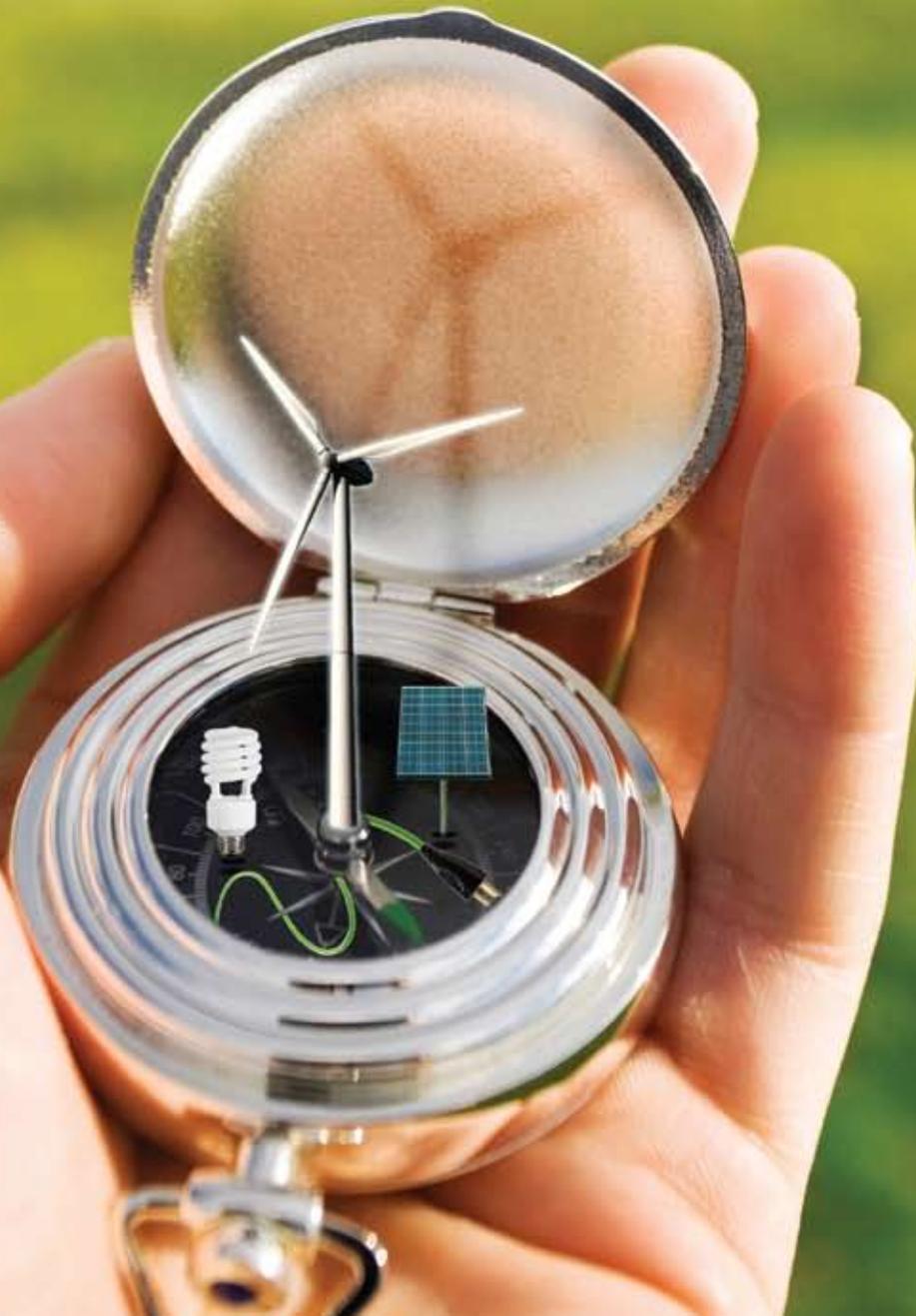


the power to live green

Toronto's Sustainable Energy Strategy | October 2009



Message from the Mayor



Toronto is at an energy crossroad. We can continue on the path of an unsustainable twentieth century energy model characterized by large-scale centralized generation and distribution and a high level of per capita energy consumption, or we can embrace a sustainable energy strategy and proceed along a new path founded on greater conservation, renewable energy sources, reduced use of fossil fuels (oil, gas and coal), and the implementation of a “smart” energy grid.

We need an energy strategy that will:

- support clean air and good health
- provide a stable and secure energy supply for residents and businesses
- build a foundation for our renewed economic competitiveness and prosperity, and
- generate new international opportunities for our industrial and financial sectors

I believe that Torontonians are ready and prepared to take this path of a forward-thinking sustainable energy strategy that meets the energy needs of their businesses, their communities and their families, while improving the quality of life of our city and enhancing environmental protection.

This document, *The Power to Live Green*, describes where we are today, where we need to be in the future, and how to get there. It focuses predominantly on stationary energy in buildings because they are responsible for almost two-thirds of the greenhouse gas emissions in Toronto. Transportation, the other major source of emissions in Toronto, is considered here, as well as in the City's *Sustainable Transportation Initiative*.

To be successful we will need to work in collaboration with other orders of government to maximize our opportunities. And, creating a climate that fosters innovation and investment by large and small businesses and individual home owners, will be critical to the plan's success.

I'm confident that this plan will lead to the creation of new green jobs, help to stimulate our economy, enhance our prosperity and continue to build our city as a progressive and green leader.

Everyone has a role to play because everyone has a stake in our energy future.

Thank you.

A handwritten signature in black ink that reads "David Miller". The signature is written in a cursive, flowing style.

Mayor David Miller
City of Toronto
October 2009

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Vision Statement

In the year 2050 Toronto is a low carbon city, having achieved the greenhouse gas emission reduction targets adopted unanimously by City Council in 2007. At the same time, the City has a clean, reliable and affordable energy supply that meets our environmental, economic, social and consumer needs in 2050 and beyond.



Goal and Objectives

The goal of the Power to Live Green is to develop an energy strategy that builds on the City's sustainable energy foundation by significantly conserving, renewing, and smartly distributing electricity and natural gas to bring us closer to an 80 percent reduction in greenhouse gas emissions from 1990 levels by 2050, while maintaining energy reliability and affordability.

Given that 94 percent of greenhouse gas emissions stem from the entire Toronto urban area and not just the corporation itself, efforts to pursue these measures depend on steps taken across all sectors—commercial, industrial, institutional (i.e. government, hospitals, schools, etc.), and residential.

Therefore, we each must:

- more aggressively retrofit existing building structures to conserve electricity and natural gas use;
- install and support renewable energy generation—whether solar, wind, or geothermal—to more cleanly power our lights, our appliances, our technology, and our operations;
- install and support distributed energy systems as a more efficient alternative for heating and cooling our buildings;
- more aggressively consume only products and services that use cleaner energy or are more energy efficient; and
- commit to more sustainable ways to transport ourselves and consider electrical vehicles where car travel is the only option.

Together, we truly have the Power to Live Green.

The City's sustainable energy strategy focuses on assisting us in achieving this goal. The recommendations and actions presented in this strategy aim to help make easier the ability to retrofit homes and business, install small-scale renewable generation projects, support larger renewable generation projects, hook up to distributed energy, obtain green jobs, grow green industry, invest in the smart grid, secure sustainable transportation and use electric vehicles, and advocate for change in other orders of government. At the same time, many existing policies and programs—a list of which can be found at Appendix A—already provide some of this support. Through these initiatives, and the recommendations and actions proposed in this strategy, the City aspires to maximize its own Power to Live Green as an example for the entire Toronto community.

Meeting our goal will enable us to achieve the following:

- 1000 megawatts of electricity conservation and demand management (“CDM”) which will offset Toronto’s projected electricity load growth and help consumers become more energy efficient.
- 1000 megawatts of renewable electricity generation distributed throughout Toronto in the form of small scale solar photovoltaics (“PV”), wind energy, and biogas.
- 1.8 billion cubic meters of reduction in natural gas through conservation and thermal renewable energy generation.
- Improved security and reliability of supply by upgrading the utility infrastructure and through the integration of distributed generation.
- Reliable, affordable energy supply.
- Progress in achieving the City’s Climate Change objectives by reducing greenhouse gas emissions to 6.7 mega tonnes, and improvements in air quality.

The Power to Live Green focuses on electricity and natural gas end-use, whether for buildings or generators, subways or streetcars. However, the strategy does not directly address mobile sources powered by fuels, such as cars and buses with internal combustion engines. Although the strategy primarily addresses electricity and natural gas end-use, it does not diminish the need for Toronto to continue to move forward with the City’s sustainable transportation initiatives and planning.



Energy Targets

To realize the goal and objectives of the sustainable energy strategy and continue working toward Council's previously adopted greenhouse gas reduction targets, the City of Toronto, through its agencies, boards, commissions, corporations and divisions (ABCCD's), together with the Toronto community, will need to reach strategic targets for both conservation and renewable energy.

The following table proposes conservation targets for electricity and natural gas consumption as well as renewable energy targets. In the short-term by the end of 2012, the strategy is to deliver electricity related conservation demand management ("CDM") and renewable generation to reduce our reliance on fossil fuel burning generation and assist the Province with their plan to phase out coal generation plants by 2014. In the mid-term by 2020, the focus is to reduce consumption of natural gas, as that will be the largest source of greenhouse gas emissions in Toronto after the phase out of coal generation plants. In the long-term by 2050, the City will continue to support existing and emerging renewable energy technologies to displace conventional electricity generation and natural gas.

Table 1: Cumulative Targets
(Based on 2007 levels of 5,000 Megawatts (MW) of electricity consumption and 4,200 Million cubic metres (Mm³) of natural gas consumption.)

