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## **ENVIRONMENTAL SERVICES ENERGY MANAGEMENT PROGRAM UPDATE 2010**

**The Environmental Services Committee recommends the adoption of the recommendation contained in the following report dated June 1, 2011, from the Commissioner of Environmental Services and the Commissioner of Corporate Services.**

### **1. RECOMMENDATION**

It is recommended that Council receive this report for information.

### **2. PURPOSE**

The purpose of this report is to update Council on Environmental Services energy management activities for 2010. The content of this report is aligned with the Corporate Energy Report to be received at the Finance and Administration Committee on June 9, 2011.

### **3. BACKGROUND**

Since 2003, the Corporate Energy Services section of the Property Services Branch has had a mandate to review and manage energy consumption for the corporation. Energy use by Environmental Services' facilities accounts for approximately 60% of the corporation's electricity consumption. As water and wastewater facilities represent the single largest user of electricity within all the services provided by York Region, it is important to ensure that energy is being used efficiently. Since 2009, an Energy Management Program has been embedded within Environmental Services to expand the Energy Management Program from reducing energy in buildings to include operations and energy related processes.

The objective of the Energy Management Program is to manage the Environmental Services facilities energy portfolio in an economical and sustainable manner. Through the program, the department is exploring enhancements to facility operations and the environment to demonstrate leadership in energy use to lower overall operating costs. With rising energy costs and a growing emphasis on environmental goals, saving energy throughout operations is becoming an increasing priority.

The Environmental Services Energy Management Program supports a number of principles and actions in the York Region *Sustainability Strategy (2007)*, including the following:

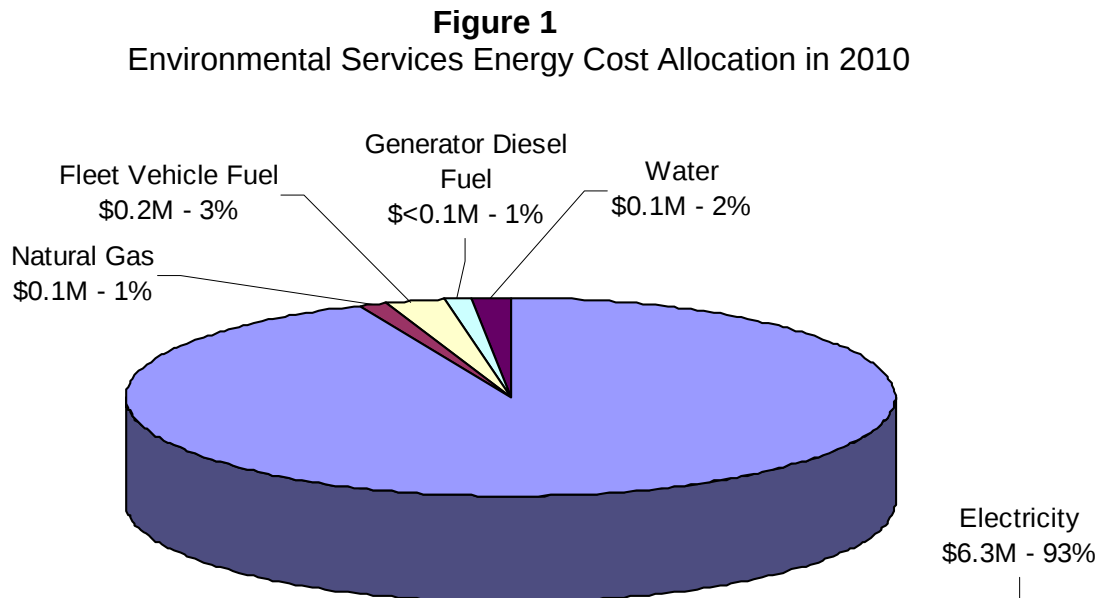
- Building Regional buildings at a minimum LEED Silver level as directed by Council.

- Continue to increase the energy efficiency and sustainability of York Region buildings through retrofits, procurement and conservation measures.
- Reduce greenhouse gas emissions in existing and future Regional facilities.
- Expand on energy efficiency initiatives and pursue other forms of renewable energy.
- Track energy performance and costs across the Region on an annual basis, and monitor greenhouse gas emissions.

#### 4. ANALYSIS AND OPTIONS

##### **In 2010, Environmental Services energy costs totalled \$6.7 million**

Energy costs to operate Environmental Services' facilities were \$6.7 million in 2010. Environmental Services' facilities represented 19% of York Region's total energy costs of \$35.6 million. As illustrated in Figure 1, electricity costs represented 93% of 2010 Environmental Services energy costs.



