW)**
A unit of energy equal to one thousand kilowatts, or one million watts.

**Micro-hydro**
Small, run-of-river electrical generation facilities.

**Partners for Climate Protection**
National program, administered by Federation of Canadian Municipalities, that brings municipal governments together to reduce the local production of greenhouse gas emissions.

**Photovoltaic**
See Solar




**Pool Prices**
The pool price is what the market is willing to pay for the electricity - it is not directly related to how much it costs to produce the electricity (although it does in a way establish what the "base" price should be). Since the cheapest form of electricity generation is usually coal or hydro and that costs around 3-4 cents/kWh, then the market is not going to demand a price lower than that because then no one would supply it.

**Power Purchase Agreement (PPA)**
An agreement between an electrical generating company to sell electricity to a purchaser (either a consumer or a retailer).

**Renewable Energy**
See Green Power

**Smog Forming Pollutants**
Particulate matter, nitrogen oxides, ground level ozone, volatile organic compounds, sulphur dioxide, and carbon monoxide all contribute to smog are can be formed by electricity generation using coal.

**Spot Market**
The open market where electricity is bought and sold.

**Solar**
A system that captures solar rays and provides electricity through the use of photovoltaic panels.

**Turnkey**
Product or service that is designed, supplied, built, or installed fully complete and ready to operate.

**Utility Grade Wind Turbine**
A large, industrial sized model of wind turbine, usually greater than 500kW.

**Virtually No Emissions**
A level of release of a toxic substance to air, water or land which is below the level of quantification established for the toxic substance.

**Wind Farms**
Large wind turbine developments involving utility grade wind turbines. Installed capacity is typically greater than 10 MW and as large as 200 MW.

**Wind Turbine**
A system that uses blades attached to a drive shaft in order to capture the kinetic energy of the wind and generate electricity.

**Wind Resource Assessments**
The measurement of wind speeds at a specific area for the period of one year.




# Appendix A

This section provides background information on the organizations and individuals who were instrumental in conducting this study.

**Clean Air Partnership**
The Clean Air Partnership (CAP) is a registered charity with a mandate to make Toronto greener, more environmentally sustainable, and an international leader in clean air. CAP develops and delivers market and community-based strategies to reduce energy use and clean the air. The Toronto Atmospheric Fund (TAF) formed CAP in June 2000 to expand the reach and impact of TAF projects. CAP is responsible for activating and coordinating the Greater Toronto Area Clean Air Council (GTA-CAC).

Upon completion of the 2002 Smog Summit, CAP pursued an investigation to report and recommend ways of supporting and developing renewable energy opportunities for implementation by members of the GTA-CAC. A Request for Proposals was issued by CAP in December, 2002, with the winning proposal accepted from the Ontario Sustainable Energy Association (OSEA) to complete the study's objectives as identified by the GTA-CAC.

http://www.city.toronto.on.ca/cleanairpartnership/index.htm

**Greater Toronto Area Clean Air Council**
The GTA-CAC is an inter-governmental working group dedicated to exploring joint initiatives and liaising with municipalities across Canada to discover best practices for reducing smog. The GTA Clean Air Council was initially established as a working group by signatories for the Inter-governmental Declaration on Clean Air at the 2000 Smog Summit held in Toronto. In 2001, additional city, town and regional governments operational in the GTA joined in an effort to clean the airshed. There are currently 21 cities and towns, 4 regions, and the federal and provincial governments who are partners in the GTA-CAC. The Clean Air Partnership is responsible for the GTA-CAC processes, budget, Web site, projects, research and moderating GTA-CAC meetings.

http://www.city.toronto.on.ca/gtacac/index.htm

**Members of the GTA-CAC**
***Federal***
Environment Canada, Health Canada, Natural Resources Canada, Transport Canada,
***Provincial***
Ontario Ministry of the Environment, Ontario Ministry of Transportation
***Regions***
Durham, Halton, Peel, York
***Cities***
Brampton, Burlington, Mississauga, Oshawa, Pickering, Toronto, Vaughan
***Towns***
Ajax, Caledon, Municipality of Clarington, East Gwillimbury, Georgina, Halton Hills, King, Markham, Newmarket, Oakville, Richmond Hill, Whitby, Whitchurch-Stouffville

# Appendix A
# Green Power Opportunities for the GTA-CAC

## Ontario Sustainable Energy Association

OSEA is a non-profit co-operative with a mission to facilitate the transition to a sustainable energy economy in Ontario through the development and support of community-based energy initiatives. To fulfill its mission, OSEA plays a role in public education and project development as well as acting as the umbrella resource for community-based sustainable energy initiatives. OSEA's knowledge and experience in the development of green power projects made them ideally suited to performing this study.

http://www.ontario-sea.org

## Study Team

The research team hired by OSEA to complete the study comprised three individuals with extensive knowledge and experience with the renewable energy industry in Ontario. The principal author, James J. Murphy is a Director with Positive Power Co-operative Inc., a non-profit renewable energy co-op operating in the Hamilton-Halton-Haldimand area. Mr. Murphy has also served as a business consultant with OSEA.

Serving as consultants to Mr. Murphy were Deborah Doncaster, Executive Director of OSEA and Siobhan Baker, a renewable energy market analyst. Ms. Doncaster has worked as a developer and educator in the renewable energy sector for the last 5 years. She served as the Project Manager for the Toronto Renewable Energy Co-op (TREC) for a 3-year term before helping to form OSEA. Mrs. Baker is a Market Research Associate with the Canadian Institute of Environmental Law and Policy (CIELAP).

## Contacts

The study team conducted extensive consultations with members of the GTA-CAC, the Industrial, Commercial, and Institutional (ICI) sector, and industry professionals. The following is a list of those who contributed to the study. The study team sincerely thanks them for their contributions:

| Contact | Organization | Contact | Organization |
|---|---|---|---|
| Ken Dack | Manager<br>Fleet Services<br>City of Brampton | Paul Graham | City of Sudbury |
| Rob Bromley | Health Services<br>Region of Waterloo | Jonathan Sandler | Northland Power Inc. |
| Brian Bechtel | Energy Manager<br>Region of Waterloo | Rigmor Short | Director<br>Alberta Urban Municipalities Association (AUMA) |
| Brian Hart | Hearthmakers Energy Co-op | Theresa Howland | Marketing Manager<br>Vision Quest Wind Electric |
| Samit Sharma | Gaia Power<br>Kingston | Louis Robert | Helimax Energie Inc. |
| Stephen Sottile | Gaia Power<br>Kingston | Greg Allen | Allen Kani Associates |
| Paul Finley | Project Manager<br>City of Sudbury | Brenda Sakauye | Environmental Co-ordinator<br>City of Mississauga |
| Mark Carroll | Councillor<br>Whitchurch-Stouffville | Beckie Jas | Environmental Health Specialist<br>Region of Halton |
| Judith Jeffrey | Planner<br>Town of Ajax | Lynn Robichaud | Senior Environmental Co-ordinator |




## Appendix A
## Green Power Opportunities for the GTA-CAC

| | | | |
|---|---|---|---|
| Michael Brown | Environmental Consultant | Paul Callanan | Manager Environmental Health Region of Peel |
| Sherri Rendek | Project Manager Clean Air Partnership | Eva Ligeti | Executive Director Clean Air Partnership |
| Roy Howard | Town Engineer Town of Newmarket | Helen Doyle | Manager Environmental Health Region of York |
| Joyce McLean | Director Environmental Affairs Toronto Hydro Energy Services | Anda Kalvins | Director Climate Change Strategy OPG |
| Charles Thornton | Power Marketer OPG | Murray Patterson | OPG |




# Appendix B: Green Power

This section provides more information on green power, green tags, green power technologies, financing and incentives.