SOURCE	By 2012	By 2020	By 2050
Conservation— Electricity *	Reduce by 200 MW	Reduce by 550 MW	Reduce by 1050 MW
Conservation— Natural Gas Heat	Reduce by 240 Mm ³	Reduce by 730 Mm ³	Reduce by 1560 Mm ³
Renewable Electricity Generation	Increase by 120 MW	Increase by 550 MW	Increase by 1000 MW
Renewable Thermal Energy	Displace 20 Mm ³ of Natural Gas	Displace 90 Mm ³ of Natural Gas	Displace 200 Mm ³ of Natural Gas

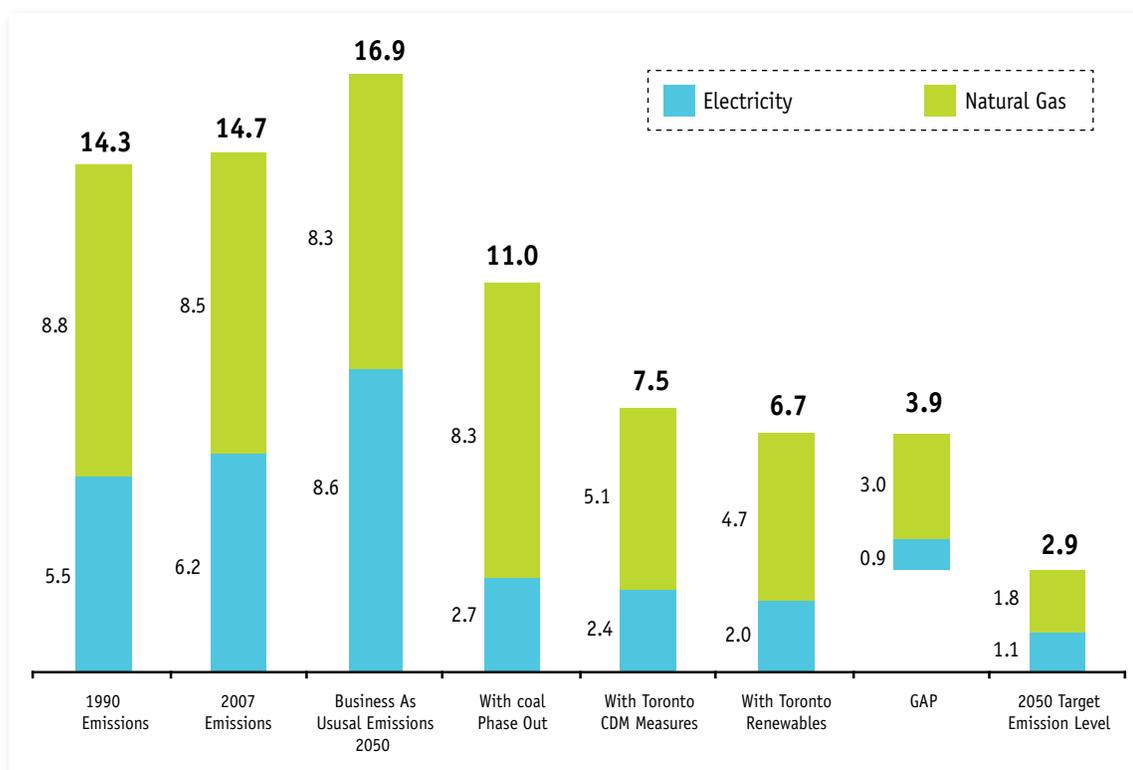
* Conservation targets are in addition to the existing 330 MW reduction by 2010 called for in the Toronto Directive from the Ontario Power Authority. See Appendix A for more details.

Meeting these energy targets will contribute greatly to achieving the greenhouse gas emissions reduction targets adopted by Toronto City Council in 2007:

- 6 % below 1990 levels by 2012
- 30% below 1990 levels by 2020
- 80% below 1990 levels by 2050

The following chart illustrates greenhouse gas emissions from stationary energy and how the targets in Table 1 help to achieve the City's climate change milestone goals. While these are aggressive targets, they do not completely achieve our greenhouse gas emissions reduction target of 80 percent by 2050, as the "GAP" in Figure 1 indicates. We will monitor and update our commitments as new technologies are developed over the next forty years.

Figure 1: Greenhouse Gas Emission Projections from Electricity Generation and Natural Gas Usage Including Coal Phase Out, Conservation Measures and Renewable Energy Generation, 1990-2050 (megatonnes per year)



Guiding Principles

Increasing conservation, renewable generation, and smart distribution of energy provides the building blocks for Toronto's sustainable energy future. The City, its residences, and its businesses must work together to significantly conserve energy use in our daily lives while encouraging appropriate levels of government, through codes and standards, to make more energy efficient technologies and appliances a mandatory requirement. We must continue to provide financial incentives to leverage investments, support conservation, and encourage market transformation.

We also must significantly renew our energy sources and move away from dependence on polluting fossil fuel sources such as oil, coal, and natural gas, simultaneously ensuring sufficient renewable generation and transmission in the process. Finally, we must find methods to better capture wasted energy through co-generation and smart grid technology.

(i) Conservation is crucial, as the lowest cost and the cleanest kilowatt is always the one that is never produced. Enormous gains can be made through cost effective energy efficiency efforts that can be targeted to offset load growth in Toronto. We will work with Torontonians and our stakeholder partners to achieve these goals. The City already has many effective conservation and efficiency programs. We will expand the program opportunities to engage more sectors and more citizens.

(ii) Renewable generation is critically important and inevitable as global supplies of oil, natural gas and uranium decline. Toronto strongly supports the Province's phase out of coal-fired power plants and will work to ensure the transition is smooth and on schedule.

(iii) Smart energy distribution will improve security of supply, eliminate waste, promote efficiency and enable conservation. Deployment of distributed energy systems and further development to the smart grid will help decentralize energy production and move clean, renewable power to where it is needed, when it is needed.

Current Conditions

a Energy sources and end-uses

Currently, electricity and natural gas end-use in Toronto accounts for approximately 60 percent of all of the City's greenhouse gas emissions. That breaks down into natural gas, used primarily for space heating and domestic hot water, which accounts for approximately 58 percent of the aforementioned 60 percent, and electricity, which accounts for the remaining 42 percent.

The following table provides a sector-by-sector analysis of energy use in Toronto and corresponding greenhouse gas emissions.

Table 2: Electricity and Natural Gas End Use Consumption and Related Greenhouse Gas Emissions by Sector

Market Sector	Electricity		Natural Gas		Total GHG Emissions (Mt/yr)
	Consumption (GWh/yr)	GHG Emissions (Mt/yr)	Consumption (Mm ³ /yr)	GHG Emissions (Mt/yr)	
Commercial	14,806	3.61	1,303	2.63	6.24
Industrial	2,553	0.62	589	1.19	1.81
Residential	7,658	1.87	2,270	4.58	6.45
Other	511	0.12	42	0.08	0.21
Total	25,527	6.23	4,205	8.49	14.72

*GWh = Giga (10⁹) watt-hour Mt = Mega (10⁶) tonnes Mm³ = Million (10⁶) cubic metres

Figure 2: Electricity Consumption by Sector

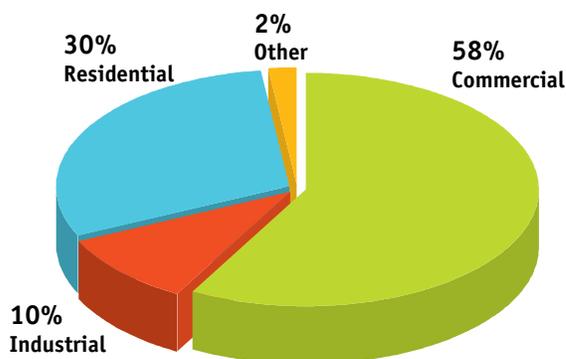
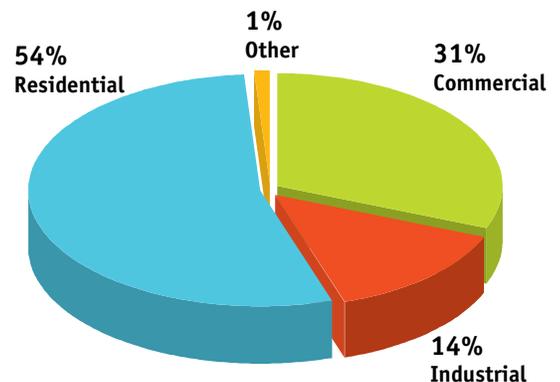


Figure 3: Natural Gas Consumption by Sector



The above table and graphs illustrate that the commercial sector is the largest user of electricity, while the residential sector is the largest natural gas consumer. Moreover, industrial energy end-use stated above largely relates to industrial processes and building operational use.

b Existing building stock

More than 80 percent of the buildings that exist in Toronto today will still be in use in 2050. Thus, energy efficiency retrofits will have to be wide-spread across residential, commercial, industrial and institutional sectors. As current green development standards apply primarily to new buildings, Toronto must advocate for and move toward mandatory requirements for existing building stock.

c Existing energy infrastructure and security of supply

Our electricity transmission and distribution network is an essential component of the infrastructure upon which the city depends. Similar to all forms of infrastructure, electricity transmission and distribution requires maintenance and periodic upgrading.

Toronto's electricity transmission infrastructure that serves the downtown core was built in the 1950's and is aging. It requires upgrading to ensure a reliable, secure source of supply is maintained. The two transmission supply points serving the downtown core—the Leaside and Manby Transformer Stations—are nearing load capacity. Short term capacity relief will be provided by the Portland Energy Centre and a new switching connection link between stations. However, mid-term and long-term issues need to be addressed including adequacy of capacity, infrastructure renewal, and mitigation of high risk events stemming from the loss of one or both of the transmission stations.

Potential solutions include increased CDM programs to reduce load demand, rapid expansion of renewables, additional natural gas fired power plants to help relieve the demands on both transformer stations, and a new transmission supply point.

d Environmental impacts

The burning of fossil fuels is by far the largest source of greenhouse gas emissions in Toronto. In 2007, the Toronto Environment Office and the Toronto Atmospheric Fund prepared a comprehensive inventory of the sources of greenhouse gas and air pollution emissions in Toronto. The inventory indicates that total community-wide greenhouse gas emissions were approximately 24.4 million tonnes (megatonnes – Mt) in 2004. Of total emissions, stationary energy from buildings accounted for approximately 14.7 Mt, or about 60 percent of all emissions. Natural gas use, primarily for space heating, is responsible for approximately 8.5 Mt (58 percent) of all greenhouse gas emissions from buildings; electricity accounts for approximately 6.2 Mt (42 percent).

Natural gas and electricity, respectively, also emit into the air annually the following amounts of pollutants:

- 6,706 and 8,858 tonnes of nitrogen oxide (NO_x)
- 381 and 126 tonnes of volatile organic compounds (VOCs)
- 527 and 1,601 tonnes of particulate matter (PM)
- 4,169 and 2,598 tonnes of carbon monoxide (CO)
- 42 and 21,112 tonnes of sulphur oxides (SO_x)

Together, the presence of these pollutants in the ambient air gives rise to smog that contributes to human health problems. Estimates are that smog contributes to the death of 1,700 people in Toronto every year with an additional 6000-plus related illnesses.

e Economic impacts

Our current approach to energy often results in significant financial losses. First, we pay for energy that gets wasted instead of conserved. Second, much of the money spent on electricity and natural gas leaves the local Toronto economy because most current power generation occurs outside and is transmitted into the City. Third, we often pay separately for the cost of environmental and human health harms caused by extracting, processing, and delivering non-renewable sources.

