TORONTO

STAFF REPORT
ACTION REQUIRED

Toronto Sustainable Energy Plan

Date:	October 24, 2008
To:	Executive Committee
From:	Deputy City Manager Richard Butts Acting Deputy City Manager and Chief Financial Officer Cam Weldon
Wards:	**All**
Reference Number:	P:\2008\Internal Services\F&re\Ec08093- F&re – (AFS 7132)

SUMMARY

This report, which was prepared jointly by staff from the City and Toronto Hydro Corporation, makes recommendations which will help meet Council's greenhouse gas (GHG) reduction targets as spelled out in the Climate Change, Clean Air and Sustainable Energy Action Plan, Phase I (CCCASE) for stationary energy, or energy used in buildings. GHG emissions from transportation, which is the other main source of emissions in Toronto, are being addressed by City Planning, Transportation Services, and the TTC. The Toronto Environment Office will continue to coordinate and report on the City's overall GHG reduction efforts.

The report analyses the City's current status in achieving the GHG reduction targets from 1990 levels, and outlines potential strategies and measures for reaching targets in 2012 (6%), 2020 (30%), and 2050 (80%). The strategy focuses on advancing electricity conservation and demand management (CDM) programs in Toronto which assist the Province in phasing out coal-fired electricity generation by 2014, followed by an emphasis on reducing emissions from natural gas. Concurrently, the City should continue to support and advance the longer-term development of renewable energy. Codes and standards should be tightened and enacted to ensure the use of market-ready sustainable energy measures. Market penetration of more expensive sustainable energy technologies and measures should be stimulated with incentives and education programs.

The report stresses the need for improved coordination among the various agencies involved in the energy sector, in order to address Toronto's unique energy needs. Barriers to meeting Council's greenhouse gas targets are identified, and suggestions for overcoming those barriers are proposed.

Finally, the report contains specific recommendations which outline a strategy for meeting the target of purchasing 25% of the City's electricity from renewable sources.

RECOMMENDATIONS

The Deputy City Manager, Cluster B, and Acting Deputy City Manager and Chief Financial Officer recommend that the Executive Committee adopt the following:

Strategic Recommendations:

1. Support the direction outlined in this report of reducing greenhouse gas emissions from stationary energy use through:

    - assisting the Province in phasing out coal-fired electricity generation by 2014 through conservation and demand management programs and other initiatives;
    - an increased focus on reducing emissions associated with the provision of thermal energy sources (primarily natural gas) following the phase-out of coal-fired electricity generation in Ontario;
    - continued support for a transition from carbon-based to renewable energy generation; and,
    - the use of regulations, incentives and educational initiatives as tools to support this approach.

2. Approve in principle the formation of a City and Toronto Hydro staff coordinating committee that will:

    - research, develop and recommend joint sustainable energy initiatives;
    - employ scenario modeling to support effective program planning and to ensure that the City's investments in emission reduction activities are well-directed;
    - address the issue of full life-cycle accounting methods to better recognize the full costs and benefits of investments in sustainable energy;
    - develop short term targets for electricity demand reduction, natural gas conservation and renewable energy production;
    - continue to identify, and recommend steps to overcome, barriers to the realization of Toronto's sustainable energy resource potential;
    - work with stakeholders as part of its mandate; and,
    - report to a steering committee consisting of the Deputy City Manger, Cluster B, the Acting Deputy City Manager and Chief Financial Officer, and the President and CEO of Toronto Hydro Corporation.

3. a) On behalf of the City, staff engage the Provincial Government and other potential partners to advocate for the creation of a Toronto energy coordinating body that will:

    - support the strategic direction described in Recommendation 1 above;

- recognize Toronto's unique energy needs;
- reflect the need for the local development and delivery of energy policy and programs;
- acknowledge and build on the strong track record the City and Toronto Hydro have in developing and delivering energy programs; and,
- address barriers to the realization of Toronto's sustainable energy resource potential in support of the City's greenhouse gas reduction targets, including those outlined in this report.

b) Based on the results of discussions with the provincial government and other potential partners, request staff to prepare further Terms of Reference for the coordinating body.

4. Green Power Sourcing recommendations:

a. In order to advance the 25 percent green power target the Chief Corporate Officer be authorized to:

i) continue negotiations with Toronto Hydro Energy Services Inc. (TH Energy) to develop the City's potential renewable energy opportunities with a view to purchasing or utilizing the green energy generated for City facilities or operations;

ii) investigate the feasibility of partnering with TH Energy to develop a wind power project including TH Energy's proposed off-shore wind project or other wind power projects in Ontario;

iii) issue a request for expressions of interest for joint ventures with community partners to develop green power assets for the City to be used towards the City's green power targets; and,

iv) investigate the feasibility of using the City's Sustainable Energy Funds for developing an incentive program to promote community based renewable energy projects that could be used towards the City's 25% green power target;

b. The Chief Corporate Officer report back to the Executive Committee on the results of discussions with TH Energy and financial implications of partnering with TH Energy or community partners in order to meet the City's 25% green energy target;

c. The Chief Corporate Officer be authorized to continue the purchase of green power for City Hall at a cost of $500,000 each year as a showcase for sustainability until other green power purchase agreements are in place.

Further Reports:

5. Direct the Chief Corporate Officer to report back to the Executive Committee during the first quarter of 2009, regarding the Sustainable Energy Funds loan targets versus actual results during 2008 and any recommended adjustments to the current program design for future years.