**Acronyms Used**

AUMA – Alberta Urban Municipalities Association
CAO – Chief Administrative Officer
$CO_2$ – Carbon dioxide
CRCE – Canadian Renewables and Conservation Expense
EAP – Electric Aggregation Program
EE – Energy efficiency
FCM – Federation of Canadian Municipalities
GHG – Greenhouse gas
ICI – Industrial, Commercial, and Institutional sector
ICLEI – International Council for Local Environmental Initiatives
IRAP – Industrial Research Assistance Program
kWh – Kilowatt-hour
LDC – Local Distribution Company
MW – Megawatt
OSEA – Ontario Sustainable Energy Association
PCP – Partners for Climate Protection (FCM program)
PPA – power purchase agreement
RFP – Request for proposal
SME – Small to medium enterprises
WPPI – Wind Power Production Incentive

**Green Power**
Green power is the fastest growing energy sector in North America. The U.S. Department of Energy estimates Canada's consumption of green power will grow at an average annual rate of 1.8 per cent until 2020 - compared to 1.7 per cent for nuclear, 1.5 per cent for natural gas and 0.4 per cent for coal.[xx] The popularity of green power is attributable to decreasing capital costs and the environmental benefits of green power generation

**Decreasing Capital Costs**
The costs of industrial-scale green power generation are decreasing; technologies such as wind have greatly decreased in cost over the last decade and solar power costs are slowly decreasing.

**Environmental Benefits**
One of the primary benefits of green power is that it does not emit greenhouse gases and reduces the use of sources which do generate greenhouse gases such as coal, oil and natural gas. Furthermore, compared to traditional energy sources, renewable energy generation does not create hazardous wastes, deplete natural resources or cause environmental degradation through extraction and transportation of fuels.

### Green Tags

In Ontario, green tags have been offered at a high of 7.5 cents/kWh (Green Tags Ontario) and a low of 3 cents/kWh (Federal government). It is expected that the price of green tags will settle somewhere between those two levels (likely around 4-5 cents/kWh). Currently, there is no structured market for green tags. Until now, green tags have been sold and administered entirely by private developers; however, in March 2003 the Ontario government circulated a draft proposal to create a central marketplace. Once established, the central marketplace will:

- Create an industry-wide definition of green tags,
- Track the sale and retirement of green tags, and
- Establish a trading price for green tags.

### EcoLogo[xxi]

Type I Facility: Renewable energy facility that began generating electricity before Jan 1, 1991
Type II Facility: Renewable energy facility that began generating electricity from Jan 1, 1991 to March 31, 2001 inclusive
Type III Facility: Renewable energy facility that began generating electricity after April 1, 2001

## Green Power Technologies

### Geothermal

Geothermal energy uses the heat from the Earth as a source of energy. Resources of geothermal energy range from the shallow ground to hot water and hot rock found a few miles beneath the Earth's surface. Almost everywhere, the shallow ground of the Earth's surface maintains a temperature between 10°C and 16°C. Geothermal heat pumps are used to tap into this resource to heat and cool buildings.

A geothermal heat pump system consists of a heat pump, ductwork, and a system of pipes buried in the shallow ground near the building. In the winter, the heat pump removes heat from the pipes and pumps it into the ducts. In the summer, the process is reversed, and the heat pump moves heat from the indoor air into the pipes. This heat is then used to provide a free source of hot water.[xxii]

### Micro-hydro

Micro-hydro systems use the energy in flowing water to produce electricity or mechanical energy. Micro-hydro power systems are run-of-the-river projects that do not require large storage reservoirs. For run-of-the-river hydro projects, a portion of a river's water is diverted to a channel, pipeline, or pressurized pipeline that delivers it to a waterwheel or turbine. The moving water rotates the wheel or turbine, which spins a shaft. The motion of the shaft powers an alternator, which generates electricity.[xxiii]

EcoLogo certification of a micro-hydro site requires:




- compliance with regulatory licenses,
- protection of indigenous species and habitat,
- requirements for head pond water levels, water flows, water quality and water temperature, and
- measures to minimize fish mortality and to ensure fish migration patterns.

**Solar**

Solar systems convert sunlight to generate electricity in order to provide hot water, and to heat, cool, and light buildings. These forms of electrical generation are referred to as solar energy. The use of photovoltaic systems solely as a form of electrical generation is not commonplace in Canada. This is primarily due to the high cost per kWh (compared to other renewables) of purchasing photovoltaic systems and Canada's limited hours of sunlight during the winter months. Traditionally, photovoltaic systems are used in intense, sun-drenched states in the U.S. such as Arizona and California.

However, photovoltaic systems are increasing in popularity for use as water heating systems in residences and businesses. EcoLogo certification requires that all cadmium containing wastes, which is a toxic ingredient contained in photovoltaic systems, must be properly disposed of or recycled.

## Production Incentives/Financing

**Wind Power Production Incentive (WPPI)**

In February 2002, Natural Resources Canada announced $260 million in federal funding to encourage the development of wind energy in Canada. WPPI is expected to encourage the development of 1000 megawatts of wind power capacity during the next five years. Under this program, the Government of Canada will provide a production incentive of 0.8 to 1.2 cents/kWh over the first 10 years of production. WPPI can be claimed for every kilowatt-hour of net production during the first ten years of production as follows:[xxiv]

| Commissioning Date | Amount of Financial Incentive for 10 yr period |
|---|---|
| April 1, 2002 to March 31, 2003 inclusive | 1.2 ¢/kWh |
| After March 31, 2003 and on or before March 31, 2006 | 1.0 ¢/kWh |
| After March 31, 2006 and on or before March 31, 2007 | 0.8 ¢/kWh |

To be eligible for the WPPI, the prospective producer must negotiate and sign a contribution agreement with NRCan. The agreement contains the following criteria, among others, for setting up a wind farm:

1. The wind farm must be commissioned between April 1, 2002, and March 31, 2007
2. The wind farm must be independently metered at the point of interconnection with the electricity grid




3. The wind farm must have a minimum nameplate capacity of 500 kilowatts. In northern and remote locations, the minimum capacity is 20 kilowatts.

**Canadian Renewables and Conservation Expense (CRCE)**

CRCE allows the cost of acquiring and installing one or more test wind turbines to be 100 per cent cost deductible under the *Income Tax Act*. However, the test turbines cannot produce more than 35 per cent of the windfarm's total nameplate capacity. Nameplate capacity is restricted to a maximum of 6 MW. Furthermore, the test turbines must be located at least 1500 metres apart, and be tested for a period of at least 120 calendar days.[xxv] Pending changes to the *Income Tax Act* will allow corporations to renounce CRCE to flow-through share investors in a year where the CRCE will be incurred in the subsequent year.

Under the pending changes, renewable energy projects would be afforded greater flexibility in the timing of investments financed using flow-through shares. The treatment of flow-through share investments in such projects would parallel that of investments in non-renewable energy projects. This change is proposed to apply to CRCE incurred after 2002.[xxvi]




# Appendix C: Municipal Case Studies

The following is a complete list of municipal examples that were explored by the study team.