Up to two-thirds of centrally-produced energy is wasted due to generation and end-use inefficiencies, and transmission line and distribution line losses. Torontonians spend nearly \$4.5 billion per year on energy—\$2.7 billion on electricity, and \$1.8 billion on natural gas. This amounts to \$3 billion being spent annually on energy that is never used. To put this into perspective, if this amount were invested in transportation initiatives, the Eglinton Light Rapid Transit line could be financed in about 1.5 years.

Residents, businesses, industries, and institutions in Toronto have come to rely on an inexpensive energy supply from predominately non-renewable sources such as coal, petroleum, and uranium (used for nuclear power), the cost for which fails to include many of the adverse impacts to air, water, soil, as well as human health, that obtaining, transmitting, and using such energy sources can cause. Given that fossil fuels are non-renewable, that new oil and gas fields are sought off-shore and in northern regions of the globe, that exploration and production costs are escalating, and that cost of addressing externalities continues to increase, the period of cheap, reliable, high carbon, fossil fuel energy may be dwindling, unable to keep pace with a demand that continues to increase.

f Social considerations

Energy is a necessity of life, especially in a northern climate. Unfortunately, even with relatively low energy prices, there are “energy equity” issues that affect many Torontonians. Low-income households (both owner-occupied and leased) tend to spend a much higher percentage of their pre-tax income on utilities (7.7 percent) compared to average income households (3.2 percent). In addition, low income households tend to live in electrically heated dwellings and less energy efficient homes.

Most low income households live in rental housing, either public or private. In many cases, their utility bills are fixed as part of their monthly rent, which allows them to ignore their energy consumption habits and, therefore, may make them less motivated to reduce their energy use as there is no direct relationship to their lease and rent costs. Tenants also lack control over many of the systems that influence a building’s energy efficiency, such as heating and ventilation.

There also are as many as 70,000 low income, owner-occupied homes and 93,000 socially housed tenants in Toronto. Many of these people are economically challenged and unable to maximize the energy efficiency potential of their homes.

g Current city, provincial, and federal policies and programs

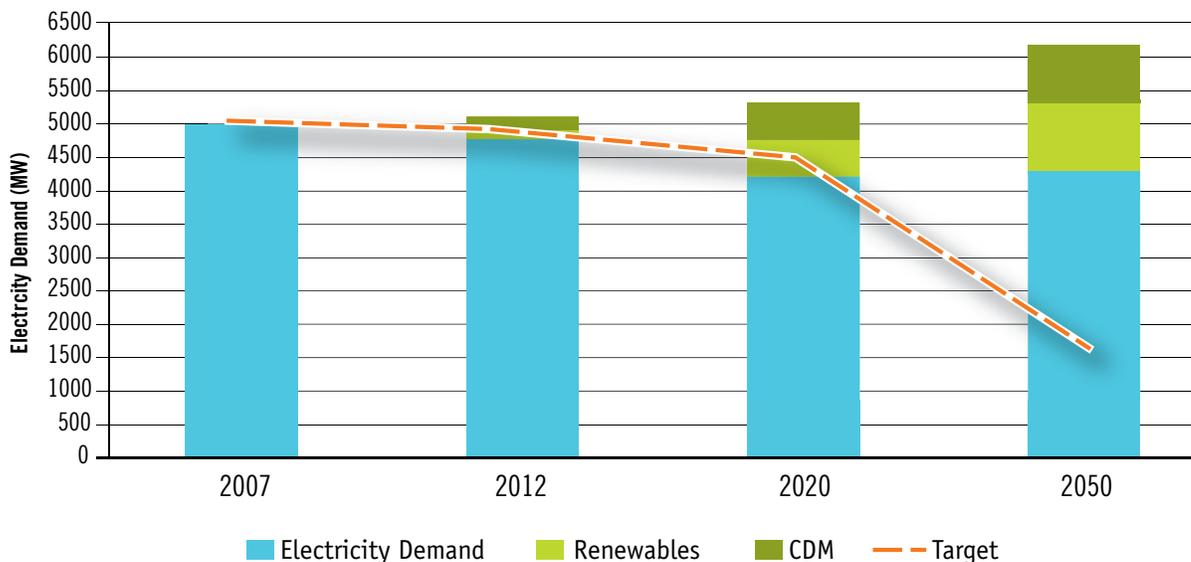
Toronto’s recent report to Council’s Parks and Environment Committee, entitled Greening Initiatives and Activities, lists numerous ongoing efforts by the City to reduce greenhouse gases and save energy. Weblinks to that report—together with an update of key City, provincial and federal developments on which the Power to Live Green seeks to build—can be found at Appendix A. Although these undertakings together have achieved significant results, the Power to Live Green builds on that momentum by forging a long-term strategy aimed at accomplishing even greater reductions and savings not only across the corporation (which accounts for only four percent of energy end-use) but also City-wide—to bring us closer to our 2050 target of an 80 percent reduction in greenhouse gas emissions below 1990 levels.

Context for Change

Current energy demand will change in the future. Electricity is expected to rise one percent year-over-year or, in real numbers, change from 5000 megawatts today to about 6100 megawatts in 2050. Similarly, demand for thermal energy also will increase. We must design new ways to address these needs—more strategic conservation demand management, growth of renewable generation, and smarter distribution of our energy.

a New ways to meet growing electricity demand

The graph below illustrates the 2007 to 2050 electricity growth forecast in demand and the positive impact conservation and demand management and renewable energy could have in displacing growth and improving Toronto's greenhouse gas emissions. While this is a significant contribution of CDM and renewable energy over time, it will fall short of meeting the 2050 climate change target of 80 percent reduction shown as the red dotted line on the graph.



i. CDM and other conservation measures

CDM is already playing a significant part in offsetting electricity growth and will continue to do so in the future. It is projected that CDM could contribute up to 1050 megawatts by 2050. As 58 percent of electricity consumption in Toronto is in the commercial sector, CDM programs will need to target the largest energy end-use loads to maximize energy saving results. Space cooling, lighting and plug load continue to be the largest loads in the commercial sector and are loads that are typically on-peak. While there is already a significant opportunity to retrofit buildings using current market ready energy efficient technology, new energy efficient technologies are constantly emerging to meet this challenge and will become part of future CDM programs offered by the City and energy stakeholder partners.

The residential sector represents approximately 30 percent of the electricity consumption in Toronto. The average home in Toronto uses approximately 12,000 kilowatt (“kWh”) per year. Space cooling, appliances and the constant growth in home electronics are the dominate energy end use loads. Targeted CDM programs, improved building codes, and appliance efficiency standards will be required along with smart grid technology and time of use rates to help meet the ambitious targets in the Sustainable Energy Plan Straegy.

ii. Renewable Electricity

It is proposed that 120 megawatts of electricity be generated within the City from renewable energy sources by 2012 and up to a 1000 megawatts by 2050. Through the Green Energy and Green Economy Act, adopted in May 2009, the Province has introduced a Feed-In Tariff (“FIT”) that guarantees a fixed price for electricity from renewable sources for a term of 20 years. The price per kilowatt hour depends on the type of technology employed, and the size of the installation. The FIT will accelerate market penetration of renewables, particularly as traditional energy prices increase and technology prices decrease. Current renewable energy technologies most appropriate for Toronto are solar photovoltaic (“PV”), wind, and bio-energy. In order for consumers to enter into contracts under the FIT, they will have to connect their installations to the electricity grid via an agreement with Toronto Hydro. In order to simplify access to the system, Toronto Hydro is developing a “user-friendly” grid connection process to be able to guarantee a reasonable turnaround time for these connections.

The Green Energy and Green Economy Act, with the FIT feature to financially support renewable energy sources, provides new opportunity for neighbourhood scale energy projects.

This shift in planning from large-scale central generation to small-scale local energy generation opens up new opportunities for green energy co-operatives, such as the one between Toronto Hydro and WindShare at Exhibition Place. It also creates new opportunities for stakeholders, such as local school boards, to utilize their land holdings and roof space to become energy centres on a neighbourhood level by linking in adjoining local businesses and residential homes.

iii. Smart Grid: Smarter Distribution of Electricity

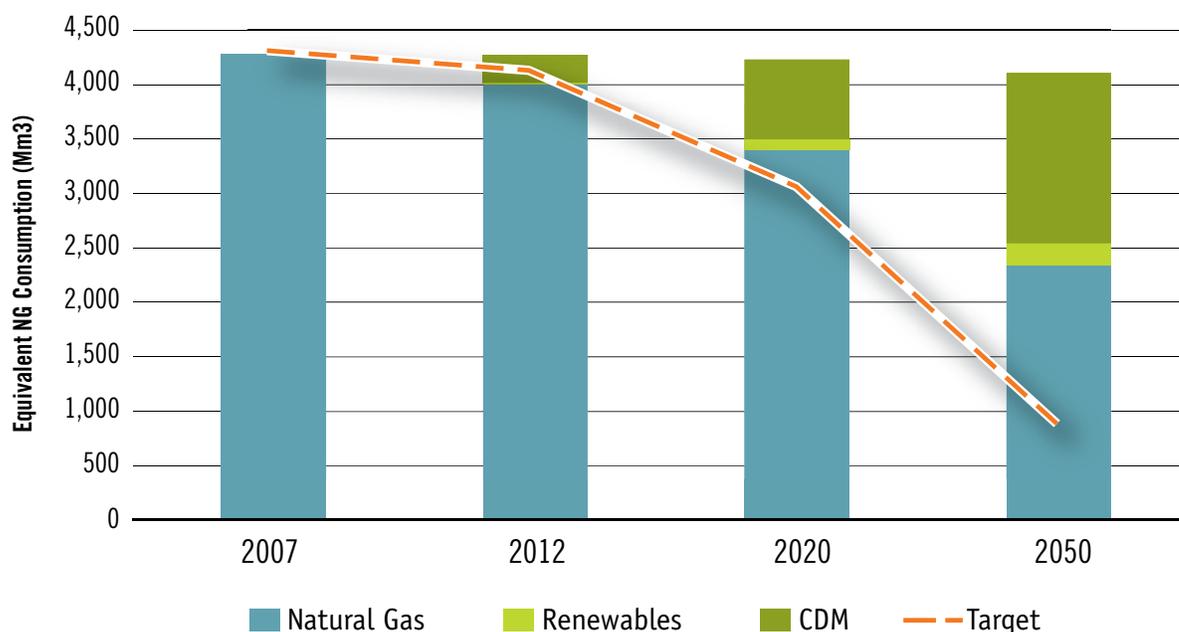
A smart grid uses digital technology to enable the electrical grid to deliver electricity from suppliers to consumers in a manner that saves energy, reduces cost, and increases reliability and transparency. It is an essential tool for efficiently meeting increasing electricity demand in the future.