6. Request Toronto Hydro Corporation and the Chief Corporate Officer to report back to the Executive Committee in 2009 on the status of "smart meter", "smart grid" and related initiatives, and their potential for assisting the City in meeting its greenhouse gas emissions targets, including the issue of distributed generation of energy from clean and renewable sources.

Authorization:

7. Authorize the appropriate City officials to take any actions necessary to give effect to the foregoing.

Financial Impact

There are no financial impacts arising from the strategic recommendations in this report.

The Recommended 2009 Operating Budget includes an allocation of $500,000 in the non-program account to purchase green power for City Hall.

Implementation of the strategic recommendations contained in this report could have substantial financial implications and will be included in subsequent reports on specific initiatives to reach Council's greenhouse gas reduction targets.

The Acting Deputy City Manager and Chief Financial Officer has reviewed this report and agrees with the financial impact information.

DECISION HISTORY

The report "Climate Change, Clean Air and Sustainable Energy Action Plan – Phase I" (CCCASE), which was adopted by Council on July 16-19, 2007, set the following targets in Recommendation 1 a):

> "Reduction targets for greenhouse gas emissions from the 1990 levels of approximately 22 million tonnes per year for the Toronto urban area:
>
> (i) 6% by 2012 (the "Kyoto target");
> (ii) 30% by 2020; and
> (iii) 80% by 2050."

Recommendation 14 of the report states:

> "City Council will ensure there is ongoing monitoring and evaluation of our progress and reporting on that progress to the community and that City Council:
>
> (a) direct the Director of the Toronto Environment Office to continue to coordinate the City's actions to measure, monitor and model greenhouse gases and smog causing emissions to ensure efforts are focused on those that have the greatest effect on human health and the natural environment;
>
> (f) direct the Deputy City Manager, Cluster B, to report on air quality and greenhouse gas emissions, outcomes of policies, programs and activities in connection with the Climate Change and Clean Air Action Plan and recommend changes and new actions as part of regular annual reporting on the state of Toronto's natural environment and outcomes of policies, programs and activities.

CCCASE also included other recommendations relating to the purchase of "green" power for the City's own operations:

"2. City Council establish the financial resources required to support the actions necessary to achieve these emission reduction targets and that City Council:

(e) direct the Chief Corporate Officer to develop a plan to achieve the City's target of obtaining 25 percent of the City's electricity needs from green energy sources over a four year phase-in period starting in 2008"

At its meeting of March 31, 2008, Council adopted Report No. EX18.1, titled 2008 Budget Committee Recommended Operating Budget which included the following recommendation in paragraph 44:

"1. City Council authorize the purchase of a sufficient amount of green electricity to meet the electricity usage requirements of City Hall for at least a one year period starting in 2008;

2. The Chief Corporate Officer start discussions with Toronto Hydro Energy Services and possibly other suppliers, including community groups, regarding partnership opportunities to develop green power projects which could be directed to the City's green power targets; and

3. The Chief Corporate Officer report back to the Executive Committee for its September 2008 meeting with a recommended long-term strategy for the City's target of obtaining 25 per cent of its electricity from green power sources."

At its meeting on December 6, 2007 the Toronto Transit Commission approved a report titled, "TTC Environmental Plan – Initiatives and Implementation", which included the following recommendation:

> "(e) direct staff to purchase 25% of its electricity from renewable or sustainable sources by 2012, subject to approval of the funds required;"

In addition, Recommendations 2 a) and b) of CCCASE endorsed:

> "(a) the creation of a $42 million Toronto Energy Conservation Fund, to provide support for energy conservation initiatives in City facilities and buildings in the Municipal, University/College, School and Hospital (MUSH) sector and not-for-profit sector in Toronto, with implementation to commence in 2008;
>
> (b) the creation of a $20 million Toronto Green Energy Fund to provide support for renewable energy installations in Toronto, with implementation to commence in 2008";

At its meeting of December 11, 12 and 13, 2007, Council adopted Executive Committee Report 15.8, "Implementation of the Sustainable Energy Funds", including recommendation 3, which reads:

> "The Chief Corporate Office be requested to report to Council before the end of 2008 on expanding the scope of the Sustainable Energy Funds to include the private sector (commercial/residential/industrial), and on the resources required to do so."

(http://www.toronto.ca/legdocs/mmis/2007/ex/bgrd/backgroundfile-5052.pdf)
(http://www.toronto.ca/legdocs/mmis/2008/cc/decisions/2008-03-31-cc18-dd.pdf)
(http://www.toronto.ca/legdocs/mmis/2007/ex/bgrd/backgroundfile-8809.pdf)

ISSUE BACKGROUND

The Energy Sector in Ontario

Electricity Industry

The electricity industry in Ontario is directed by the provincial government. Several government and non-government agencies are involved in the planning and development of electricity supply, transmission, distribution and management systems. The roles of these agencies are described below.

The Ministry of Energy and Infrastructure (the Ministry) develops and advises on all aspects of energy policy for the province. Through its oversight of the Ontario Power Authority (OPA), the Ontario Energy Board (OEB) and the Independent Electricity

System Operator (IESO), the Ministry is responsible for setting the legislative policy framework to ensure the supply and delivery of electricity and natural gas. The Ministry represents the provincial government in its dealings with Hydro One and Ontario Power Generation (OPG).