## Waterloo

The Regional Municipality of Waterloo, Public Health Department initiated a study to investigate air emissions created by Regional government operations, and various ways to mitigate these. It was determined that Regional operations produce 724,704 kg of air emissions per year. Sixty per cent of these emissions are from Regional vehicles, 40 per cent from electricity usage. During peak periods, more coal-fired electrical generation is used to meet demand – thus there is a direct relationship between electricity used in the Region of Waterloo and the amount of coal burned at the coal plants. Because of prevailing wind patterns, the Nanticoke coal plant has a large impact on the air quality within the Region of Waterloo.

The result of the study was the Clean Air Plan which documents the preferred emissions reduction measures prioritized based on impact of air emissions reduction, feasibility and cost-effectiveness. The top 11 recommendations involve: use of alternative fuels in Regional vehicles; installation of catalytic exhaust mufflers on older buses; programs to reduce Regional employee car use; 10 per cent green energy purchase; electric hybrid buses; energy efficient (EE) retrofit for traffic signal lights, street lights; EE lighting in Regional affordable housing; EE upgrades to Regional buildings. Implementation of these 11 measures would reduce total Regional emissions by 17 per cent.

The Region will be building a new structure at their Operations Centre to house Emergency Medical Services. The building will be "state-of-the-art" and will showcase technology such as photovoltaics. The Region also has a co-generation project at its landfill, being implemented by Tormont Energy. The Regional government has no power purchase agreement (PPA) in place, instead they are taking advantage of the 4.3 ¢/kWh capped rate.[5] The Region is planning a small solar array, approximately 5 kW capacity, as part of the design of one of its new buildings. This project is being done in partnership with ATS Technologies and Arise Technologies and will be used partly as a demonstration project.

Target dates have not yet been set for the green power purchase. The green power project will be delayed for one year due to budget constraints; the City is planning to build budget allowances for this in 2004. Initiatives associated with buildings are most relevant to Green Power purchases by municipalities in general since cost savings from

[5] From "Bill 210: First Round of Regulations Released" by Borden Ladner Gervais LLP: Reg 339/02 defines "designated customers" as: a consumer with demand of <= 50kW; a consumer who has an account with a distributor related to a dwelling (condominium, residential complex, co-op property); charitable institution; home for special care; employer with <= 50 employees; MUSH sector (municipalities, universities, school boards, hospitals).

projects like energy efficient retrofits are being used by other jurisdictions to fund green power purchases.

Energy use (electricity and natural gas) within the Region's buildings accounts for about 12 per cent of total Regional emissions. Expected reduction in energy consumption of the initiatives relating to the buildings sector is as follows:

- **Building Improvements:** HVAC system, building energy management and exhaust heat recovery upgrades usually reduce energy use by about 20 per cent.
- **Office Equipment Replacement:** Purchase of ENERGY STAR ® office equipment and implementation of automatic power down software can reduce power use by 50 per cent. It is recommended that the Region purchase ENERGY STAR ® equipment as existing equipment needs to be replaced.
- **Lighting Retrofits:** Energy efficient (EE) lighting retrofits in Regionally managed affordable housing buildings (2,557 units) is expected to reduce energy consumption by about 30 per cent.

### Potential $CO_2$ and Greenhouse Gas (GHG) Reductions

Torrie Smith estimated emissions reductions for greenhouse gases, volatile organic compounds and particulate matter. The following is a summary of total emissions reductions expected for initiatives to reduce emissions associated with the building sector:

- EE lighting retrofits in Regional buildings – 4,236 kg
- HVAC system, building energy management and exhaust heat recovery upgrades – 4,458 kg
- Replace all 1300 personal computers with ENERGY STAR ® office equipment with enabled power down features – 3,958 kg
- EE lighting retrofits in Regional affordable housing (2,557 units) – 4,315 kg
- Buying Green Power to cover 10 per cent of the Region's electricity use – 15,748 kg

### Results

The process itself was very successful as a result of cooperation at the senior managerial and staff level as well as inter-departmental interest within the Regional Government. An inclusive committee consisting of all affected parties was formed under the leadership of the health unit. Data was collected from all areas including: facilities; finance; engineering; and fleet and provided to the consultant for analysis. Based on both the results and the areas of significant emissions (the vehicular section), recommendations were prioritized, summarized and presented to Council for endorsement.

### Cost of Implementation

Expected costs and paybacks associated with initiatives aimed at the buildings sector are as follows:

- EE retrofits in Regional buildings are expected to cost $350,000 with a 3-year payback.




- Purchase of ENERGY STAR ® office equipment is no more costly than conventional equipment with the exception of LCD flat screen monitors, which cost about $250 more.
- EE lighting retrofits in Regional affordable housing (2,557 units) is expected to cost $1,011,000 with a 5-year payback.
- The premium cost of buying green power to cover 10 per cent of the Region's electricity use is $351,000.

## Kingston

The City of Kingston, The Municipality of Frontenac Islands, Hearthmakers Energy Co-operative Inc., and the Federation of Canadian Municipalities have partnered to develop the Greater Kingston Trade Winds Project. The project involves a wind farm with a capacity of 36MW on Wolfe Island, whose deployment is planned for the end of summer 2004. The other aspect of the project is the feasibility study for using savings from energy efficiency retrofits of city-owned buildings and housing for wind power purchases and/or share purchases of the wind farm. Hearthmakers has received two substantial grants from the Federation of Canadian Municipalities (FCM) Green Municipal Enabling Fund (GMEF) to finance Energy Efficiency audits of municipal buildings and a feasibility study for the wind project.

Hearthmakers is a community co-operative whose objective is to promote energy efficiency and the use of renewable energy among all end-users of energy in the community. Co-op members buy shares, making a return from the renewable power which is sold. Hearthmakers earns income from performing energy audits of residences, and Industrial, Commercial and Institutional (ICI) buildings. Hearthmakers has a partnership with the Better Buildings Partnership in Toronto to share learning and expertise. Hearthmakers is working with St Lawrence College in Kingston to develop energy efficiency audit training for buildings from residences and small businesses to ICI.

This project is now in the development stage with Hearthmakers driving it and Gaia Power managing it. A business case for the wind project is underway. A feasibility study is currently being conducted for connection from the Wolfe Island wind farm to the electrical grid on the mainland, once that is complete the Environmental Assessment process will begin. A Request For Quotes (RFQ) has been issued for the turbines. The role of the local distribution company (LDC), Utilities Kingston, in this project is quite minimal. The project is paying the LDC to work out connectivity from the wind farm into the grid.

A key aspect of how this power is being sold is through coupling energy efficiency (EE) savings to partially fund the purchase of renewable energy. The City of Kingston, schools, churches, hotels, apartments, industry and federal institutions like Canadian Forces Base (CFB) Kingston are doing energy efficiency audits of their buildings to identify cost-efficient retrofits. Hearthmakers is conducting the energy audits, which are expected to decrease energy consumption by 30-35 per cent.




Once these building owners have paid back the cost of the EE retrofit with savings from reduced electricity consumption, heating and cooling, they will use some of the remaining EE savings to fund the purchase of wind energy. There has also been significant interest in EE savings among residential users.