Toronto Hydro is investing in the development and implementation of a smart grid in the City of Toronto that will modernize an aging infrastructure, significantly improve the efficiency of the existing electricity distribution system, provide access for renewable electricity and emerging technologies, prepare for electrified transportation, and empower customers with information, options, and control, to manage their electricity and reduce their carbon footprint.

b New ways to reduce natural gas consumption

The next diagram presents the forecasted natural gas consumption to 2050, including conservation programs and renewable thermal energy generation.

Figure 5: Natural Gas Consumption Projections with the Implementation of Conservation and Renewable Programs



i. Conservation

The most significant opportunity to reduce natural gas consumption is through conservation and energy efficiency measures. It is projected that conservation measures can reduce Toronto's annual natural gas consumption by more than 1,500 million cubic metres by 2050. This represents a reduction of approximately 35 percent of the current natural gas consumption. In order to achieve this conservation reduction various actions are needed including boiler upgrades, building envelope improvements, and equipment and process improvements.

The residential sector accounts for 54 percent of the natural gas currently consumed. Therefore, a significant focus of natural gas conservation programs need to be geared towards the residential sector.

For a typical household, there is the potential to reduce natural gas consumption by more than 40 percent through conservation measures. For example, natural gas usage for space heating can be reduced by 50 percent through boiler upgrades, building envelope improvements (e.g., improved insulation, windows, etc.), and load control (e.g., programmable thermostat). For water heating, boiler upgrades and on-demand domestic hot water systems have the potential to reduce the natural gas consumed by more than 30 percent. The natural gas consumption for appliances (i.e., gas clothes dryers and stoves) can be reduced by 25 percent through appliance upgrades.

ii. Renewable Thermal Energy

There also is the opportunity to reduce natural gas consumption through the generation of renewable thermal energy such as geo-energy, solar thermal and bio-energy. It is projected that the generation of renewable thermal energy can displace more than 200 million cubic metres of natural gas annually by 2050. This represents about 5 percent of natural gas that is currently consumed. To displace this amount of natural gas, 930,000 megawatt hours of renewable energy will have to be generated. To put this in perspective, a residential solar hot water system generates, on average, 2.5 megawatt hours annually.

The residential sector has the largest potential for reductions in natural gas consumption through renewable thermal energy generation. It has been estimated that, in the residential sector, renewable thermal energy—including geothermal heating, solar hot water, solar air, biogas and biomass—can displace 125 Mm³ of natural gas annually by 2050. The achievable potential for the commercial sector is the displacement of 74 Mm³ of natural gas and for the industrial sector, a displacement of 4 Mm³ of natural gas.

iii. Distributed Energy Infrastructure

Distributed or district energy is a recognized approach to meeting the heating, cooling, and domestic hot water needs of buildings, that also can support the process heating requirements of local industry. District energy is the distribution of thermal energy using a pipeline distribution system. A district energy system may be designed with a single central energy plant or multiple smaller plants. These thermal plants may use various types of fuel including natural gas, renewable energy (geo-energy, bio-energy, solar), or industrial waste heat. By linking buildings and industrial activities together, district energy systems can aggregate the varying energy requirements into a steady heat load that can be effectively and efficiently managed.

Modern high performance district energy systems provide an opportunity to meet the demand and minimize energy waste, reduce energy costs, provide increased security of energy supply, and reduce the need for large scale central generation.

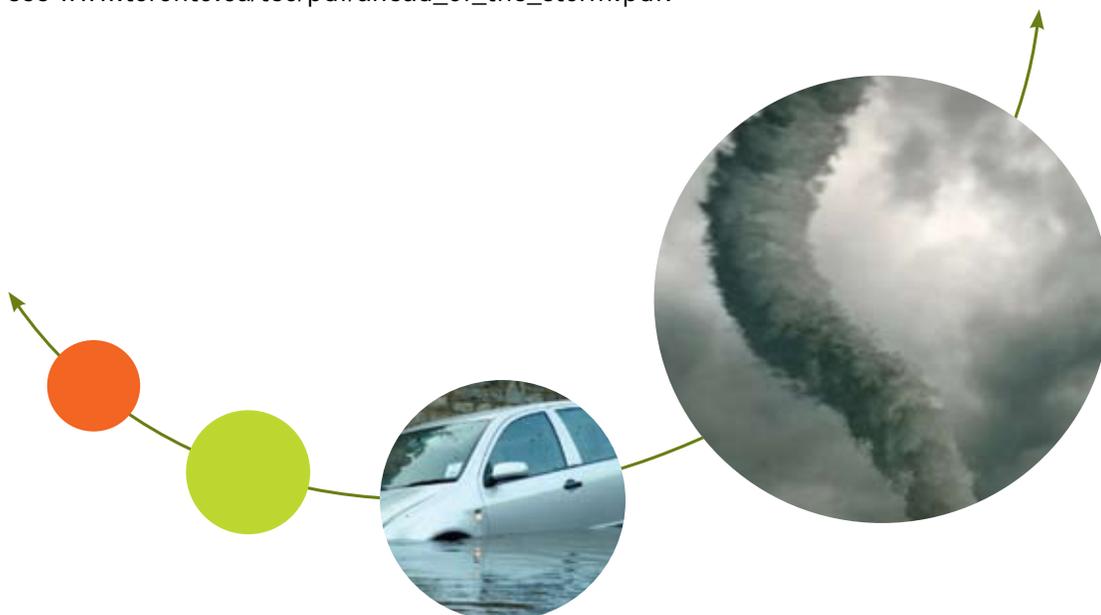
C Community energy planning and community power projects

Alongside the aforementioned efforts to address growing electricity and thermal heat demands is planning at the community level. Community Energy Planning (“CEP”) provides research, analysis and stakeholder engagement to generate ideas, opportunities and support for sustainable options. CEP describes how energy is used in communities, and how its use affects the community including energy cost, energy security, and environmental impacts. Community Energy Plans show how designing for sustainable energy supports community objectives of greenhouse gas emissions reduction, local job creation and funds retained in community. Community Power Projects are a class of sustainable energy generation projects that are owned, developed and controlled in full or in part (50 percent or more) by residents of the community in which the project is located. The Ontario Sustainable Energy Association defines Community Power proponents to include local residents, farmer collaboratives, co-operatives, First Nations, municipalities, and other institutions working to develop local sustainable energy projects. Anyone can become an individual member. The Province’s passage of the Green Energy and Green Economy Act in May 2009 changed existing regulations to make it easier to form community energy co-ops.

d Climate change adaptation

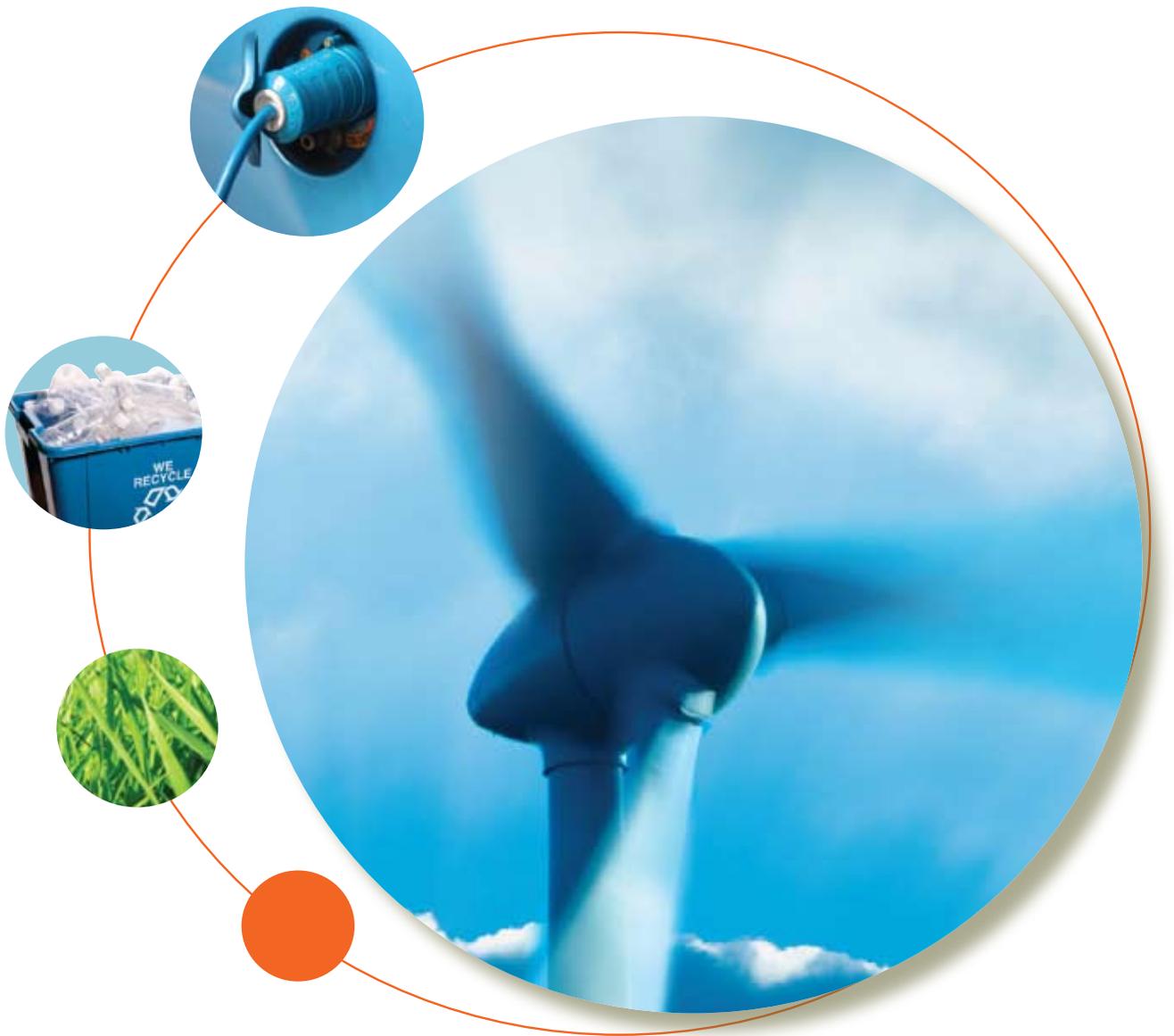
As a result of climate change, our local weather patterns are changing to result in more extreme weather events. Such events will place stress on our energy infrastructure in the future. Going forward, we must build and upgrade our energy infrastructure to take into account climate change impacts to maintain a consistent and reliable energy supply.