- The OPA conducts independent planning for electricity generation, conservation and demand management, and transmission, and develops Integrated Power System Plans for Ontario. It forecasts electricity demand and the adequacy and reliability of electricity resources for Ontario for the medium and long-term, and also procures electricity.

- The OEB is an independent economic regulator responsible for regulating Ontario's electricity and natural gas sectors. It is responsible for protecting the interests of energy consumers, given the monopolistic aspects of both sectors, and licenses independent energy retailers. Some of the OEB's particular responsibilities include: setting natural gas and electricity rates; licensing all electricity market participants (i.e. the IESO, generators, transmitters, distributors, wholesalers and retailers) and licensing all natural gas marketers who sell to residential and smaller commercial consumers. Through its licensing and associated rule making authority, the OEB implements government energy policy through economically efficient and financially sustainable industry rules and policies. The OEB is also responsible for fair competition in the wholesale electricity sector through the IESO-housed Market Surveillance Panel, which reports to the OEB Chair.

- The IESO is a non-profit corporation responsible for managing the reliability of Ontario's power system and forecasting the short term demand and supply of electricity. It also operates the wholesale electricity market, and is mandated with a market rule compliance function.

- Hydro One is a provincially owned company that owns and operates the majority of the electricity transmission lines in the province. It also serves as the local electricity distribution company in some rural areas of the province.

- OPG is an electricity generation company owned by the Province. OPG generates approximately 70% of Ontario's electricity through hydroelectric, nuclear and fossil fuel stations. (New power generation is increasingly being supplied by private companies, primarily through natural gas and wind generation.)

<u>Toronto Hydro Corporation</u>

Toronto Hydro Corporation (THC) is a holding company with two subsidiaries:

- Toronto Hydro-Electric System Limited (THESL) - responsible for the distribution of electricity, under the regulation of the OEB.

- Toronto Hydro Energy Services Inc. (TH Energy) - provides energy efficiency and renewable energy generation services, and manages streetlights across the city, all on an unregulated basis.

THESL is a local electricity distribution company that purchases power from the provincial electrical grid for distribution to some 680,000 local customers. It is 100% owned by the City, and the load that it serves accounts for approximately 18% of peak electricity demand (5,005 megawatts) in Ontario. Electricity consumption in Toronto in 2007 was 26.4 million megawatt hours. THESL is regulated by the Ontario Energy Board, pursuant to the *Ontario Energy Board Act, 1998*. Consumer and business electricity rates are established by Board Order following a hearing process, and include a fixed rate of return on investment for the utility.

TH Energy operates in a competitive market, and is unregulated by the OEB. It has successfully delivered a number of energy efficiency projects for the City.

Natural Gas Industry

Unlike the electricity industry, the natural gas industry is dominated by private sector firms, including Enbridge Gas, which distributes natural gas in Toronto. The industry is regulated by the Ontario Energy Board, which requires gas utilities to submit proposed rates for review and approval. Natural gas marketers in the residential and small commercial markets are also licensed by the OEB.

Most of Toronto's natural gas is imported from Western Canada at a cost to consumers of approximately $1.8 billion per year. However, gas production in that region has reached a plateau and is declining, while domestic demand in Alberta has been increasing. At the same time, Ontario is experiencing dramatic growth in demand for natural gas at gas-fired electricity plants, including the new Portlands Energy Centre, and a number of other plants planned for the GTA. The decline in supply and increase in demand are causing significant upward pressure on natural gas prices.

Natural gas is the largest single source of GHGs in Toronto, at approximately 8.7 megatonnes of CO_2 annually; these emissions represent nearly 60% of all building-related emissions. The emissions attributable to natural gas consumption within the City are much greater than electricity-related emissions (6.2 megatonnes, or about 40% of emissions from buildings), and slightly larger than the emissions from all vehicles in Toronto (8.6 megatonnes per year).

Current Issues Affecting Toronto

Coordination Among Agencies

Growing interest in the impact of climate change has led to a significant increase in the number of initiatives designed to reduce GHG emissions. A report prepared in 2007 in

support of the City's CCCASE by PricewaterhouseCoopers identified over 80 programs offered by the three orders of government, utilities and others in the Toronto area aimed at energy conservation, or increasing renewable energy generation; that number has grown since then. In January 2007, the province appointed an Agency Review Panel to review issues related to Ontario's provincially owned electricity agencies (described above). In its report, the panel commented on the "significant duplication of effort" among these agencies, and suggested in particular that the functions of the Ontario Power Authority could be integrated into those of other agencies.

Toronto's energy system is unique in that it has no local body to coordinate its functions. In other key areas such as transportation (Metrolinx) and the waterfront (Waterfront Toronto), there are interagency organizations that allow stakeholders to work together to coordinate system planning and service delivery on a local level. Energy-related policies and programs in Toronto are neither developed nor delivered in a coherent manner. This lack of coordination creates the risk of gaps and overlap in services, and confusion about incentives and other programs in the marketplace.

Recent decisions by the Provincial government suggest that its recognition of the role of municipalities in the development of sustainable energy resources is growing. For example, the *Energy Conservation Leadership Act, 2006* will require municipal governments to prepare and submit energy plans on a regular basis. The Act does not provide municipalities with the tools required to meet its expectations; in fact, it could actually reduce the power of local governments through provisions that allow it to override municipal bylaws. However, the province has created new support tools for municipal energy initiatives, such as the Municipal EcoChallenge program, which provides funding through both grants and low-interest loans to municipalities.