##### **Per capita energy costs, electricity consumption and greenhouse gas emissions have declined since 2006**

Consumption of electricity, natural gas and water decreased in 2010 compared to 2009. Electricity, natural gas and water use is lower than in 2006. Fleet vehicle fuel use has increased due to a larger number of vehicles.

Table 1 below shows the department's energy costs, electricity consumption and greenhouse gas emission data over the last five years.

One of the significant factors driving Environmental Services' energy consumption and offsetting efficiency gains is population growth in the Region. Table 1 illustrates that on a per-capita basis, energy costs, electricity consumption and greenhouse gas emissions have declined since 2006.

**Table 1**  
Environmental Services Per-Capita Energy Trends

|                                             | 2006       | 2007       | 2008       | 2009       | 2010       |
|---------------------------------------------|------------|------------|------------|------------|------------|
| Population                                  | 949,600    | 982,900    | 1,012,000  | 1,032,600  | 1,062,000  |
| Total Energy Cost (\$)                      | \$6.8M     | \$6.6M     | \$7.0M     | \$6.5M     | \$6.7M     |
| - \$ Per capita                             | \$7.2      | \$6.7      | \$6.9      | \$6.3      | \$6.3      |
| Electricity Consumption (kWh)               | 64,293,414 | 62,367,321 | 64,913,482 | 64,203,549 | 63,105,690 |
| - kWh Per capita                            | 67.7       | 63.5       | 64.1       | 62.2       | 59.4       |
| Carbon Footprint (tonnes CO <sub>2</sub> e) | 14,517     | 14,282     | 14,829     | 14,529     | 14,376     |
| - kg Per capita                             | 15.3       | 14.5       | 14.7       | 14.1       | 13.5       |

Notes from Table 1:

- Population values are based on year-end estimates from the Planning Department
- Electricity, natural gas and water costs and consumption are tracked via Energy and Environmental Management System software
- Fleet vehicle fuel costs and consumption tracked via Fuel Management system
- Generator diesel fuel costs and consumption tracked via Environmental Services year end chemical inventory
- 2006 emission factors are used as the baseline year for electricity, natural gas, fleet vehicle fuel and generator diesel fuel to calculate the total carbon footprint. These factors are from York Region's Energy and Environmental Management System software
- Energy costs, consumption and carbon footprint analysis for water, wastewater and solid waste facilities owned and/or operated by third parties are not included

### **Energy rates for electricity and fuel increased in 2010**

Table 2 summarizes Environmental Services Department 2006 to 2010 average total electricity cost rate (\$/kWh), average total natural gas cost rate (\$/cu.m.) and average total fleet fuel cost rate (\$/litre) to show the change over the years.

**Table 2**  
Energy Cost Rates for Environmental Services (2006-2010)

|      | <b>Average Total<br/>Electricity Cost<br/>Rate (\$/kWh)</b> | <b>Average Total<br/>Natural Gas Cost<br/>Rate (\$/cu.m.)</b> | <b>Average Total<br/>Fleet Fuel Cost<br/>Rate (\$/litre)</b> |
|------|-------------------------------------------------------------|---------------------------------------------------------------|--------------------------------------------------------------|
| 2006 | \$0.101                                                     | \$0.455                                                       | \$0.917                                                      |
| 2007 | \$0.099                                                     | \$0.535                                                       | \$0.928                                                      |
| 2008 | \$0.099                                                     | \$0.475                                                       | \$1.076                                                      |
| 2009 | \$0.095                                                     | \$0.436                                                       | \$0.842                                                      |
| 2010 | \$0.100                                                     | \$0.367                                                       | \$0.940                                                      |

Natural gas rates continue a long-term downward trend and in 2010 the unit cost for natural gas was 20% lower than in 2006. Energy expenditures for electricity and vehicle fuel started to increase in 2010. Electricity rates increased by 5% in 2010 compared to 2009. The cost of fuel increased by 11% in 2010 compared to 2009. The Region's lowest energy cost expenditures since 2006 were in 2009. Price pressures for electricity and fuel resulted in increased costs in 2010 compared to 2009.

#### **Electricity time-of-use rate structure continues to provide cost savings for Environmental Services facilities**

The drop in electricity cost observed in 2009 is a result of the implementation efforts of the Energy Procurement Strategy, which moved large hydro accounts from the Regulated Price Plan to the Hourly Ontario Energy Price and Weighted Average Hourly Spot Price. This initiative drove over \$300,000 dollars of cost savings in 2009.