In April 2008, the City released the forward-thinking report *Ahead of the Storm: Preparing Toronto for Climate Change – Development of a Climate Change Adaptation Strategy*. Among other things, the report addresses energy adaptation. For more details, see www.toronto.ca/teo/pdf/ahead_of_the_storm.pdf.



Recommendations and Actions for Change

Change requires action. To significantly conserve, increase renewable generation, and smartly distribute to meet our energy targets—and thereby bring us closer to an 80 percent reduction of greenhouse gases below 1990 levels by 2050—adoption of the following measures will power the City and the community to live green:

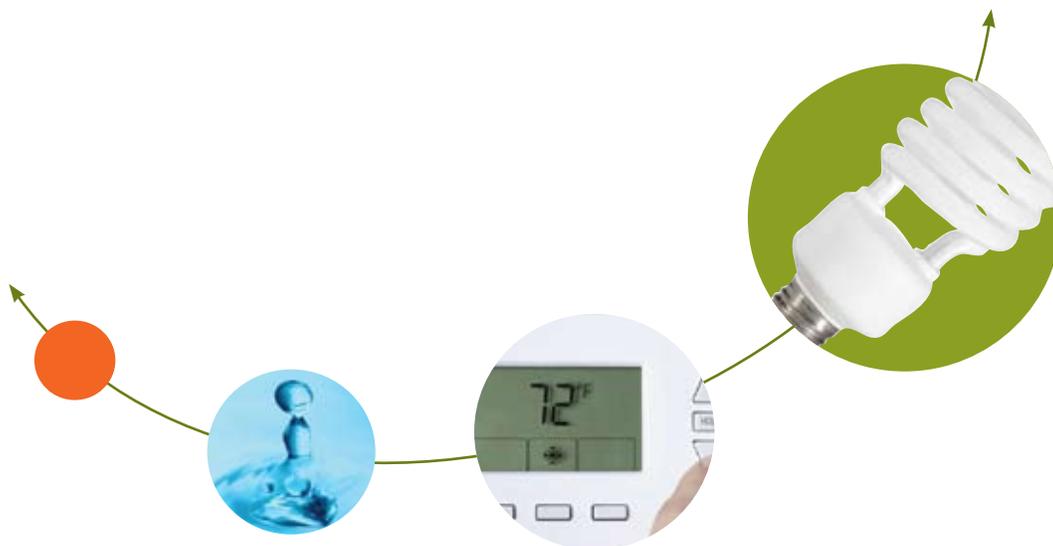


(i) Adopting the vision statement

The City Council should adopt the Vision Statement from the Power to Live Green: Toronto's Sustainable Energy Strategy

(ii) Adopting the energy targets

The City Council should adopt the Energy Targets in Table 1 of the Power to Live Green: Toronto's Sustainable Energy Strategy.



(iii) Making it possible to live green

For a typical household, there is the potential to reduce natural gas consumption by more than 40 percent and electricity consumption by more than 10 percent through energy efficiency measures. These reductions can be achieved through a range of actions, including boiler upgrades, building envelope improvements (e.g., improved insulation, windows, etc.), load control (e.g. programmable thermostat), appliance upgrades, lighting efficiency improvements, and space cooling improvements.

Results from Natural Resources Canada's ecoENERGY Retrofit – Homes program, that helps homeowners of existing low-rise properties make smart energy retrofit decisions, show that the average grant yields a reduction in energy use of approximately 30 percent and greenhouse gas emission reductions of approximately 4 tonnes per house. By implementing the energy retrofit recommendations from the ecoENERGY Retrofit – Homes program, a typical homeowner could save \$700 a year on a \$2,000 annual heating bill. Recently, the City of Toronto began partnering with Natural Resources Canada through the City's Home Energy Assistance Toronto ("HEAT") to offer up to \$1,000 in additional grants and potentially track efficiency results locally.

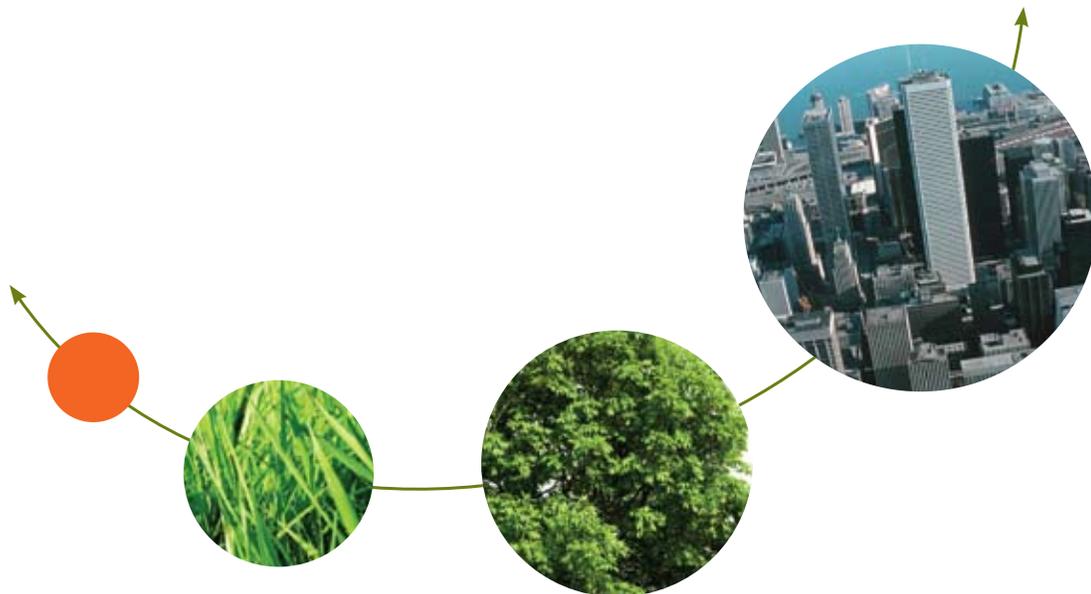
Similarly, as water supply and demand in a home depends on energy to treat and pump water, efforts to conserve water can greatly contribute to reducing energy.

Despite existing federal programs, the City can and must do more to help residents and business access these initiatives, realize these savings, and collectively achieve even greater energy efficiency and greenhouse gas reductions across Toronto.

Therefore, the City will make it possible to Live Green by:

1. Facilitating before the end of 2010 the formation of an active partnership, to be called the 'Live Green Toronto Energy and Water Efficiency Initiative', among the City of Toronto and its Agencies, Boards, Commissions, Corporations, and Divisions, such as Toronto Water and Toronto Hydro, and other appropriate stakeholders, such as Enbridge and Enwave, to design, deliver and co-ordinate energy efficiency and water conservation programs and renewable energy programs for all market sectors in Toronto, including:
 - i. coordination of programs, policies and resources;
 - ii. building upon existing community support programs, door-to-door and marketing efforts and other outreach activities to more fully engage residents and businesses in taking action;
 - iii. development of new programs and initiatives to address emerging issues associated with supporting residents and businesses in taking action;
 - iv. investigation and development of new financing tools and options to support residents and businesses in taking action;
 - v. coordination of initiatives that involve installation of simple energy efficiency, water conservation, and climate change adaptation measures;
 - vi. establishing of reporting guidelines to track performance against the targets of the Sustainable Energy Strategy and the Climate Change Action Plan; and
 - vii. providing a one-stop resource to access information and resources on, but not limited to:
 - Grants, financial incentives and financing options;
 - Options for completing energy and water consumption audits;
 - Assistance in the preparation of conservation and renewable energy plans;
 - Identification of and advice on obtaining required permits;
 - Advice on how to find qualified contractors and installers; and
 - Educational programs.

2. Working with all appropriate City Agencies, Boards, Commissions, Corporations, and Divisions to ensure:
 - i. Conformity of all existing policies, programs and initiatives with the vision, principles, targets, and recommendations from this staff report and the Power to Live Green: Toronto's Sustainable Energy Strategy;
 - ii. Integration of the goal and objectives of the Power to Live Green: Toronto's Sustainable Energy Strategy into planning efforts; and
 - iii. Integration of the goal and objectives of the Power to Live Green: Toronto's Sustainable Energy Strategy into sustainable community planning frameworks used for community based neighbourhood redevelopment planning.



(iv) Retrofitting the built environment for energy efficiency

More than 80 percent of the buildings across the commercial, industrial, and institutional sectors that exist in Toronto today will still be in use in the year 2050. If Toronto is going to achieve its energy conservation targets these buildings will need to be retrofitted to reduce their energy consumption.

Therefore, the City will seek to achieve greater energy efficiency in the built environment by:

1. Developing by 2011 a phased-in implementation plan for a by-law(s) that will eventually establish an energy efficiency standard for all buildings, both for new construction and existing retrofits that will assist in the achievement of the City of Toronto's stated greenhouse gas emission reduction targets and that addresses the following:
 - i. Strategy for phase-in of the by-law(s);
 - ii. Proposes energy efficiency standards for both new and existing buildings;

- iii. Thresholds that trigger application of the by-law(s);
 - iv. Economic impact of the plan and a stakeholder engagement process;
 - v. Financial and other supports that will be provided to property owners to bring their buildings into compliance with the by-law(s); and
 - vi. Timelines for the phased-in implementation of the by-law(s);
2. Identifying all opportunities where the City could encourage residents and businesses to consider implementing energy efficiency retrofits (e.g. Committee of Adjustment; building permit applications; licensing applications) and create the necessary operational changes to take advantage of those opportunities;
 3. Preparing in 2010 a plan that builds on existing programs and successes to further enhance the building efficiency and integration of renewable energy in all City-owned facilities;
 4. Coordinating advocacy efforts to federal and provincial regulators and the banking industry to allow for and offer, respectively, more competitive lending practices for energy retrofits and renewable energy projects;
 5. Considering during the 2011 review of the City's Official Plan changes, including implementation plans, strategies and guidelines, that will help advance the objectives of the Climate Change Action Plan and the Sustainable Energy Strategy; and
 6. Undertaking the actions necessary in 2010 for the City to evaluate and implement a building energy benchmarking and energy use labelling program, initially for institutional buildings and subsequently for commercial/multi-unit and residential buildings.



(v) Greening the grid for Toronto to become the renewable energy capital of Canada

The analysis completed as part of the development of this energy strategy indicates that it would be achievable for Toronto to generate 1000 megawatts of renewable electricity, which would represent more than 15 percent of the forecasted electrical demand in the year 2050. It was also estimated that it would be achievable to generate 930 gigawatt hours of renewable thermal energy annually, which would displace 200 million cubic metres of natural gas, a 5 percent reduction in the forecasted natural gas consumption in the year 2050. This generation of renewable electricity and thermal energy would yield a reduction of 0.8 megatonnes of greenhouse gas emissions annually.