The City and the provincial government have recognized the need to work together on issues that affect both parties. On March 3, 4 and 5, 2008, City Council adopted Executive Committee Report 17.9, "Agreement on Cooperation and Consultation between the City and the Province of Ontario dated January 15, 2008", which recommended approval of an agreement on ongoing discussions and co-operation between the two governments about matters of mutual interest, as provided in the City of Toronto Act, 2006. This agreement provides a framework within which both governments could coordinate their energy efforts along with others.

Electricity System Planning

Under the Electricity Act, 1998, (the "Act") the Ontario Power Authority (OPA) is responsible for developing both an integrated power system plan (IPSP) and appropriate procurement processes for managing electricity supply, capacity and demand in accordance with its approved IPSP. The IPSP and procurement processes must both be submitted to the Ontario Energy Board (Board) for review and approval. In developing the IPSP, the OPA was required to comply with the government's June 13, 2006 Supply Mix Directive which stipulated that the province's electricity requirements should be met from specified resources (conservation, renewable resources, nuclear power for baseload requirements and natural gas-fired generation for peaking, high-value and high-efficiency

uses). Coal-fired generation is to be replaced by cleaner sources in the earliest practical time frame. The Supply Mix Directive also states that the IPSP must strengthen the transmission system.

The OPA filed an application with the Board on August 29, 2007 seeking an order of the Board approving the IPSP. The City intervened in the application in order to ensure its interests are represented in the Board's review of the IPSP.

On September 17, 2008, the Minister of Energy and Infrastructure issued a directive, "Amendments to Supply Mix Directive Issued June 13, 2006", to the OPA under subsection 25.30(2) of the Act. This Supplemental Directive provides direction to the OPA to review its IPSP, with a view to increasing and accelerating targets in certain key areas of its proposed IPSP, including conservation, renewable generation, distributed generation and enabling transmission.

The Board has adjourned the proceedings until such time as the OPA files its amended, updated or revised IPSP that is to be no later than March 16th 2009. It was felt that continuing to hear the OPA witness panels would be of little value as by virtue of the integrated nature of the IPSP much of the evidence might be updated.

The Board has required the OPA to file with the Board, and serve on the parties, a written update on its progress in updating the plan and any changes to the proposed date to filing the updated evidence. This progress report must be filed by November 30th, 2008.

The Deputy City Manager, Cluster B, and Acting Deputy City Manager and Chief Financial Officer will be reporting to the Executive Committee on the status of the IPSP hearings, and the City's participation in the process.

Although the IPSP identifies a number of issues affecting the Greater Toronto Area, it does not offer a comprehensive process for dealing with Toronto's particular electricity needs. As evidence of this fact, while the IPSP is undergoing review, the OPA has been moving ahead with a number of major local electricity projects on an individual basis, such as the Portlands Energy Centre, consideration of a third transmission line into the City, and a proposed natural gas-fired plant in the southwest GTA. These and other issues could be addressed through a joint Toronto energy coordinating body.

Phasing out Coal-Fired Electricity Generation

The Government of Ontario is committed to ending coal-fired electricity generation in Ontario by 2014. Ontario currently has four coal-fired generating stations: Nanticoke, Lambton, Thunder Bay, and Atikokan. Together they account for approximately 21% of Ontario's electricity generating capacity. The Lakeview generating station in Mississauga was shut down in 2005. Closing the remaining coal plants would result in a significant reduction in greenhouse gas emissions both locally and province-wide. The City's electricity conservation and demand management (CDM) and renewable energy initiatives will assist the provincial government in its coal phase-out efforts.

The Ministry of Energy and Infrastructure (formerly the Ministry of Energy) has set targets for renewable electricity in Ontario of 5%, or 1350 MW, by 2007; 10% by 2010; and 15,700 MW, or about 30%, by 2027. The Minister has also issued several directives to the OPA, requiring it to develop new CDM, renewable energy, and generation resources. In response to these directives, the OPA has developed a number of programs to encourage energy generation from renewable technologies. Among these are:

- The Renewable Energy Standard Offer Program (RESOP) is designed to provide long-term, stable contracts for the purchase of electricity generated by renewable sources under 10 megawatts in size. By the end of 2007, this program had awarded contracts for over 900 MW of renewable electricity generation. In March, the OPA suspended RESOP to address program oversubscription and resulting backlogs, design flaws and interconnection constrained area issues, such as those in Toronto. The program was scheduled to be re-launched in the fall of 2008. At the time of this report, it has yet to be re-launched and OPA has not committed to a date.

- RFP processes for procurement of electricity from larger projects, which has resulted in contracts being issued for over 1300 MW of generation.

- A program to reduce electricity demand in Toronto by 300 megawatts by 2010, which is being delivered by the City's Energy Efficiency Office, Toronto Hydro and the Building Owners and Managers Association of Toronto.

Codes and Standards

Another area in which the province exercises control over energy is through the Ontario Building Code (OBC), the responsibility for which rests with the Ministry of Municipal Affairs and Housing. Beginning in 2012, the OBC will begin measuring energy efficiency in new buildings versus the standard contained in the federal government's Model National Energy Code for Buildings. Council has previously requested the provincial government to allow the City to begin applying those standards by 2010; however, the province has declined to support this request.