When the project was first started, the intent was to fund the majority of its cost via EE savings. When the business case was developed further, it was decided to increase the size of the project to benefit from economies of scale and reduce per unit costs. Now future EE savings will contribute part of the cost of buying renewable energy. Depending on individual circumstances, payback from EE retrofits can be 6-15 years. For electricity consumers who want to pay back all their capital costs first, this EE savings stream will not be available to help fund renewable energy purchases for several years. Some electricity consumers may choose to direct a portion of the EE savings toward green energy purchases before all the capital costs are paid back.

The focus for the first few years is to sell all the power to the ICI sector, including the city, via PPAs. The value of these PPAs is partly a hedge against fluctuating and rising energy prices in Ontario for those not covered by the 4.3 ¢/kWh retail price cap. Prices being discussed in these PPAs are confidential, but in Canada, prices for wind can range from 8 - 12 ¢/kWh depending on wind speed, costs to connect to the grid and other factors. The intent is to sell about 2/3 of the power to the ICI sector including heavy industry, and about 1/3 to offices and facilities owned and operated by the corporation of the City of Kingston also via a PPA.

It is very expensive from a marketing point of view to sell green power to residential and small to medium enterprise (SME) electricity users so the intent is to target these segments in later years once the market for green power is more mature. The other problem with targeting these market segments is that current regulations in Ontario, especially the lack of retailers and net-billing make it very difficult to devise a mechanism to deliver power to these users. For these reasons, there would have to be a critical number of residential and SME users interested to make it viable to devise a way to sell the power to them. Experience in other places in Canada shows that only up to 1 per cent of electricity users are willing to pay a premium for green power. For example, ENMAX green power had 0.88 per cent uptake among residential users and 1 per cent uptake among business and industrial users in 2001.[xxvii]

This project has been highly praised for its innovative approach in two main areas. First, having an urban and a rural municipality working in partnership for mutual benefit with respect to the wind project has been a huge advantage. Unlike other areas where there have been problems with objections to erection of wind turbines, there have been no objections here to date. Mutually shared civic pride in the project and economic, health and environmental benefits have been a large factor in overall acceptance of the project. Secondly, linking actions in energy efficiency and the purchase of renewable energy together have been excellent in terms of public awareness for a sustainable energy economy. This idea of using EE savings to fund the purchase of renewable energy has achieved a lot of attention from industry as well.




**Appendix C**
**Green Power Opportunities for the GTA-CAC**

## Benefits

Hearthmakers conducted public consultation workshops regarding the wind project and energy efficiency actions. The public also likes the community co-op model in that it is democratic and they have real input into the project. The community co-op model also contributes to civic pride in that it is a home-grown project. This is seen as a large part of the reason why there have been no objections so far to the wind turbines on Wolfe Island, unlike similar projects in other jurisdictions.

Having local people perform EE audits and work on the wind project attracts and retains revenue dollars within the community. Money saved from the energy efficiency retrofits of buildings and revenues from the co-operatively owned wind farm are real dollars that are returned to the local community, rather than siphoned off to other locations like Toronto, or Alberta. It is estimated that these saved and earned dollars re-circulate in the community up to 7 times before leaving the community, creating new jobs and supporting businesses.

When people see decision makers like leaders in the civic government, churches and local business invest in energy efficiency resulting in significant savings, it contributes to public support of these organizations. Also since these organizations are seen as being fiscally responsible, people want to support them more in terms of making donations or buying their products since they feel like their money is being well spent. All of this also contributes to civic pride.

## Potential $CO_2$ and GHG Reductions

Queens University in Kingston has been hired to establish carbon emissions baseline for the city to more readily quantify the emissions reductions from EE initiatives and renewable energy consumption within the area. International Council for Local Environmental Initiatives (ICLEI) will help to quantify emissions reductions, especially from large ICI buildings.

## Barriers, opposition

The provincial government's actions and recent regulatory changes in the electricity sector provide a serious disincentive for EE and renewable energy in the province. In addition, critics suggest that implementation of the recent 4.3 ¢/kWh price cap are political interference in the electricity market. An open market, governed by market forces may have led to making renewable sources more competitive in pricing. The degree to which incentives that are offered to the fossil fuels and nuclear industry are absent from all levels of government for renewable energy sources is another major barrier, making electricity from unsustainable and unhealthy energy sources artificially inexpensive.[xxviii]

## Cost of Implementation

Since winds on Lake Ontario predominantly start at the west end of the lake and blow toward the east, Wolfe Island has a very good wind regime, this helps to maximize the wind power produced. The current work on the business case for the wind project and feasibility study for connection to the mainland will provide more accurate cost numbers.




The wind project is estimated to cost on the order of $70-80 million. EE retrofits for the City of Kingston are estimated to cost approximately $3 million and provide about a 6-7 year payback from energy savings.

### Financing and incentives used

The wind project is being financed by a combination of industry investors, Hearthmakers co-op members, FCM's Green Municipal Enabling Fund (GMEF). The FCM GMEF grant for the feasibility studies has been matched by Hearthmakers with other funding: $150,000 from Human Resources Development Canada (HRDC); $60,000 from Agriculture Canada; $50,000 from the City of Kingston for EE audits of social housing and the carbon baseline study.

### Potential for replication in the GTA area?

Hearthmakers GMEF funding application (E3076) specified that other municipalities could participate – i.e., municipalities and community members in other areas can participate in the Greater Kingston Trade Winds Project. That is to say any municipality, such as the City of Toronto, may use savings from the energy efficiency retrofits of their buildings for purchasing power from the Wolfe Island wind farm, or shares of the wind farm through the co-operative. Hearthmakers has applied for Industrial Research Assistance Program (IRAP) funding for preparing a packaged program for marketing of the innovative project elsewhere.

## Sudbury

The City of Sudbury has established a joint venture partnership with Northland Power Inc. for the development of renewable energy projects. The first of these projects is an initiative to develop approximately 50 megawatts of wind power inside and outside of Sudbury's geographical boundaries. Northland Power is the lead partner in the consortium, but Northland and the City of Sudbury expect to share the majority of financial commitments equally.

The project is currently at the feasibility stage. Some wind resource assessments have been completed. More wind resource assessments are currently being conducted with financing from Northland Power and a grant from the Federation of Canadian Municipalities (FCM) Green Municipal Enabling Funds (GMEF). The business case for the project is currently being developed with funding from GMEF.

Since the project is in the feasibility stage, the numbers here from early planning exercises are not firm, but are presented to give an idea of the anticipated scale of the project. As the business case unfolds, it will determine the best way to roll out the project, capacity of turbines to use, etc.

Work currently underway includes the study of interconnection issues, completing wind resource assessment, costing engineering estimates, timing and rollout for deployment. The project is considering utilizing 66 wind turbines - each with a capacity of 750 kilowatts (kW) - by the end of 2004. There are other options available and the exact




choice of turbines has not been finalized at this point in the feasibility study. Sites on Manitoulin Island, and near the City of Sudbury are under consideration.

The second component of the project involves German wind turbine manufacturer, REpower Systems AG. and the City of Sudbury. Both parties have entered into a partnership which has seen REpower Systems AG. incorporate a subsidiary firm, REpower Wind Corp., within Sudbury. REpower Wind Corp. is currently establishing assembly and marketing operations and will be using its proprietary technology in the development of the project. Depending on how the market for wind turbines develops in North America, and especially Canada, this could have a very significant economic development and diversification payoff.

The City of Sudbury has made a commitment to FCM and to ICLEI that they will champion renewable energy. The City of Sudbury is an equity shareholder in the project. The owners of the project want the people of Sudbury to be able to directly invest in the project. The business plan currently being developed for the wind project will help to define the types of investment best suited for this project. It will also help determine how the power will be sold and to whom.