Therefore, the City will work with key stakeholders and assist the Toronto community to aggressively “green the grid” by:

1. Ensuring that all City, Agency, Board, Commissions, and Corporation by-laws, permit processes, policies and operational procedures are designed to accommodate and streamline, the installation of renewable energy systems on public and private property;
2. Considering during the 2011 review of the City's Official Plan changes, including implementation plans, strategies and guidelines, that will help advance the renewable energy goals and targets set by Climate Change Action Plan and the Sustainable Energy Strategy;
3. Coordinating the actions necessary, including accessing the Feed-in Tariff, that will see by 2020 the installation of renewable energy systems, where feasible, on all City owned buildings and properties; and
4. Implementing all viable opportunities for utilizing the bio-gas generated from the processing of waste at landfills, source separated organic facilities and waste water treatment facilities.

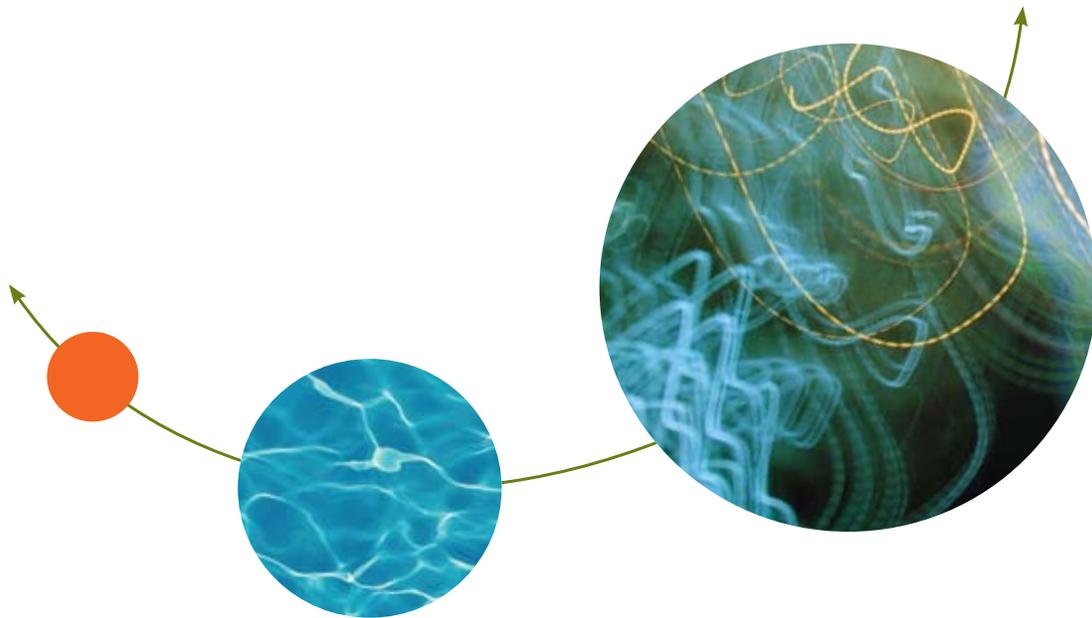
(vi) Investing in distributed energy infrastructure

The implementation of distributed energy infrastructure in both existing and new neighbourhoods has the potential to significantly reduce the City's energy consumption through deployment of a more efficient and flexible distribution network.

A study conducted by the Canadian Urban Institute (CUI) evaluated the potential for district energy systems in Canada in a report entitled *Advancing District Energy Development in Canada* (Sept 2007). In this report the development of district energy systems in three City of Toronto neighbourhoods (Scarborough Centre, North York Centre, and the Sheppard Corridor) is considered. The study finds that the development of combined heat and power (CHP) district energy systems in these three neighbourhoods would yield significant energy and greenhouse gas emissions reductions. The total annual energy reduction for these three communities is estimated to be approximately 4,100,000 gigajoules, corresponding to a reduction in greenhouse gas emissions of approximately 200,000 tonnes. This represents a combined 27 percent reduction for the three communities evaluated. An emission reduction of 200,000 tonnes is equal to a reduction of almost 1.5 percent of the City's greenhouse gas emissions, current as of 2007.

Therefore, the City will facilitate the development of district/distributed energy system in existing and new neighbourhoods to reduce energy consumption and greenhouse gas emissions and enhance energy security by working with key stakeholders to establish in 2010 the system potential, identify barriers and potential mechanisms to facilitate the installation of district/distributed energy infrastructure including:

1. Identifying the geographic areas with the greatest potential for district/distributed energy installations, based on energy utilization mapping and other research, experiences of existing programs, such as the Mayor's Tower Renewal, and assessments of neighbourhood interest;
2. Identifying and assessing appropriate energy sources for the district/distributed energy systems that will help achieve the greenhouse gas and smog causing emission reduction targets set in the Climate Change Action Plan;
3. Coordinating the installation of the infrastructure with other City infrastructure and stakeholder work, in order to reduce start-up costs;
4. Identifying and addressing any issues associated with existing City of Toronto by-laws and policies;
5. Advocating for any required changes or investments from the Province of Ontario, the Ontario Power Authority, the Ontario Energy Board or other relevant provincial bodies; and
6. Developing any necessary provisions, as permitted, under the City of Toronto Act.



(vii) Supporting development of a smart grid

Toronto Hydro is investing in the development and implementation of a smart grid in the City of Toronto that will modernize an aging infrastructure, significantly improve the efficiency of the existing electricity distribution system, provide access for renewable energy and smart grid technology, prepare for electrified transportation, and empower customers with information, options, and control, to manage their electricity and reduce their carbon footprint.

Therefore, the City should support this effort by:

1. Continuing to monitor and encourage further development by Toronto Hydro and provincial and federal authorities of smart grid technologies and innovations;
2. Collaborating with Toronto Hydro to support Toronto Hydro's Smart Grid education, outreach, and advocacy plan to enhance the public profile of Smart Grid and its relevance to the City's Energy Strategy; and
3. Ensuring that all City buildings are fully equipped and enabled to take advantage of the smart grid, innovative technology and pending rate options.

(viii) Fostering the green economy and green jobs

Estimates are that 14.2 jobs can be created for every one million dollars spent on energy conservation, renewables, and smart distribution. Given the commitment that the Power to Live Green makes to increased sustainable energy, the potential exists for significant job creation.

Therefore, the City will build upon its adoption in July 2007 of the Green Economic Sector Development Strategy by:

1. Working with stakeholder partners and renewable energy business associations to ensure that any mechanical, structural, and related inspection requirements specific to Toronto and/or Ontario are integrated into existing and contemplated national and provincial training programs;
2. Marketing and promoting existing energy efficiency and renewable energy certification programs available in Toronto and the GTA;
3. Working with local school boards on the design of a training course as part of the Specialty High School Majors program in the area of energy efficiency retrofits and renewable energy generation;
4. Working with appropriate stakeholders to develop a program that will provide job placement support to the community for skilled tradespeople positions in the areas of retrofitting buildings and generating renewable energy;
5. Working with local community colleges in the design, development and marketing of training programs that will generate people with the skills necessary to assist property owners in complying with emerging energy efficiency and renewable energy by-laws and regulations; and
6. Establishing in 2010 the business processes necessary for internal coordination within the City of Toronto to more proactively evaluate, pilot and implement new and emerging energy conservation and renewable energy technologies.



(ix) Sustainable transportation, including electric vehicles

Leading by example, in 2008 the City assessed electric powered motor vehicles through the Toronto Plug-in Hybrid Electric Vehicle Pilot and found a 36 percent improvement in fuel economy compared to Hybrid Electric Vehicles, as well as an estimated 45 percent improvement compared to the most fuel efficient internal combustion engine cars. Such greater fuel efficiency promises fewer greenhouse gas emissions. Given this, the City needs to now consider charging infrastructure and the use of demand management tools as we move forward in sustainable transportation planning.

At the same time, however, the City must be careful not to let efforts to promote electric vehicles dilute its prior commitment to other sustainable transportation initiatives that promise even greater energy savings and carbon reductions. Walking to the grocery store, rather than driving a compact car, is estimated to avoid the emission of 240 grams of carbon dioxide equivalent (“eCO₂”), a common unit for greenhouse gas emissions, per trip per person (which amounts to 596 metric tonnes of eCO₂ if all Torontonians made this change). Biking promises similar results. As for using public transportation instead of cars, the Toronto Transit Commission (“TTC”) estimates that it replaces on average more than 1 million vehicle-trips daily. Furthermore, the TTC estimates that one bus replaces 50 cars, one Light Rail Transit (“LRT”) vehicle replaces 70 cars, one Articulated LRT vehicles replaces 100 cars, one four-car Scarborough Rapid Transit train replaces 200 cars, and one subway train replaces 900 cars at peak times on most routes in the TTC system. Finally, where a car is the only viable option, even car sharing promises significant greenhouse gas reductions. For instance, given that a standard compact car emits 240 grams eCO₂ per km travelled, if four people filled one car, each person would be responsible for only 60 grams eCO₂ for a one kilometre trip. By contrast, if four people each drove their own compact car, approximately 960 grams of eCO₂ would be emitted into the air, an almost 94 percent increase from not car sharing. Toronto’s Walking Strategy, Toronto’s Bike Plan, TTC’s TransitCity, and Smart Commute are all existing programs aimed at delivering these kinds of results. However, more can be done.

Therefore, the City will continue its work on sustainable transportation and advance its electric vehicle efforts by:

1. Ensuring that the first priority for transportation planning and infrastructure development is for net zero energy modes of commuting such as walking and cycling, and, as a second priority, for alternatives such as telecommuting, public transit and car-pooling;
2. Working with all appropriate internal and external stakeholders, to complete an analysis of mobile source emissions among trucks, cars, rail, airports, and other sources to help inform the design of and priorities for mitigation measures, including potential by-laws, as previously authorized under the Climate Change Plan;
3. Ensuring the City's Green Fleet Plan incorporates the integration and utilization of electric vehicles, where appropriate for City operations;
4. Building upon the existing work of the City of Toronto, the Toronto Atmospheric Fund, Toronto Hydro and others, to initiate and undertake economically viable actions necessary to support and facilitate the utilization of electric powered motor vehicles in corporate and commercial fleets; and
5. Considering during the 2011 review of the City's Official Plan policies and guidelines changes, including implementation plans, strategies and guidelines, that will help advance infrastructure requirements for and deployment of electric vehicles.

(x) Innovative financial tools

To provide the necessary funding for most of these actions to occur, the City will continue to explore all viable funding options including, but not limited to, revenue bond financing, grants, tax incentives, funding from the Federation of Canadian Municipalities, funding from the rate-base through Ontario Energy Board, and funding from Ontario Power Authority, in particular the new Municipal Renewable Energy Program.