Staff from City Planning will report separately on issues relating to achieving higher energy efficiency requirements for new development through the Toronto Green Development Standard, including seeking authority under the City of Toronto Act to require greater energy in buildings. Achieving higher levels of energy efficiency in new development, should act as a catalyst to raise the bar for retrofit standards as well.

The federal government regulates energy efficiency in appliances and other energy-consuming equipment through the *Energy Efficiency Act.* Electricity use (known as "plug load") from electronics and other consumer products has increased; however, the efficiency of many of these devices remains unregulated.

Research by City and Toronto Hydro staff indicates that overall energy use by consumer electronics and household appliances could be reduced by as much as 30% if minimum standards were raised to match the level of energy efficiency that is currently achievable by energy efficient products (e.g. EnergyStar) with little financial impact on consumers (see below).

City of Toronto's Involvement in Sustainable Energy

City Energy Programs

The City of Toronto has a long record of leadership on sustainable energy issues. In the early 1990's Council created the Toronto Atmospheric Fund (TAF) and the Energy Efficiency Office (EEO) in response to emerging concerns about climate change. Both have been recognized internationally as examples of best practice for the reduction of greenhouse gas emissions by local governments.

In 2000, the City adopted an Environmental Plan, which established several goals for sustainable energy development (including a 20% reduction in CO2 attributable to energy used in city operations by 2005 based on 1990 levels). Since then, Council created the Energy Retrofit Program, which has carried out energy retrofit projects on City facilities that have resulted in reductions of 16,700 tonnes of GHGs, 51,000,000 kWh of electricity consumption savings, and 33.8 MW of demand savings annually. Project costs of $50 million have resulted in savings of $5 million on energy bills annually.

Since 1997 the EEO's Better Buildings Partnership has contributed to the City's greenhouse gas emission reduction targets by focusing on building renewal and energy efficiency in buildings. Over 47 million square feet of gross floor area has been retrofitted realizing approximately $20 million in annual operating cost savings and reducing CO2 emissions by 200,000 tonnes per year. More recently, Council approved a joint undertaking with the OPA which enhances the BBP program with OPA funded incentives for electricity savings. Quarterly and annual reports are submitted to the OPA which illustrate the BBP's track towards a target of 90 megawatts of electricity demand reduction by the end of 2010.

The most recent and comprehensive effort by the City to address climate change and energy challenges is the Climate Change, Clean Air and Sustainable Energy Action Plan, Phase I, which contains numerous recommendations for actions to reduce GHG emissions, including a number related to stationary energy use. These actions include the creation of Live Green Toronto, which offers a wide range of information and programs to Torontonians who want to reduce their impact on the environment, and the Sustainable Energy Funds, which provide zero-interest financing for energy efficiency and renewable energy projects in the municipal, universities, schools, hospitals (MUSH) and not-for-profit sectors. The Toronto Environment Office, which coordinates the implementation of the CCCASE, will submit regular progress reports on the implementation of the Plan's recommendations.

City Energy Policies (Appendix A)

The City's energy policies are found in a number of documents. A compilation of these policies and their source is attached as Appendix A.

Toronto Hydro Programs

Along with the City, Toronto Hydro is also acknowledged as a leader in the development and delivery of sustainable energy programs. Some examples of these include:

- The ***peaksaver***® air conditioning cycling program;
- Summer Savings for Residential Customers;
- The Great Refrigerator Roundup;
- Low Income/Social Housing programs, and;
- The Business Incentive Program

In 2007, Toronto Hydro programs achieved savings of 167 megawatts, resulting in a total savings of 355 megawatts (over 7% of Toronto's peak summer demand) since 2005.

TH Energy has been working with the City on a number of renewable energy projects. Among these are a biogas cogeneration plant at Ashbridge's Bay; biogas generation using material from the green bin program at the Dufferin and Disco yards; a possible wind installation at Beare Road and the Toronto Zoo, and biogas cogeneration at the Green Lane site. They are also examining various wind energy projects including the development of an off-shore project in Lake Ontario near Scarborough.

Toronto Hydro is one of several local distribution companies in the province participating in an initiative sponsored by the IESO to examine "smart grid" infrastructure for electricity distribution. Smart grids apply leading edge information, communications and electrical/electronic technology to optimize the operation of the distribution system, which will help in the introduction of distributed energy generation, time-of-use pricing, and other sustainable energy system measures. In addition, Toronto Hydro is currently implementing a large scale capital project called REBUILD, which involves upgrading the distribution infrastructure in order to improve system reliability, reduce power outages and accommodate future growth. Toronto Hydro and City staff plan to report to the Executive Committee on a regular basis on progress on the smart grid and other infrastructure initiatives, including possible synergies between them.

COMMENTS

Impact of Existing and Planned Energy Initiatives

In 2007, the Toronto Environment Office and the Toronto Atmospheric Fund prepared a comprehensive inventory of the sources of GHG emissions in Toronto. The inventory indicates that total community-wide GHG emissions were approximately 24.4 million

tonnes (megatonnes) in 2004. Of total emissions, building energy use accounted for approximately 14.9 megatonnes, or about 63% of all emissions. Natural gas use, primarily for space heating, is responsible for approximately 8.7 megatonnes (58%) of all GHG emissions from buildings; electricity accounts for approximately 6.2 megatonnes (42%).