The bulk of wind electricity produced was intended to be sold as "green power" to residential customers through energy retailers at a premium of about 7.5 ¢/kWh. However, Ontario's restructuring of the electricity market is pushing Northland Power and the City of Sudbury to negotiate Power Purchase Agreements (PPAs) with the Industrial, Commercial and Institutional (ICI) sector. The ICI sector is not covered by the current 4.3 ¢/kWh price cap and those whose previous PPAs are expiring have recently seen prices as high as 11.3 ¢/kWh. Northland Power is currently discussing PPAs with a few potential buyers. They will likely be the prime negotiator for signing up buyers for the power and managing those contracts although the City of Sudbury will also be involved.

In addition to PPAs, other mechanisms for selling green power are under investigation. These include selling the "green attributes" of the power via a "Green Tags" business model to smaller buyers such as residential and small business. To sell power from the wind project, the joint venture intends to partner with an entity (identity is confidential) that already markets and sells power. Proponents of the Sudbury project believe their "first mover" advantage will help them reach a favourable agreement with such a partner. Owners of the project also want a local marketing effort to capitalize on civic pride and the local support for the project.

Part of the Sudbury area is served by Hydro One, the other by the local LDC, Greater Sudbury Utilities Inc., which is owned by the city. It is only an agent to distribute power; it was not set up as a retailer of power. The LDC is currently investigating if and how it can set itself up as a retailer of power. If it can retail power, that will provide more options for selling the green power from the wind project. Some municipalities sign a PPA for a block of their power and "float" the rest, buying it as they go. The City of Sudbury did not do this; it has no PPA. When the city determines how much green power it will purchase, it can just go ahead and buy it. This will most likely be accomplished by the city signing a PPA with the project.




## Effectiveness

This Joint Venture has been working very well in terms of moving the wind project ahead. Some of the aspects which have been key to its success to date are:

- A champion for the project inside the city (Paul Graham) who has been instrumental in generating support for the project within council, outside partners and the community at large.
- The City of Sudbury has done a very good job of managing the balance between the premium cost of green power, and economic development. For example, to keep the cost of green power down during the development phase of the project, it is necessary to hire 'experts' on wind power, who do not have to allocate resources to the learning curve, rather than train people locally to do it. It is very important to manage these kinds of economic development expectations to prevent a "backlash" from the public against the project later.
- The City of Sudbury has been willing to set a good example for Business, Residential and ICI consumers of power by showing its willingness up front to pay the premium price for green power.
- The City of Sudbury is planning to put up a large equity stake in the project once the construction phase begins, and thus will be accepting some of the risk associated with the project.
- The City of Sudbury has been an important partner in terms of attracting potential buyers (including ICI) of the power. The City has been an active supporter and promoter of the project.
- Given its municipal powers, and stakeholder position in the project, the City has enabled the project by activities like making land available for the project, speeding up processing of permits where possible.
- The Sudbury economy is dependent upon heavy industry. It has the local expertise and infrastructure - like transportation of large products – in place to enable manufacture of large industrial components. This makes it a good candidate for some of the manufacturing associated with this project and others like it as the market for wind power continues to develop in Canada.

## Benefits

The wind project is expected to supply up to 40 per cent of Sudbury's residential electrical needs, keeping these energy expenditure dollars in the local economy. According to a city representative, these dollars are expected to circulate about 7 times within the economy, creating a spin-off effect.

Economic development and diversification benefits are expected from REpower Wind Corp. in the form of local assembly and marketing. As the project and the market for wind power in Canada mature, the plans for how much of the turbine and which parts to manufacture and market locally will evolve. There is already some blade manufacturing in Ajax and tower manufacturing in Southern Ontario, providing expertise in these areas within the province.

In terms of this wind project, there will be some local jobs created during construction and ongoing operation of the project. Numbers from Superior Wind Energy Inc. estimate that the number of short-term jobs created during construction is approximately 1 job/MW, and the number of long-term jobs created for ongoing operation of the wind




farm are approximately 1 job/10MW of capacity. The construction phase usually lasts about 6 months and involves jobs such as road building, concrete work, crane work, engineering, environmental consulting, construction management. Local people could be trained to perform the operations and maintenance work associated with the ongoing operation of the wind farm.

Sudbury expects to earn a Rate of Return from its equity stake in the project. Both the City and Northland expect to earn market rates of return that are provided to other wind power project developers and ensure that such market rates are not below each entities cost of capital.

For the part of the project that is local, security of electricity supply is an important benefit. This will help to prevent local users and industry against outages elsewhere in the IMO grid such as the widespread failures caused by the 1998 ice storm. By promoting the project and agreeing to pay a premium for green power itself, the City of Sudbury is setting an excellent example for others, and building the market for green power locally.

**Barriers, opposition**

The main problem is that in Canada it is difficult to secure long term PPAs. PPAs here are typically up to 3 years as compared with PPAs of 20 years in Europe. The long PPAs in places like Europe are sufficient to stimulate investment in renewable energy while the short ones here are not. Every jurisdiction that has significant amounts of renewable energy, has long term PPAs. Even PPAs of 10 years would be reasonable to stimulate renewable energy investment here.

Every jurisdiction in the world which has made a success of renewable energy has demonstrated leadership in all the various levels of government. Some municipalities in Ontario are planning their own renewable energy projects, but to make a viable market, more leadership and support must be shown at both the provincial and federal levels. In particular, there need to be aggressive Renewable Portfolio Standards (RPSs) from these levels of government to build the market for renewable energy.

There is a risk whether enough PPAs can be signed to sell all the wind power from this project. Although discussions are underway, no PPAs have been signed to date. It is hoped that the 4.3 ¢/kWh price cap will be removed before the 2006 as scheduled, raising conventional electricity prices to more realistic levels for all electricity consumers. This will create a much more level playing field for the sale of wind power.

There has not been any significant opposition to the project to date although it is still in the early stages. Northland Power has had a town hall meeting on Manitoulin Island and feels that the attendees provided strong support. They are planning additional information sessions and project updates. Inside Sudbury, 100 per cent of the members of Council support this initiative.




### Financing

Construction of the turbines is expected to cost $86 million. The City of Sudbury received $100,000 from the FCM GMEF to produce a business plan for their wind farm. They are planning to use the FCM GMEF to partly fund implementation of the project.

Northland Power is planning to use the Wind Power Production Incentive (WPPI) as well as the Class 43.1 Accelerated Capital Cost Allowance. The Canadian Renewable and Conservation Expenses (CRCE) has not been used yet for a couple of reasons. The first of these is that its requirement that there be a time lapse of 120 calendar days[6] between construction of "test turbines" and the rest of the turbines on the site creates practical problems in having to arrange to have the right people, material and equipment on site for 2 separate construction phases. The second reason is that Flow-Through Share (FTS) financing is not viewed by Northland Power as core financing option for this project.

Financing for the first phase of this project is internal to the Joint Venture between Northland Power and the City of Sudbury. The FTS financing enabled by CRCE may be considered for project at the appropriate time. It could be helpful in attracting strategic partners via tax write-offs. Since WPPI and CRCE cannot be used on the same turbine, this would most likely involve using CRCE for the test turbines and WPPI for the rest if they decide to use CRCE.