(xi) Advocating for action provincially, nationally and internationally

To continue to provide leadership on climate change, energy conservation and renewable energy, the City will advocate for provincial, national, and international action by:

1. Engaging provincial and federal authorities on the following Sustainable Energy Strategy issues and, if necessary, pursuing alternative, local measures as permitted under the City of Toronto Act:
 - i. Amendments of the Planning Act, Building Code Act and/or related laws to remove barriers to more widespread energy efficiency, renewable energy, and “smart” distribution;
 - ii. Amendments of the City of Toronto Act, the Planning Act, Building Code Act and/or related laws to explicitly authorize application of the appropriate elements in the Toronto Green Standard to existing residential, commercial, institutional, and industrial buildings, triggered by action such as renovations or changes in ownership;
 - iii. Amendments of provincial laws to require energy audits and disclosure of energy consumption of buildings at point of sale and that the Province of Ontario fund the required energy audits;
 - iv. Higher energy efficient standards for appliances and heating and cooling systems;
 - v. Economic support and other measures to remove barriers hindering the growth of the local, green building materials industry;
 - vi. Allowing more competitive lending practices to the commercial, institutional, and industrial sectors for conservation and demand management processes;
 - vii. City representation on the advisory board established under the Green Energy and Green Economy Act for reforming the Ontario Building Code to assure greater energy efficiency;
 - viii. Stronger incorporation of renewable energy into the provincial and federal governments’ long-term energy reliability planning so that aspects of the City’s future energy and climate change actions, that may contribute to an increase on the load (e.g. increased number of street cars/light rail cars; promotion of electric vehicles) do not generate substantial increases in greenhouse gas emissions;
 - ix. Reduction and removal of barriers that hinder growth and competitiveness of a locally produced, low carbon, green building materials;
 - x. Reducing and removing barriers that contravene City policies or adopted targets or otherwise limit the City’s ability to secure Ontario Power Authority funding for renewable energy generation projects and conservation measures undertaken by the City;
 - xi. Implement stricter standards for corporate average fuel economy (CAFE) standards and alternative fuel development for internal combustion vehicles; and
2. Intervening when needed to support City objectives at the Ontario Energy Board in connection with the City’s Climate Change Action Plan and Sustainable Energy Strategy goals.



(xi) Monitor and report regularly on progress

To help implement the strategy, the City will begin preparing annual reports on environmental achievements and challenges that:

1. integrate reporting on the implementation of the Climate Change Action Plan, the Sustainable Energy Strategy and related initiatives, such as the Green Economic Development Sector Strategy, the Sustainable Transportation Initiatives and the Water Efficiency Plan;
2. identify the outcomes of these policies, programs and other activities; and
3. identify emerging issues and challenges and make recommendations for new or amended actions required to further achieve the targets established in the Climate Change Action Plan and the Sustainable Energy Strategy.

In addition, the City will monitor, inventory, and report on greenhouse gas and smog-causing emission reductions, energy consumption, and renewable energy generation within the context of the Climate Change Action Plan and Sustainable Energy Strategy.

Finally, the City will create internal working groups in the following areas to enable central coordination of energy developments during implementation: (a) Renewable and New Energy-Focused Technologies Implementation Working Group; (b) Distributed Energy Infrastructure Working Group; (c) Sustainable Transportation and Electric Vehicle Support and Implementation Working Group. These working groups will report to the City's Executive Environment Team, thereby assuring constant engagement of the City's management.

APPENDIX A

Energy Policies and Programs – City, Provincial and Federal

i. City Policies and Programs

Toronto has a number of energy and energy-related programs underway that have contributed significantly to conservation demand management and development of renewable energy technologies.

The Green Initiatives and Activities Report for 2007 – 2008 submitted to the Parks and Environment Committee of the Toronto City Council reports on corporate energy and climate change projects completed, underway and/or envisioned at that time.

- **Staff Report** (<http://www.toronto.ca/legdocs/mmis/2009/pe/bgrd/backgroundfile-23951.pdf>);
- **Appendix A** (<http://www.toronto.ca/legdocs/mmis/2009/pe/bgrd/backgroundfile-23952.pdf>)
- **Appendix B** (<http://www.toronto.ca/legdocs/mmis/2009/pe/bgrd/backgroundfile-23953.pdf>)

Additional past and ongoing initiatives related to buildings can be found on the City's Energy Efficiency Office database at:

- http://spreadsheets.google.com/pub?key=r_eVxG4Nz7pst8iDoxc-fDA&output=html

Below are highlights of key corporate energy and climate change programs and policies presented in or undertaken since the Green Initiatives and Action Report:

[1] The Mayor's Tower Renewal

(www.towerrenewal.ca/index.php)

Begun in 2008, The Mayor's Tower Renewal project is facilitating energy retrofits in both public and private high-rise residential buildings. The program drives broad environmental, social, and economic change by improving Toronto's concrete apartment tower neighbourhoods. A major focus is improving energy efficiency.

[2] The Toronto Green Development Standard

(www.toronto.ca/planning/greendevlopment.htm)

Adopted in December 2008, the revised Toronto Green Standard (formerly known as the Toronto Green Development Standard) is a two-tiered set of mandatory and incentive standards that encourage more sustainable building development practices, including improved energy efficiency measures, in new construction.

[3] Home Energy Assistance Toronto

(www.toronto.ca/livegreen/home_energy_heat.html)

In October 2009, Toronto launched Home Energy Assistance Toronto ("HEAT"). Owners of low-rise residential buildings can receive up to \$1,000 from Toronto towards energy conservation measures and up to an additional \$10,000 in combined federal and provincial grants. This program is scheduled to operate until 2012.

[4] Better Building Partnership

(www.toronto.ca/bbp)

The Better Buildings Partnership is an innovative program administered by the Energy Efficiency Office to provide resources including financial assistance for energy efficient retrofits and construction of Toronto's buildings. The BBP's primary goal is to reduce carbon dioxide emissions that come from energy used primarily to heat, light, and cool buildings. Currently partnered with the Ontario Power Authority, BBP delivers attractive energy savings incentives for buildings in Toronto and helps institutional and non-profits building sectors take advantage of Sustainable Energy Funds that offer zero interest loans for energy conservation or renewable energy projects.

[5] Toronto Hydro Corporation

(www.torontohydro.com)

Toronto Hydro Corporation is a holding company that, through its two wholly-owned subsidiaries—Toronto Hydro-Electric System Limited (“THESL”) and Toronto Hydro Energy Services Inc. (“THESI”)—distributes electricity, engages in conservation demand management activities, provides street lighting services, and develops energy efficiency products and services, among other things.

THESL owns and operates \$1.9 billion of capital assets comprised primarily of an electricity distribution system that delivers electricity to approximately 684,000 customers located in the City of Toronto. THESL is the largest municipal electricity distribution company in Canada and distributes approximately 18 percent of the electricity consumed in Ontario. THESL is one of several local distribution companies in the province participating in an initiative sponsored by the Independent Electricity System Operator to implement “smart grid” infrastructure for electricity distribution and is acknowledged as a leader in the development and delivery of sustainable energy programs.

THESI is an energy services company, which owns and operates street lighting and expressway lighting assets in the City of Toronto, provides energy efficiency products and services and develops and operates renewable energy generation projects. THESI, has been working with the City on several renewable energy projects, including biogas cogeneration plants, PV and proposed wind energy projects.

Over the next several years, Toronto Hydro plans to develop and deliver the following conservation programs, among others:

Residential Sector

- Appliance Efficiency Upgrade and Take-Back Program
- Room Air Conditioner (“AC”) Efficiency Upgrade Program
- Central AC Efficiency Program
- Programmable Thermostat Program
- Electric Water-Heater Timers Program
- Geothermal Cooling and Heating Incentive Program
- Solar Water-Heating Incentive Program
- Multi-Unit Residential Building Sub-metering
- Smart-Meters, Time of Use Rates, and In-Home Display Programs
- Conservation Culture and Education

Commercial, Industrial, and Institutional Sectors

- Chiller Replacement Program
- Chiller Efficiency Enhancement Program
- Rooftop AC Replacement Program
- Rooftop AC Efficiency Improvement Program
- Deep-Lake Water Cooling Incentives for Enwave
- Occupancy Sensor Incentive Program
- Building Automation System Incentive Program
- Building Window Film Program
- peaksaver Direct Load Control Program

- Lighting Efficiency Retrofit Program
- Peak Load Shifting Program
- PC Power Management Program
- Datacenter Incentive Program
- Office Equipment Efficiency Program
- Vending Machines Energy Management Program
- Buildings of Faith Conservation Program

Low Income Sector

- Building and Suite Conservation Program
- Electric Car Share Pilot Program

Toronto Hydro also anticipates developing and implementing the renewable programs such as Customer-owned Renewable Distributed Generation, Solar Distributed Generation, and Off-Shore Wind Generation.

[6] Enwave Energy Corporation and Deep Lake Water Cooling

(www.enwave.com/dlwc.php)

Enwave Energy Corporation, partly owned by the City, is the largest district energy company in Canada and one of the largest in North America. It provides heating and cooling to commercial, institutional and multi-residential buildings in Toronto, and also operates a facility in Windsor, Ontario.

District energy customers get their heating and air conditioning via underground pipe distribution networks that are connected to one or several large plants. These facilities can generate heating, cooling and electricity in a manner which is more efficient and, therefore, more environmentally friendly than in-house systems.

Enwave operates four large energy plants with over 20 kilometres of distribution piping, and sells over 2.5 billion pounds of steam each year. Its deep lake water cooling system uses the cold water from Lake Ontario to cool buildings in downtown Toronto. City Hall,

Metro Hall, Police Headquarters are now connected to Enwave's deep lake water cooling system. Union Station will be connected to the system in the near future. The system has enough capacity to air condition over 3.2 million square meters of building space or approximately 100 large office towers.

[7] Toronto Atmospheric Fund Projects

(www.toronto.ca/taf)

The Toronto Atmospheric Fund, established in 1991, has funded over 300 leading-edge projects to reduce emissions and improve air quality. Recent programs relevant to The Power to Live Green include TowerWise aimed at energy efficiency retrofits for high-rise residential buildings newer than those covered by Mayor's Tower Renewal, as well as EV300 aimed at shaping the electric vehicle market by piloting their operation through fleet purchases.

[8] Live Green Toronto

(www.livegreentoronto.ca)

The City's Live Green Toronto Program, created in 2008 is investing \$20 million to green Toronto's homes and businesses with innovative projects such as shared geo-thermal systems and green roofs and provides a one-stop public outreach and support network for greening communities.