For this report, Toronto Hydro and City staff looked at how existing stationary energy initiatives might contribute to the achievement of the City's 2012 (6%), 2020 (30%), and 2050 (80%) GHG reduction targets from the baseline year of 1990.

Figure 1 below illustrates projected GHG emissions for the City of Toronto between 1990 and 2050 based on three scenarios: 1) a business as usual (BAU) scenario; 2) a scenario illustrating the emission reductions needed to achieve the City's GHG targets; and 3) a scenario based on existing and proposed new energy initiatives.

The BAU scenario assumes that annual growth in electricity and natural gas consumption experienced between 1990 and 2004 remains constant through 2050, and that no efforts are made to curtail this growth. This scenario results in total stationary energy emissions of 16.9 Mt (an increase of 18%) by 2050.

The second scenario indicates Council's 2012, 2020 and 2050 GHG reduction targets. In this scenario, emissions from electricity and natural gas use in the City decrease from 14.3 megatonnes (Mt) in 1990 to 2.9 Mt in 2050.

The third scenario illustrates the projected emissions that would result if the Province successfully implements its plan to replace coal-fired electricity plants by 2014, and if proposed new sustainable energy initiatives administered by the City, Toronto Hydro, the Province, the federal government and other agencies are implemented. In this scenario, the City's emissions from stationary energy are projected to decrease from 14.9 Mt in 2004 to 10.5 Mt in 2050, leaving a forecasted gap of 5.7 Mt.

Figure 1

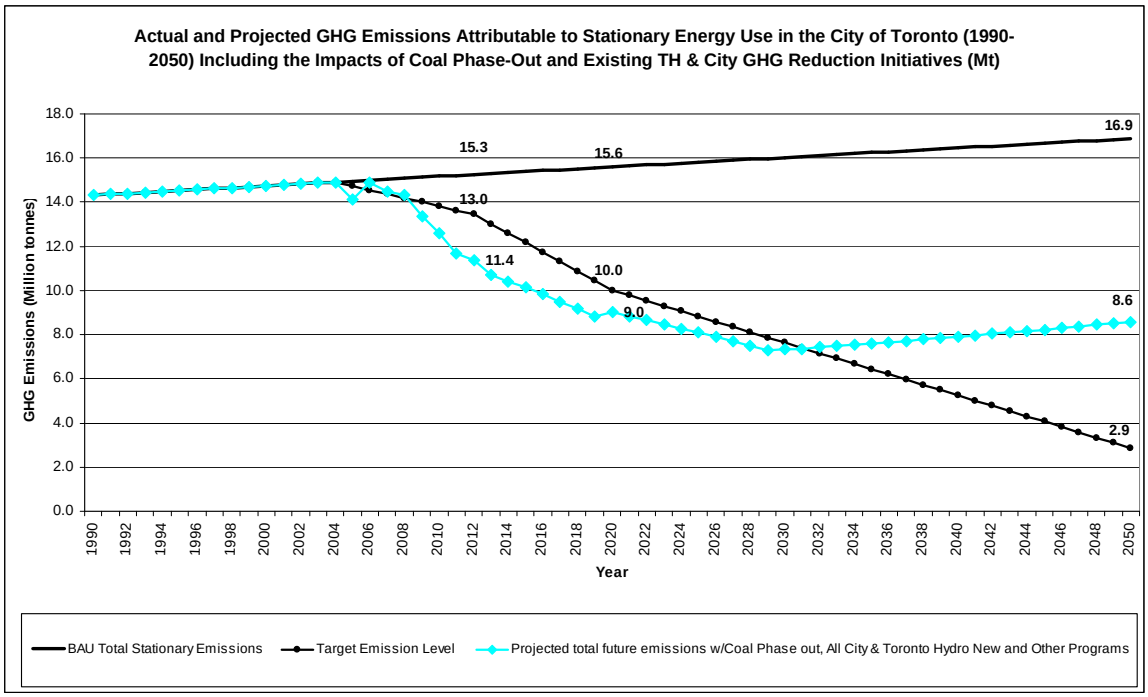


Figure 2 below provides more detail on the potential sources of emissions reductions by 2050. Bars 1 through 3 indicate current GHG emissions, emission growth to 2050, and total GHG emissions in 2050 in the BAU scenario. Bars 4 through 6 show the reductions in emissions due to coal phase-out, other current energy initiatives, and planned new initiatives. Bar 7 indicates the gap (5.7 megatonnes) in emissions that will then remain between current achievable reductions and the 2050 target emission level of 2.9 megatonnes (Bar 8).