Effective November 2009, municipalities began paying for electricity on a time-of-use basis for most facilities. This mirrors the smart meter initiative for residents where power used during daylight hours on weekdays is more expensive. The department continues to benefit from lower electricity costs during off-peak time-of-use energy price rates for facilities that have 24-hour operations.

It is difficult to predict future energy pricing. Energy prices are driven by weather, economic activity and generation capacity. *Ontario's Long Term Energy Plan* released in November 2010 predicted electricity rate increases of between 2.7% annually for large industrial accounts to as much as 7.0% annually over the next five years for residential and small business accounts.

#### **Environmental Services' greenhouse gas emissions are primarily due to electricity use**

As a member of the Partners for Climate Protection, the Region has adopted a framework to reduce its greenhouse gas emissions. An important step to reducing emissions is to better understand which facilities are contributing to emissions generation.

Wastewater treatment plants have been recognized as a source of greenhouse gas emissions because they produce carbon dioxide, methane and nitrous oxide during the treatment process. In 2011, York Region staff will investigate the production of greenhouse gas emissions from wastewater treatment plant processes since 2006 using the *Intergovernmental Panel for Climate Change Guidelines for National Greenhouse Gas Inventories*.

The most significant opportunity for abatement of greenhouse gas emissions for Environmental Services is to continue to improve energy efficiency by reducing electricity use at all facilities. The ongoing Environmental Services Energy Management Program will ensure that energy is being used in the most efficient manner possible towards achieving greenhouse gas emission reductions.

Greenhouse gas emissions and energy use will be taken into consideration in finalizing servicing strategies on future growth areas, such as pumping vs. gravity sanitary sewers and comparing Lake Ontario water supply to Lake Simcoe and ground water supply sources. A holistic energy management approach will be considered as part of future environmental assessments.

### **Environmental Services is investigating energy management focused key performance indicators**

Staff are currently developing methodologies for capturing and analyzing water, wastewater and solid waste services energy intensity key performance indicators to better understand energy use and continue to identify opportunities for increased energy efficiency across all facilities. This is being pursued as part of the current Levels of Service, Key Performance Indicators and Data Management Strategy project.

Staff will work towards achieving the following goals with energy key performance indicators scheduled to be reported in 2011:

- Improving facility energy efficiency (kWh/m<sup>3</sup>, kWh/tonnes processed) through exploring operational and equipment efficiency improvements
- Managing operating energy costs (\$) and consumption (kWh, litres, m<sup>3</sup>) through energy procurement and energy use reduction initiatives
- Reducing greenhouse gases associated with energy consumption (tonnes of CO<sub>2</sub>e) through energy use reduction initiatives and incorporating renewable energy sources
- Improving fuel economy (litres/100 km) through educating staff on fuel efficiency as part of Department Fleet Fuel Challenge

### **Energy from Waste will generate 15.8 megawatts of power annually**

York Region converts a portion of our waste into fuel pellets at the Dongara waste pelletization plant for use in commercial heating operations. The remaining residual waste is currently sent to Ontario landfill sites.

The proposed Durham-York Energy from Waste facility will manage household residual waste left over after Durham and York Regions' diversion efforts. Waste materials will be burned in a high-temperature combustion process. The energy released will be recovered as steam, electricity and heat. The proposed thermal facility processing 140,000 tonnes per year of residual municipal waste will generate about 15.8 megawatts (MW) of power, approximately 13.6 MW of which will be provided to the grid. This is enough energy to power approximately 10,000 homes. York Region will contribute 30,000 tonnes per year of residual material to this facility.

Both of these waste management initiatives support Council's commitment to the 4<sup>th</sup> R in waste management – energy recovery.

### **Incorporating LEED® and integrated design process into Capital Delivery projects**

Environmental Services is investigating ways of incorporating principles of sustainability into its project management and capital delivery process. Implementation of Leadership in Energy and Environmental Design (LEED®) and the integrated design process are tools being reviewed as part of this project. The integrated design approach brings together all project stakeholders with their different perspectives and skills in a collaborative process that focuses on the design, construction, operation and occupancy of a building over its complete life-cycle.

The Leslie Street Sewage Pumping Station upgrades project is applying the integrated design process and is currently investigating pursuing LEED® certification as part of the upgrades. Stouffville Zone 2 Pumping Station is in the process of pursuing LEED® Silver certification. The integrated design process was applied as part of the project management process of this project. McCleary Court Community Environmental Centre achieved LEED® Gold in 2010 through applying the integrated design process into the project.

An environmental design standards project has been initiated to revise standards and design criteria to include energy efficiency and sustainability strategies into Environmental Services infrastructure.