[9] Toronto Solar Neighbourhoods

(www.solarneighbourhoods.ca)

The Toronto Solar Neighbourhoods Initiative offers financial incentives for solar hot water installations for homes in Wards 31 and 32 (Danforth). Residents initially receive professional assistance to identify opportunities to save energy and reduce their home energy bills before the solar hot water

system gets installed. This is a pilot program with an objective to install up to 150 solar hot water systems on homes, which will serve as a model for the City of Toronto's Live Green Toronto program and represents the first phase of a planned City-wide solar hot water campaign to be rolled out in 2010.

[10] Exhibition Place's Net Zero Energy Program

(www.explace.on.ca)

As a participant in Ontario's Environmental Leaders Program, the City's Exhibition Place has committed to become a net zero energy operation by 2012. Among the initiatives designed to achieve this goal are the installation of a 100,000 kilowatt solar photovoltaic system, energy efficient lighting efforts, a land lease for the construction of the first urban wind turbine in North America jointly owned by Toronto Hydro Energy Services and WindShare Co-operative, and a host of related pilots and other commitments.

[11] Cool It, Power It, Grow It—the Greening of City Hall

(www.toronto.ca/ewmo/)

Building upon the City's Energy Retrofit Program that has carried out energy retrofit projects on City facilities, resulting in cutting 51 million kilowatt hours of electricity consumption and saving \$5 million a year, the City also recently began a conservation program for City Hall. That effort—Cool It, Power It, Grow It—includes expansion of a green roof, building thermal upgrades, control automations, micro generation, procurement of green power from renewable energy sources, and connection to Enwave's Deep Lake Water Cooling system.

[12] Eco-roofs

(www.toronto.ca/greenroofs/index.htm)

The City now offers up to \$100,000 per installation for green and cool roofs on industrial and commercial buildings.

[13] Ashbridges Bay Wastewater Treatment Plant

(www.toronto.ca/legdocs/mmis/2009/pw/bgrd/backgroundfile-21453.pdf)

Toronto Hydro Energy Services will be constructing an 8 megawatt biogas co-generation plant at Ashbridges Bay Treatment Plant ("ABTP"). The digester process provides methane for the co-generation plant to convert into biogas fuel used for electricity. The cogeneration plant will provide electricity and thermal heat, as well as emergency standby power in case of power interruption for the site. In addition to the ABTP project, other bio gas plants from Toronto landfill sites and source-separated organic facilities are under-development and will offer a renewable energy and a positive contribution to the City's climate change targets.

ii. Provincial Policies and Programs

Despite Toronto's energy work to date and plans under the Power to Live Green for the future, the City's jurisdiction over energy matters is not entirely our own. The province regulates energy supply, transmission, and distribution in Ontario. The Ministry of Energy and Infrastructure ("MEI") sets the legislative and regulatory framework for these matters and oversees, directs, and/or negotiates with the Ontario Power Authority ("OPA"), the Ontario Energy Board ("OEB"), the Independent Electricity System Operator ("IESO"), Hydro One, and Ontario Power Generation ("OPG") to implement this framework.

[1] Phase-Out of Coal

In 2007, the Ontario government passed legislation to phase out the Province's coal-fired power plants by 2014. This past September, OPG, on behalf of the province, announced that it "will continue to reduce carbon dioxide emissions through an ongoing coal phase out plan which targets emissions from coal at 19.6 million tonnes in 2009 and 15.6 million tonnes in 2010. By 2011, coal electricity generation will be cut by two-thirds." See <http://news.ontario.ca/mei/en/2009/09/ontarios-coal-phase-out-plan.html>.

Coal plants are a leading contributor of climate change due to their release of high quantities of greenhouse gas emissions. They also release significant quantities of mercury, smog-causing nitrogen oxide and sulphur dioxide emissions as well as small particulate matter.

The coal phase out will assist the City in achieving its 2012 and 2020 greenhouse gas emission reduction targets for stationary energy. In turn, electricity CDM and renewable energy initiatives will assist the provincial government in its coal phase out efforts.

Removing coal from the electricity supply mix will result in a reduction of 5.9 megatonnes of greenhouse gas emissions, or nearly one-quarter of Toronto's total current emissions of 24.4 megatonnes (including emissions from transportation and other sources).

[2] Toronto Directive

In February 2006, the then-Minister of Energy (now Ministry of Energy and Infrastructure) issued a directive to the Ontario Power Authority to develop 330 megawatts of conservation demand management in Toronto by 2010. Known as the "Toronto Directive", the electricity savings initiative is being delivered by the City's Better Buildings Partnership (90 megawatt in the institutional sector and for new buildings in all sectors), Toronto Hydro (90 megawatt in the residential, low income and small commercial sector) and the Building Owners' and Managers' Association (150 megawatt in the large commercial sector). A new directive, consistent with the goals and objectives of the Green Energy and Green Economy Act, is anticipated soon.

[3] Green Energy and Green Economy Act

In May, 2009 the Provincial Legislature passed the Green Energy and Green Economy Act ("GEA"). The GEA aims to boost the development of and investment in renewable electricity projects (such as wind, solar, hydro, biomass, and biogas) and research, in particular through an OPA-administered feed-in-tariff ("FIT"). The GEA also seeks to increase conservation by introducing measures to help residents and businesses manage energy use, such as providing retrofit incentive programs and strengthening efficiency standards for household appliances.

Pursuant to the GEA, MEI will issue a directive—similar to the Toronto Directive from February 2006 described above—that will set forth specific megawatt reduction requirements. There also may be additional funding through a Global Adjustment Mechanism that will allow for socialization of costs across the province based on certain criteria. The Province claims the GEA will create 50,000 green jobs in the

first three years and promote economic growth in Ontario. These goals will have a positive impact on Toronto's efforts to reduce greenhouse gas emissions and further green our city.

The following table highlights key initiatives and opportunities that can be realized through the GEA.

Key Initiatives and Opportunities in the Green Energy and Economy Act

Conservation	Opportunity
Optional energy audits for buildings at time of sale.	Encourages energy retrofits. Currently few levers for existing buildings (e.g., Building Code primarily deals with new buildings)
Building Codes and standards review process.	Strengthens efficiency requirements for new buildings. Staff has asked for City representation in the process.
Stronger role for local utilities in conservation programs.	More local design and implementation of programs.
Improving efficiency levels in appliances.	“Plug load” and “phantom load” (i.e. the electricity consumed by appliances when in operating mode and when in standby mode, respectively) are growing and need to be curtailed through regulation. Mandatory use through codes and standards will transform market via attrition.
Municipalities will be required to develop energy plans with targets and report on results.	Coordinates energy initiatives of the City's ABCCD's and energy stakeholders (Toronto Hydro, Enbridge and Enwave).
Guaranteed long term contracts for the purchase of energy from renewable sources (known as the FIT)	Price stability and predictability for renewable energy developers – could generate increased investments.
Development of a smart grid.	Improves infrastructure for distributed renewable energy; increases opportunities for customer engagement in demand management.
“Right to connect” to grid.	Security – also likely to increase investment.

In September 2009, several provincial ministries issued regulations pursuant to the GEA that address approval issues and requirements for renewables. Moreover, the OPA, pursuant to a ministerial directive, issued the terms of and model contract for the FIT that is at the centre of the GEA.

iii Federal Policies and Programs

Energy policy and regulations as set by the Canadian Government are an important element in an effort to achieve the energy objectives outlined in this strategy. The federal government has a significant role to play in setting standards for energy efficiency in products used by residents and businesses ranging from furnaces to refrigerators to computers and televisions.

Some of the recent actions of the federal government in the area of energy efficiency and clean energy include:

- Establishment of the Clean Energy Fund which has \$1 billion in funding for five years for the development and demonstration of promising new technologies in carbon capture and storage and renewable energy development;
- Expansion of the ecoENERGY program which provides financial incentives to homeowners and businesses to undertake energy efficiency retrofits to their buildings; and
- Proposed regulations for new energy efficiency standards for a range of consumer products, in particular those that rely upon stand-by power which is becoming one of the more significant draws on Canada's electrical energy system.

APPENDIX B

Actions you can undertake now

What residents can do now

It takes everyone to create a sustainable energy system for Toronto. Here are 10 things residents can do today to help us get there. Consult www.LiveGreenToronto.ca for more details. Also visit www.torontohydro.com for electricity saving tips.

- 1. Improve your home's energy efficiency.** Explore the Live Green Toronto website to find all the grants and rebates available, including Toronto's new Home Energy Assistance Toronto (HEAT) program to receive up to \$1,000.
- 2. Save \$150 a year!** Say goodbye to that energy-wasting second fridge—call Toronto Hydro for free pick-up & disposal.
- 3. Get \$60 towards the purchase of a new high efficiency clothes washer.**
- 4. Get \$60 to \$75 towards the cost of a new low-flow toilet.** Flush less water and money down the drain!
- 5. Go cool, green and shady.** To get a free tree planted on City-owned street allowances in your neighbourhood, contact the City's Forestry Division.
- 6. Energy-efficient CFL light bulbs contain mercury; dispose of them safely** at a Community Environment Day or at one of two Toronto Hydro locations.
- 7. Air conditioning got your hydro bills soaring?** Sign-up for Toronto Hydro's PeakSaver and get a \$75 rebate on your hydro bill.
- 8. Work with neighbours to develop an energy saving project in your neighbourhood.** Apply to the Live Green Toronto program for grant support.
- 9. Trade in your old incandescent seasonal lights for energy-saving LEDs** at a Festive Light Exchange.

What business can do now

Businesses also play an important role. Here are some great opportunities:

- 1. Explore financial incentives** for energy efficiency businesses under 25,000 square feet. www.torontohydro.com
- 2. Install a green or cool roof.** Consult www.LiveGreenToronto.ca for details.
- 3. Business Improvement Associations can apply for a Live Green Toronto grant** to fight climate change. www.LiveGreenToronto.ca
- 4. Arrange for tree planting along the city-owned street allowance** to spruce up your business front and reduce energy needs in the process.
- 5. Sign up for the adopt-a-bin program** to keep the street litter free and save energy wasted on responding to combined sewer overflows from such trash.
- 6. When your air conditioning is running in the summer, keep your doors closed.** Consider subscribing to Toronto Hydro's peaksaver program to reduce costs and save energy on your central air conditioning system. www.torontohydro.com
- 7. Explore other opportunities with the help of www.greenTbiz.org.**
- 8. Obtain cash incentives for installing water efficient equipment.** Consult www.LiveGreenToronto.ca for details.
- 9. Trade in your old incandescent seasonal lights** for energy-saving LEDs at a Festive Light Exchange. www.torontohydro.com