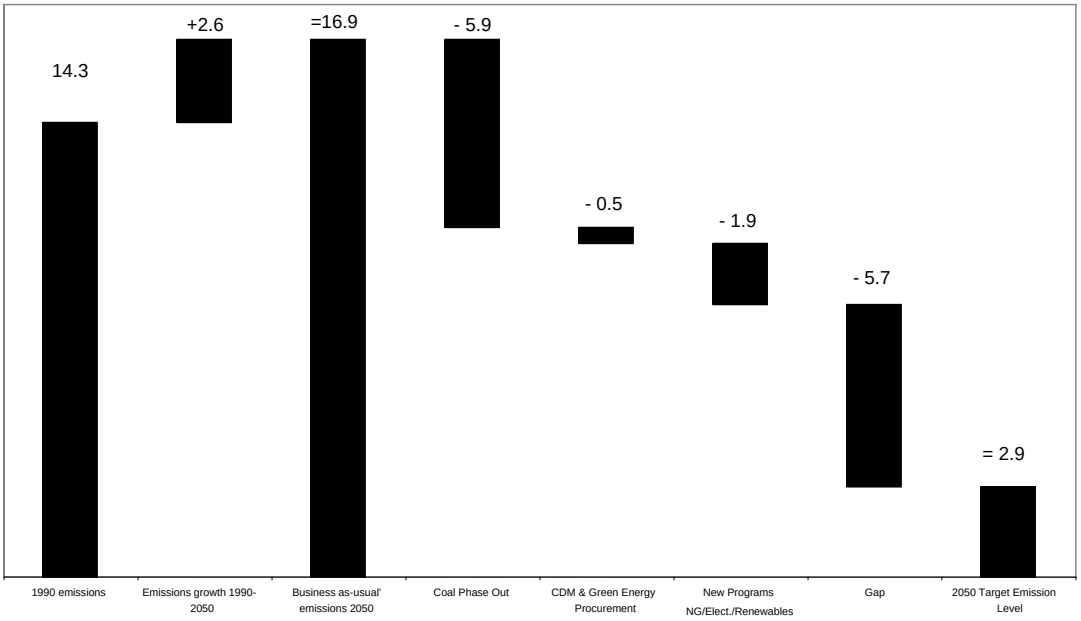
Based on the preliminary assessment of the potential GHG impacts of existing and new sustainable energy initiatives to be implemented by the City, Toronto Hydro and others, it can be concluded that:

- The phase out of coal-fired plants by 2014 will help the City achieve its 2012 and 2020 GHG reduction targets. The City is contributing to coal phase-out goal through a number of initiatives, and should continue to support the Province in the achievement of coal phase out.

- Once coal has been phased out, efforts should be focused on developing the most efficient and sustainable means to provide space and hot water heating in the city. These could include programs to improve the efficiency of natural gas used for heating, and through renewable energy technologies such as solar thermal domestic hot water heating and geothermal heating and cooling.

Figure 2

GHG Emissions from Stationary Energy Consumption in the City of Toronto
Projected emissions and reduction potential 1990 - 2050 (Megatonnes per Year)



- Even with coal phase out and conservation and demand management (CDM) programs, there will still be a significant gap of 5.7 megatonnes in 2050 between actual GHG emissions and the City's GHG target. This gap is almost equal to the GHG reductions attributable to the coal phase-out.

- Planning and implementation of measures needs to begin now in order to bridge the forecasted gap in 2050, as many of the necessary measures may take years to develop and generate results.

- A significant proportion of the total CDM resource available within the Province of Ontario rests within the City of Toronto, as does the local capacity to tap this resource. Toronto is therefore uniquely positioned to contribute to both the Province's and the City's sustainable energy future.

Closing the Long-Term Gap – Barriers and Opportunities (Appendix B)

Toronto Hydro and City staff undertook additional research to determine how the gap between projected 2050 GHG emissions and the City's reduction target could be filled. The research focused on examining the potential GHG reductions that could be achieved if the market penetration of existing CDM and renewable energy technologies were significantly expanded. The main conclusions of this work are as follows:

- Given the amount of jurisdictional overlap in this area, sustainable energy planning and development in Toronto will require coordination with the province and other parties.

- Toronto Hydro has developed estimates of acceptable consumer investment thresholds based on their experience in the marketplace (i.e. residential sector – 8 year payback on energy investments; commercial sector – 3 year payback; industrial sector – 2 year payback). Many energy savings measures, such as high-efficiency lighting, building envelope, furnaces/boilers, air conditioning and motors, meet these thresholds – i.e. they are cost effective and technically feasible today. Codes and standards should be used encourage the implementation of these measures.

- However, the City's 2050 emission reduction targets cannot be achieved by relying solely on those measures that meet current investment thresholds. More expensive renewable energy technologies and other efficiency measures that may exceed current thresholds will be needed if the City is to achieve its targets.

- Given that many of these renewable technologies are just emerging, they may require public policy support (e.g. financial support, industry capacity development programs) to accelerate their market penetration and reduce their cost. Educational programs will be needed to supplement these support mechanisms.

- It is expected that the need for this support will decline over time, as the cost of traditional energy sources increases due to increased demand and dwindling supply, and the cost of renewable technologies declines through market transformation. Most renewable technologies have high upfront costs and very low operating costs; this cost model varies greatly from that of traditional generation technologies.

- Traditionally, Council has placed a greater emphasis on developing energy programs than on issues relating to energy policy and planning. However, as energy issues become increasingly important and complex, and as the City continues to define its role in this area, the need for energy policy and planning capacity will increase.

- Consumer investment decisions based on simple financial paybacks do not necessarily reflect the full costs and benefits associated with technologies throughout their lifespan. Utilizing full lifecycle accounting would help reflect the long-term costs and benefits (including externalities – those costs/benefits generated by economic activity that do not accrue to those directly involved in the activity) of energy investment decisions, as well as the savings that can result from a particular technology beyond its simple payback period (the length of time it takes for the savings to equal the initial cost). The City can play a key role in supporting consumers in their efforts to understand full lifecycle cost accounting and to encourage investment decisions that are made using this standard. This issue requires further research; staff should report further on the implications of adopting a full lifecycle costing approach for energy investment decisions.