## Alberta

Alberta Urban Municipalities Association (AUMA) provides services to urban municipalities in Alberta and advocates on their behalf. Total municipal energy use in Alberta is estimated to be 1,100,000 MWh/yr.[xxix] In late 2000, prior to deregulation, electricity prices were climbing in Alberta. Municipalities wanted stable budgets and stable electricity prices.

To reduce energy use by municipalities, AUMA proposed that the provincial government set up a fund to finance energy efficiency improvements in municipal buildings. As a result, Municipal Energy Efficiency Trust (MEET), was established as a revolving fund of $100 million that municipalities can borrow from and pay back with their energy efficiency savings. To hedge against increasing electricity prices, AUMA initiated an Electric Aggregation Program for urban municipalities to do a bulk purchase of power including some green power. Edmonton and Alberta are not part of this program since they own their own local distribution companies. Since Alberta has no local distribution company (LDC) except in Calgary and Edmonton, it was not seen as feasible for municipalities to implement their own local wind projects. The option of municipalities owning their own green energy project was not discussed. The remainder of this section provides more detail on the Electric Aggregation Program for green power purchase.

[6] The intent behind this requirement is that "test turbines" should be just that , a test – i.e., testing the viability of the rest of the project at the site, If more turbines go up at the same time, NRCAN views all of them as implementation turbines. See July press release at http://www.fin.gc.ca/news02/02-063e.html - these proposed changes still need to be enacted by parliament to come into effect - practically speaking some developers are going ahead with implementation assuming they will be enacted.




**Electric Aggregation Program (EAP)**

EAP is a pooled purchase of electricity to cover the needs of municipal facilities owned and operated by member municipalities such as water pumping, recreation centers and office buildings. In 2000, AUMA developed an RFP for a pooled purchase of electricity over 3 years for its members. There are currently 180 municipalities participating in this pooled electricity purchase. The Mayor of Pincher Creek was on the committee to develop this RFP and championed the inclusion of a green power component in this RFP. The RFP issued in 2000 included 2 per cent green power over a 3-year power purchase agreement. The RFP also included on and off-peak pricing.

It is up to the company awarded the contract to source the green power. ENMAX won the 2000 RFP, its green power product "Greenmax" is sourced from wind. That agreement will expire at the end of 2003 and AUMA is currently working on an RFP for the next 3 years. AUMA hopes to get agreement from member municipalities to increase the green power component to 5-10 per cent in the next RFP. This is considered reasonable given that the premium price of green power is lower now than it was in 2000. Also, rising public awareness of the need for action on climate change in general should increase support for municipal purchase of green power. To accommodate municipalities who want to go beyond baseline support of green power, the next RFP is expected to include provision for a number of different participation levels. This may require the power provider to offer power blends with different percentage levels of green power built in, or some other mechanism such as green tags to "top up" green power purchases for municipalities who want a higher level of green power.

ENMAX has sold its green electricity to both residential (0.88 per cent enrollment in 2001) and business and commercial customers (1 per cent enrollment in 2001)[xxx]. Among business and commercial customers, the buyers are almost exclusively government – federal, provincial and municipal, also hospitals and schools. The City of Calgary is buying <10 per cent of its energy from this green source for its "ride the wind" initiative. When its current contract runs out at the beginning of 2005, the Province of Alberta has commited to buy 90 per cent of its power from green sources.

One attractive aspect of the agreement between AUMA members and ENMAX for their blended power product is that on- and off-peak pricing has been included. This feature is very attractive to many ICI customers in that it allows cost savings by shifting some electrical loads from on-peak to off-peak times. Although actual prices vary throughout the time of the contract, expected prices are averaged to provide a contract price. There can be a 2-3 ¢/kWh differential between on and off-peak on a given day. Making use of this feature requires that customers have the right kind of meter.

To provide input into the next RFP, a consultant is looking at large loads of member municipalities. This person makes recommendations on potential Energy Efficiency savings as well as how to shift loads to take advantage of on and off-peak pricing. This individual assessment increases support for the program among member municipalities as well as providing valuable input for the RFP.




## Effectiveness

This Electric Aggregation Program has been very effective in getting municipalities to consume green power. AUMA is confident that with lower premium prices for green power, it can increase the amount of green power in the mix to 5-10 per cent in the next RFP.

The negotiated price of the 3-year contract has proved to be reasonable for member municipalities compared to spot market prices over the same period.

Factors seen as driving the success of this project include:

- Having a champion (Mayor of Pincher Creek in this case) for green power on the committee developing the RFP.
- Building a business case to show the low cost of supporting green power.
- Get "buy in" from municipalities up front by having them contribute to the cost of developing the RFP. In this case these costs included hiring a consultant to estimate current and projected energy needs of the member municipalities, legal costs etc.
- Public awareness of the problems caused by climate change and burning coal in particular makes environmental stewardship acceptable as the additional cost of the program.
- Reduced premium cost of green power is expected to result in higher per cent of green power in next RFP.
- A consultant helping municipalities estimate savings from load shifting to take advantage of on and off-peak pricing acts like a marketer for the program, increasing acceptance.
- AUMA is staying involved with member municipalities regarding this program. It obtains weekly updates, and markets the benefits, such as environmental stewardship, of supporting the program.

## Benefits

On and off-peak pricing has enabled member municipalities to shift some of their load to off-peak times, reducing electricity costs. The 180 municipalities participating in the power purchase program have had their electricity use estimated at 400,000 MWh. As a result of the current power purchase with 2 per cent green power, an estimated 8000 MWh of power is now coming from green sources rather than coal[7] for each of the 3 years of the contract.

## Potential $CO_2$ and GHG Reductions

For each kWh of green power sold, 1kg less $CO_2$ is emitted by displacing coal-fired generation[xxxi]. For the 2000 RFP, the estimated 8000 MWh of green power is displacing 8000 metric tonnes of $CO_2$[8] for each of the 3 years of the purchase agreement.

Actual measurements for Jan 2001 – Sept 2002 show 13,573,699 kWh of wind generated electricity displacing coal for this period. This translates to about 13,500

[7] 51.6 per cent of electricity in Alberta is from coal – presentation by Theresa Howland at Alberta Municipal Energy Efficiency and Greenhouse Gas Conference, March 2003
[8] A metric or "long" ton is 1000kg (= 2200lb), the U.S. measures in "short tons" of 2000lb




tonnes less $CO_2$ emitted into the air for this time period. Assuming AUMA members agree to a 5-10 per cent level of green power in the next RFP, that will result in an estimated $CO_2$ reduction of 20,000 – 40,000 tonnes/year.

**Barriers, opposition**

At first, member municipalities objected to including green power in the RFP because of the additional cost. When a business case was done to show the Chief Administrative Officers (CAOs) the small incremental cost of including just 1 per cent green power in the overall product, this objection diminished. This enabled the CAOs to gain agreement from their Councils to commit to 2 per cent green power. Member municipalities agreed on 2 per cent green power in the 2000 RFP and are expected to agree to a higher amount (5-10 per cent) in the upcoming 2003 RFP based on lower premiums (see Cost of Implementation, below).

Initially there were severe billing problems with having a separate retailer (ENMAX) and distributor (Aquila or ATCO in most cases). This problem was not related to green power but the newly competitive electricity market. ENMAX, the retailer sent bills based on data from distributor. The distributor estimated electricity use based on previous use rather than actual data, reading meters only quarterly which resulted in bills from the retailer which didn't reflect actual use. To address this, distributors must now read meters every 2 months. The other problem here was with enrolling and de-enrolling sites. It is up to the distributor to create unique site identifications for electricity loads. This has been done in such a way that a large amount of data needs to be transferred if a municipality wants to buy its power from a retailer like ENMAX. This process is error prone and if one piece of data is wrong, it can result in the wrong customer being billed. This problem could be alleviated by having a single clearinghouse for the data.