### **Process energy audits at seven facilities will identify potential energy savings**

Process energy audits at York Region water and wastewater facilities will provide recommendations towards enhanced facility energy efficiency. Process energy audits are

currently being completed at seven water and wastewater facilities as part of this round of audits:

- Mount Albert Water Pollution Control Plant
- Queensville Well No. 3 / Queensville Well No. 4
- Humber Sewage Pumping Station
- Bayview Water Pumping Station
- Maple Water Pumping Station
- Newmarket Sewage Pumping Station
- Pine Valley Sewage Pumping Station

These facilities were selected as representative facilities from each of the significant electricity consuming facility types: wastewater treatment facility, ground water treatment facility, water pumping station and wastewater pumping station. The selection of sites was based on consideration of a number of factors: high annual electricity consumption (kWh), range of energy intensity (kWh/m<sup>3</sup>) for facility type and potential for efficiency gains.

Energy audits will identify and quantify capital, operating and maintenance efficiency improvements as well as advanced energy measures. Integration of best practices identified from the process energy audit reports will reduce emissions of greenhouse gases through improving the energy efficiency of facility operations and lead to reduction in energy use.

The final energy audit reports are to be completed in Q3 2011.

### **Staff education and awareness are key to achieving long-term sustained energy savings**

Through the Environmental Services Energy Management Program, education and awareness initiatives, staff are encouraged to make a difference in reducing operating costs by improving energy management strategies as part of daily operations. Operations staff are involved in defining opportunities for improving facility energy management and improving fleet vehicle fuel efficiency.

The 2010 Operations Maintenance and Monitoring Fleet Fuel Challenge focused on improving Environmental Services fleet fuel efficiency (litres/100 km and CO<sub>2</sub>e /km). This challenge achieved an improvement in fuel efficiency by 2% from 2009. This is equivalent to approximately 8 tonnes of greenhouse gas reduction achieved through improving fuel efficiency. This reduction is equivalent to approximately one operations vehicle taken off the road.

Training is an integral part of the Energy Management Program and is critical to achieving and sustaining energy savings. Studies have shown that education and

awareness activities can yield savings over the long term. The overall intent of the training program is to complement technological and organizational changes and maximize energy saving results from projects. Training will allow staff to modify operations to increase efficiencies, identify opportunities for energy savings measures and raise awareness among staff. Case studies have shown that energy training and education for operational staff can lead to greater energy savings than some building retrofits.

### **Environmental Services is proactively undertaking energy management training to drive energy savings**

Environmental Services addressed this potential in the following ways in 2010:

- Developed energy management training and communication program material available on York Region's intranet under Energy Management Program Toolbox for staff
- Established an Environmental Services Energy Working Group
- Continued to conduct Energy Management presentations requesting feedback on ways to reduce energy without compromising quality of services at Environmental Services meetings
- Conducting on-going Energy Management sessions at Operations Maintenance and Monitoring monthly team lead meetings
- Conducted Operations Maintenance and Monitoring Fleet Fuel Challenge 2010; to be expanded into department wide initiative in 2011
- Continued to support environmental activities including Earth Hour

The continued support and cooperation of all branches and business units within Environmental Services is paramount to deliver an effective Energy Management Program.

### **Renewable energy is an increasingly important part of the energy supply**

Electricity from renewable sources is currently purchased for two Environmental Services facilities: the Household Hazardous Waste Depot in East Gwillimbury and the Stouffville Pumping Station in Whitchurch-Stouffville. Electricity comes from off-site wind and hydroelectric facilities that have been certified as low impact by Environment Canada's Environmental Choice program's EcoLogo requirements for green power supplies. The intent of this strategy is to encourage the development and use of renewable energy technologies on a net zero pollution basis. This initiative achieves a reduction of approximately 13 tonnes greenhouse gas emissions per year.

The Stouffville Pumping Station also incorporates a 4.8 kW solar photovoltaic system adjacent to the facility which provides over 36% of the building's energy use (excluding process energy). This system is designed to generate 7,800 kWh per year. This solar

photovoltaic system is the Region's first offered microFIT program contract. The microFIT Program is a stream of the Ontario Power Authority's Feed-in Tariff (FIT) Program for renewable energy in Ontario. This initiative achieves a reduction of approximately 1.6 tonnes of greenhouse gas emissions per year.

### **Cost-benefit analysis of solar photovoltaic installations reveals that solar development is worthwhile**

Five Environmental Services facilities were included as part of the Solar Photovoltaic Feasibility Study. The study concluded that development of a solar project under the Feed-In Tariff (FIT) program is worthwhile and of benefit to the Region to further explore at three of the Environmental Services locations. Table 3 presents the financial modeling for the three candidate sites within Environmental Services to be further explored.