- The adoption of renewable energy technologies could have major implications for the energy transmission and distribution system. These implications require further study, and should be the subject of ongoing research and reporting by both City and Toronto Hydro Corporation staff.

Additional barriers, their impacts, and proposed actions to address them are attached as Appendix B. Particular barriers to the sourcing of green and renewable energy for the City's own operations are discussed below.

Specific Program Recommendations

Sourcing 25% Electricity from Green and Renewable Energy (Appendix C)

The City's commitment to source 25% green electricity is based on the desire to reduce the City's contribution to greenhouse gases and to accelerate the development of new, green and renewable energy in Ontario.

The City's current electricity consumption including Agencies, Boards and Commissions is approximately 1,977,000 MWh and therefore the target is to source a total of 500,000 MWh from renewable sources. Meeting the 25% target would result in the reduction of approximately 123,000 tonnes of CO_2.

As an example, the City of Calgary is sourcing 75% of its electricity requirements from renewable sources and this amount to 260,000 MWh per year. A key element in this program is a 20-year power purchase agreement for wind energy from its wholly owned company ENMAX Energy Corporation. ENMAX has completed construction of the 37 wind turbines with a capacity of 80 MW and the City of Calgary is purchasing 100% of its output. The City of Calgary also has other renewable projects such as biogas, district energy and retail green power purchases.

The City's goal of sourcing 500,000 MWh from renewable energy would be by far the largest green electricity purchase by a municipality in Canada. Unfortunately, there is not enough green electricity currently available for purchase in the Province to meet the City's requirements. To address this problem, The Delphi Group was hired by the City to develop a sourcing strategy to meet the City's 25% target.

While developing the strategy it became clear that the approach had to extend beyond a simple purchasing option because of the significant green electricity cost premiums and this would not be financially sustainable in the long term.

A three part approach was undertaken by Delphi:

1. Assess the City's renewable electricity sourcing options

2. Review programs designed to provide incentives to the establishment of new renewable generation assets
3. Evaluate the City's options to influence the development of new generation assets

Delphi then evaluated four sourcing options: a) Green electricity purchase, b) Commercial joint ventures, c) City joint ventures (Toronto Hydro Energy Services) and d) Community Power.

The total investment for this approach, based on the premium cost identified in the Delphi study, is projected to cost up to $598 million. The 20 year financial implications of this approach are detailed in Appendix C.

The City should continue to investigate a diversified approach that includes all four sourcing options in the strategy. This approach would allow the City to take advantage of City assets and provide a catalyst for the community to participate in building more green and renewable energy. This is also an opportunity for the City to further educate and spur the community to take part in reducing the overall environmental footprint.

As an interim solution the City should continue to purchase a small amount of green electricity as it has been doing for City Hall. The purchase of 20,000 MWh for City Hall is equivalent to approximately 1% of the City's electricity requirements. The City's other green power projects such at deep lake water cooling, geothermal and photovoltaic projects contribute less than 1% of the City's electricity requirements. These initiatives will contribute about 3,700 MWh by the end of this year and will increase to about 7,400 MWh by 2013.

There are some general barriers that will need to be considered when developing renewable energy projects and bringing them on line.

1. Transmission Constraints: There are areas in the Province that have no ability to accept new electricity generation because of transmission constraints. The GTA is one of those areas. The OPA is currently reviewing these transmission constraints as part of the Integrated Power System Plan (IPSP). These constraints have caused the OPA to only accept Renewable Energy Standard Offer Projects (RESOP) applications from micro projects (no greater than 10 kW) and farm based bio-energy projects.

2. Development Timelines: There are significant waiting times for developing renewable projects caused by, but not limited to, resource assessments, permitting issues, zoning by-laws, siting, environmental impact studies, and interconnection approvals. For example wind resource assessment studies for onshore developments normally take one year while off shore projects can take up to two years. There is also competition to secure renewable resources and land in non-grid constrained areas.

3. Competition for Renewable Electricity: The Province is trying to bring on renewable energy generation through RESOP. The City through its 25% target is also trying to

bring on renewable energy generation. The City may be forced to pay the same premium or out bid the province in order to access some of the electricity generation required to meet its target.

There are a number of renewable options available to the City, however, the diversified approach would utilize the City's existing assets and promote the development of new green energy sources over the long term. The next step would be to investigate a joint venture with TH Energy to develop the City's renewable energy opportunities and other potential arrangements as outlined in the Delphi report.

Sustainable Energy Funds

The CCO will report back to Executive Committee in the first quarter of 2009 regarding Sustainable Energy Funds projected vs. actual results in 2008. Recommended adjustments to the current Sustainable Energy Funds program design will be made as necessary in consideration of the operating experience, process and impact evaluation documented by staff for 2008.

Furthermore it is important to note that since the approval of the Sustainable Energy Funds last year the external environment has changed dramatically. Given the challenging financial landscape, barriers and opportunities to optimizing participation rates and penetration rates of potential subscribers will be analyzed with a view to developing further recommendations for the design of the program.

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SIGNATURES

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ATTACHMENTS

Appendix A - Summary of City's Sustainable Energy Policies
Appendix B - Barriers to Sustainable Energy
Appendix C - Green Power Sourcing Strategy