**Cost of Implementation**

Green Power was originally priced at a premium of 6 ¢/kWh. This has now decreased to a premium of approximately 2 ¢/kWh. ENMAX has been able to reduce the premium by a combination of economies of scale, incentives like WPPI to lower production cost, also the currently higher spot market price for conventional electricity in Alberta. In 2002 the average spot market price was about 4.5 ¢/kWh, it has recently been 8-9 ¢/kWh although it is not expected to stay that high in the long term.

**Financing and incentives used**

Municipalities involved in green power purchase did not use any incentives. The PPA they negotiated was a reasonable price including the small percentage of green power. FCM funding is seen to be restrictive in that some funding from another source must also be available.

ENMAX did not use any funding or incentive sources. VisionQuest, the producer of the power takes advantage of WPPI, CRCE and Class 43.1 to reduce its cost of producing wind power.




**Potential for replication in the GTA area?**

Whether a municipality should buy green power or do its own project depends on the goals. Since local projects tend to be smaller, buying green power through a PPA can have a larger impact on the environment. However, local projects can be good for demonstration purposes and public education. In addition, FCM funding is available for local projects.

## New Brunswick

The Lamèque Island Wind project was initiated by both the City of Lamèque and the "Coopérative d'énergie renouvelable de Lamèque". The project is being driven by the Co-op. Some municipalities of the area of Lameque may become members of the co-operative, along with individuals and other co-ops. For example the fishery co-op is interested in investing in this project. Some ICI interests may also invest in the project, the co-op is negotiating with some of them. Although the University of Moncton is neither member of the co-op nor an investor in the project, they collaborate with the Co-op in promoting the deployment of wind energy in the area.

The project involves the development of a utility-scale wind farm. Helimax Energy Inc. is the consultant hired to plan the project. The Co-op is currently deciding how to handle the implementation phase. NB Power has been very cooperative; they contributed some money towards a feasibility study. NB Power will collaborate by upgrading the electrical system to accommodate connecting the project.

Some municipalities may be interested in buying the green power as well as being investors in project. Their goal in investing in the project is not profit, but environmental and health benefits. If they do make a profit from their investment, they may put it towards the purchase of green energy. It is not yet known what percentage of the power they will buy.

In the first few years, NB Power intends to sell most of the power to the federal government. The project has benefited from strong local support. NB Power has been very cooperative. Bird migration paths are being taken into account when siting the project. One site was eliminated because of bird migration paths, although its wind was stronger than the chosen site. The Environmental Assessment study has been started and there has not been any opposition to date.

Two main barriers have been encountered during this project. The first is to keep the price at which electricity is sold to NB Power competitive to the Utility. The second is to put the equity together while keeping a form of co-operative model. It has been a challenge to manage the different cultures and goals of the co-op vs. big business.

FCM provided $100,000 for the feasibility study. If municipalities in the area become part of the co-op they will likely apply for GMF funding to help implement the project.




# LakeWind

LakeWind is a unique community-owned wind farm project that is being propsosed and developed by the Ontario Sustainable Energy Association. The overall intent of this development is to achieve a critical mass of renewable energy power generation, while distributing ownership down to the community level across Ontario.

There are two primary business models that OSEA has under consideration, both of which incorporate the potential for municipal participation:

1. "Self-generation" co-operative
2. Investment co-operative

In both models, there are some common core elements. These are outlined briefly below, and the unique aspects of the two models are then detailed.

### Core Co-operative Structure

LakeWind would be structured as a 'co-operative of co-operatives'. An overall province wide co-op would be established by OSEA, and local communities would set up their own co-op organizations. Individuals in the local communities would invest money, via their local co-op, in the LakeWind project. In return, individuals would receive ownership shares in the project (a formal share offering would be conducted under the direction of the Financial Services Commission of Ontario or FSCO). This money would provide the capital for the construction of a 10-20 MW wind farm in a location in Ontario that was endowed with a high quality wind regime. In addition, the siting of the wind farm would be contingent upon strong local support and local involvement/investment of the local community. In effect, each local community would proudly 'own' one or more turbines, or a portion of a turbine.

### Self-Generation Co-operative

The business model that most closely aligns with the co-operative principles is a self-generation model, in which the power which is *produced* by the co-operative would also be *consumed* by the co-operative members. Practically, this would mean that the power output generated by the wind farm would be deducted from the individual investor's energy bill in proportion to their ownership share in the project. This would require the capability for net billing/metering, which is not currently available in Ontario.

OSEA has identified an alternative which conceptually achieves the same end result through the use of "Green Tags". In simplest form, this involves separating the energy aspect of the wind power from the green attribute. The wind power generated would be sold into the electricity grid as brown power, either on the spot market or through a contractual agreement. After normal operating costs, remaining funds would be distributed to shareholders as a dividend, in proportion to the number of shares they own. In this way, the individual investors receive a financial return on their investment from the sale of the energy.

The green aspect of the power generated would be returned to individual investors in the form of a green tag, and would be retired, thereby ensuring an actual reduction in




the proportion of GHG generated from electricity. In this way, individual investors are consuming the environmental or green attribute of the wind power.

### Municipal Participation in the Self-Generation Co-operative

This model for LakeWind offers a truly innovative, cost effective and turnkey (ready to operate) option for local municipalities to participate in renewable energy projects and meet their GHG reduction targets.[9] By choosing to participate in LakeWind, the role of the municipality would be very similar to the role of an individual investor, but with some distinct elements *(refer to Figure 1 below)*:

- All municipalities that chose to participate in the project would invest via an overall municipal entity, which in turn would be a joint venture partner in the LakeWind Wind Farm along with the community co-operative organizations.
- It is suggested that the municipality would finance their investment in the project through the low-cost financing provided by the Federation of Canadian Municipalities' Green Municipal Investment Fund (GMIF).
- Similar to an individual, the municipality would receive a financial dividend from the sale of the power. This would go towards the repayment of the loan from the FCM's GMIF.
- In addition, the municipality would receive green tags from the wind power generated each year for the life of the project (traditionally estimated at 20-25 years), which they would retire. In effect, this is a form of 'consumption' of green power, thereby resulting in a reduction of GHG emissions.

There are a number of other possibilities that could apply in respect to the green tags.

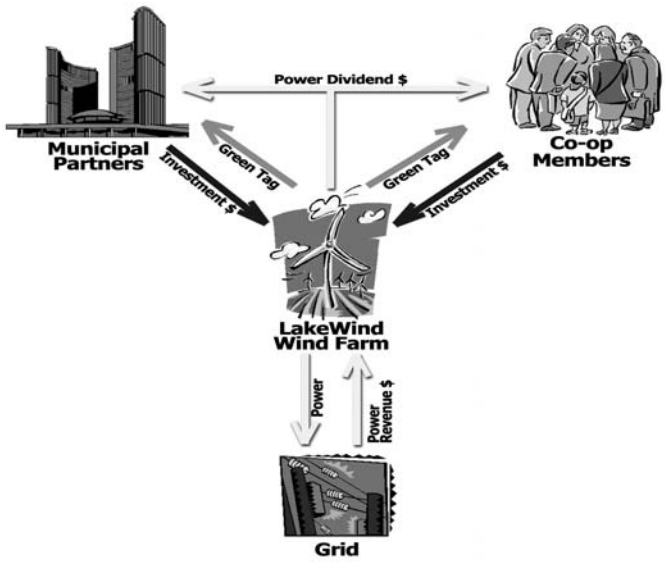
- First, during the early life of the project, the green tags generated could be flowed through to the federal government as a form of repayment of the GMIF loan – the federal government would receive the credit for GHG reductions and retire the green tags. In return, the municipality would receive a financial reduction of their loan balance. Once the loan is paid off, the credits for GHG reductions from the green tags would revert to the municipality.
- Individual investors from the LakeWind co-operative could choose to sell their green tags, via the LakeWind organization, to the municipalities. This would create a 'win-win' scenario: the municipalities would have access to a larger pool of green tags, therefore contributing further to their GHG reductions, while the individual investor would improve their financial return on investment in the project.

[9] OSEA will ensure that GHG reductions qualify under PCP requirements and that independent verification and certification of the retirement of the credits is in place.




**Appendix C**
**Green Power Opportunities for the GTA-CAC**

***Figure 1 – The LakeWind Model***




**Requirements of Municipalities**
For the municipality, this is an extremely efficient, 'turnkey' option. The municipality only needs to make the financial investment in the project and in return they receive an ongoing dividend stream and GHG reductions. Other than this, the project will not require additional municipal staff time, materials, or any other resources. This is an especially attractive aspect relative to other options to reduce GHG reductions (e.g. retrofitting buildings, etc).

**Benefits to Municipalities**
For the municipality, participation in LakeWind offers an easy and effective way to achieve their objectives of creating sustainable communities and meeting their GHG targets within PCP. LakeWind represents a true 'triple bottom line' solution:

**Economic**
- The municipality will receive a financial return on their investment by way of the dividend from the sale of the wind power. This revenue stream will continue for approximately 20-25 years (the assumed life of the project).
- OSEA believes that the LakeWind concept represents one of the most economical ways for municipalities to achieve their GHG targets, and, given the turnkey nature of the project, one of the easiest methods.

**Environmental**
- Municipalities will, in effect, be consuming green power as they receive and retire the green tags from the wind power that is generated. In so doing, they will be displacing GHG emissions.
- In addition, this type of project allows communities that would otherwise not be able to initiate a renewable energy project of their own to take advantage of the environmental benefits and economies of scale of such a project. In particular,




communities that do not have good wind regimes would still have the opportunity to participate in the most economical form of green power currently available.

- Since the wind technology is benign and the local siting community will be involved in the project, having the wind turbines located outside of a municipality's jurisdiction will not be an issue. The project does not burden the siting community with any negative consequences, environmental (e.g. emissions) or otherwise.

**Social**

- Community goodwill is bolstered as the individual investors from the municipality witness the tangible participation of their local government in this project. By marrying the municipal government involvement with the local individual involvement, the project takes on a true community-driven dimension, as both constituencies work in a collective manner to improve their environmental footprint.
- The construction and ongoing operation of the wind farm will create new employment opportunities in a new and growing skilled field. The Canadian Wind Energy Association (CanWEA) has calculated that for every million dollars invested in wind energy, 8 full-time equivalent jobs are created.[xxxii]

**Financial Analysis**

The following chart clearly illustrates the cost-effectiveness for municipalities of self-generating their own green tags vs. purchasing green power or green tags.

| | **Self-Generation[10]** | **Green Tags** | **Green Power** |
|---|---|---|---|
| Cost/kWh | $0.004 | $0.035 | $0.090 |
| Less: Cost of Brown Power | $0.000 | $0.000 | $0.053 |
| **Net cost of "Green" (per kWh)** | **$0.004** | **$0.035** | **$0.037** |
| | | | |
| Total kWh – per year[11] | 790,000 | 790,000 | 790,000 |
| Total kWh – 20 years | 15,802,000 | 15,802,000 | 15,802,000 |
| | | | |
| Total Cost – per year | $3,486 | $27,650 | $28,914 |
| Total Cost – 20 years | $69,730 | $533,070 | $578,353 |
| | | | |
| Extra cost per year | $0 | $24,164 | $25,428 |
| Extra cost – 20 years | $0 | $483,340 | $508,623 |
| | | | |
| **Index** | **100** | **793** | **829** |

[10] Not including the capital costs of the project
[11] 790,000 kWh is used for illustration purposes




# Sources

[i] http://www.oeb.gov.on.ca/html/en/abouttheoeb/statsandmaps.htm
[ii] http://www.pembina.org/newsitem.asp?newsid=69&section=
[iii] Green Power Opportunities for Ontario - CIELAP, David Suzuki Foundation, TREC, 2002
[iv] http://www.environmentalchoice.com/greenpowerfiles/guidelines/Draft_Electricity_Guideline.PDF
[v] www.canwea.org
[vi] http://www.opg.com/envComm/E_greenPower.asp
[vii] http://www.opg.com/envComm/E_greenPower.asp
[viii] http://www.solarenergysociety.ca/photovoltaic.htm
[ix] www.windshare.com/faq.html
[x] http://www.ewea.org/doc/03-03-03%20World%20figures.pdf
[xi] http://www.nationalwind.org/pubs/avian_collisions.pdf
[xii] http://www.ec.gc.ca/pdb/ghg/lfg_protocol_e.cfm
[xiii] http://www.ene.gov.on.ca/envision/gp/3651e_e5.pdf
[xiv] http://www.fcm.ca/scep/case_studies/waste_management/toronto_waste_sum.htm
[xv] http://www.fcm.ca/scep/case_studies/waste_management/toronto_waste_sum.htm
[xvi] http://www.environmentalchoice.com/greenpowerfiles/guidelines/Draft_Electricity_Guideline.PDF
[xvii] http://www.ene.gov.on.ca/envision/gp/3651e_e5.pdf
[xviii] Janet McFarland, Globe And Mail "Across the Board" April 2, 2003
[xix] http://www.cnp.ca/resources/nuc-subsidies-at-50-ex-sum.html
[xx] http://www.eia.doe.gov/emeu/international/canada.html
[xxi] http://www.environmentalchoice.com/default_grc.cfm?Content=Login
[xxii] http://www.eren.doe.gov/RE/geo_basics.html
[xxiii] http://www.nrel.gov/docs/fy01osti/29065.pdf
[xxiv] http://www.canren.gc.ca/programs/index.asp?CaId=107&PgId=622
[xxv] http://www.fin.gc.ca/news02/data/02-063_2e.html
[xxvi] http://www.fin.gc.ca/drleg/02-063_1e.html
[xxvii] Green Power Marketing in Canada: The State of the Industry, Pembina Institute p.20
[xxviii] See Ensuring Green Power Supplies in Ontario: Responding to Perverse Subsidies and Other Market Inequities http://www.cielap.org/ensuringgreenpower.pdf for more detail on this issue.
[xxix] AUMA http://munilink.net
[xxx] Green Power Marketing in Canada: The State of the Industry - Pembina
[xxxi] Presentation by Theresa Howland at Alberta Municipal Energy Efficiency and Greenhouse Gas Conference, March 2003
[xxxii] http://www.canwea.ca/pdfs/CanWEA-WindVision.pdf Pg. 4