**Table 3**  
Candidate Solar Installation Locations within Environmental Services

| <b>Location</b>                  | <b>System<br/>(kW)</b> | <b>Cost<br/>(\$)</b> | <b>Payback<br/>(years)</b> |
|----------------------------------|------------------------|----------------------|----------------------------|
| Garfield Wright Recycling Centre | 500                    | 3.2 M                | 8.3                        |
| North Markham Reservoir          | 500                    | 3.4 M                | 8.3                        |
| Georgina Water Treatment Plant   | 100                    | 0.8 M                | 9.9                        |

As part of the next steps, a structural review of the roof strength is being conducted at these locations. Discussions still need to take place on sources of funding if the Region is to proceed with solar project installations at these sites. Staff are currently exploring options on whether York Region should outright purchase solar photovoltaic systems or pursue leasing arrangements to lease out roof area for solar developers. It is important to note that the environmental benefits (i.e. greenhouse gas emission reductions) are assigned to the Ontario Power Authority under the FIT Contract and are not eligible to be claimed by the Region as a reduction under either scenario.

A SolarWall® was installed at Mount Albert Water Pollution Control Plant in 2010. The SolarWall preheats ventilation air supply which directly offsets the need for electric heating at the facility. The predicted annual savings is approximately \$4,000 in avoided electricity costs.

Feasibility studies at the Maple Pumping Station and Leslie Street Sewage Pumping Station were completed in 2010, with respect to demand response using emergency generators. Discussions are taking place to determine next steps.

The feasibility of on-site energy generation from wastewater operations is being explored as part of the Sludge Management Strategy Project in exploring treating sludge on-site rather than hauling the sludge.

## **Energy reporting evolving to satisfy pending Regulations**

The Province's *Green Energy and Green Economy Act, 2009*, pending Regulations, will require all public agencies to prepare an energy conservation and demand management plan summarizing annual energy consumption for each of the public agency's operations and a description of the expected results of current and proposed conservation activities.

The *Water Opportunities and Water Conservation Act, 2010*, pending Regulations, will require the Regional Municipality of York to prepare a "municipal water sustainability plan" covering all municipal services including a Water Conservation Plan for facilities.

This plan must include:

- Summary of annual water use for each of the Corporation's operations
- Description and forecast of expected results from current and proposed activities to be taken by the Corporation to conserve water
- Summary of progress and achievements already accomplished

This plan will require coordination with the preparation and implementation of the Demand Management Plan under the *Green Energy Act*.

The Corporate Services Department, Property Services Branch will continue to lead the annual energy reporting for the Corporation and the annual report content will expand to include the new reporting requirements set out in the *Green Energy Act* and *Water Opportunities and Water Conservation Act*. The Corporate Energy Report to be received at the Finance and Administration Committee on June 9, 2011 will cover this reporting in more detail.

## **5. FINANCIAL IMPLICATIONS**

As energy costs continue to rise, knowledge of energy efficient technologies and best practices is becoming more valuable. To date the successful implementation of the Energy Management Program is a result of York Region employees' engagement in identifying ways to incorporate energy efficient practices and equipment into facilities. Energy efficiency projects can vary in complexity from very simple - operating process equipment on a different schedule, to complex – replacing critical process equipment. Energy projects within the Environmental Services Energy Management Program to date are being integrated with business processes as part of daily operations and incorporated directly into capital projects. Some of the energy initiatives that have a corporate focus involving Environmental Services facilities are funded as part of the Corporate Energy Services Energy Management Program.

Energy savings vary from project to project. Table 4 displays the cost savings accumulated over the last five years. However, Table 4 currently does not indicate all the implemented energy initiatives and associated direct and indirect savings associated with incorporating energy efficient practices into our facilities.

Next steps of the program are to establish a measurement and verification program, which will be supported through the Levels of Services, Key Performance Indicators and Data Management Strategy project. This project moves towards having the required data to be able to better quantify energy savings through monitoring changes in energy efficiency at our facilities.

**Table 4**  
Environmental Services Energy Program Cost Savings Summary 2006-2010

| <b>Component</b>  | <b>2006<br/>(\$)</b>                                                                           | <b>2007<br/>(\$)</b> | <b>2008<br/>(\$)</b> | <b>2009<br/>(\$)</b> | <b>2010<br/>(\$)</b> | <b>Cumulative<br/>(\$)</b> |
|-------------------|------------------------------------------------------------------------------------------------|----------------------|----------------------|----------------------|----------------------|----------------------------|
| Electricity       |                                                                                                |                      |                      |                      |                      |                            |
| Interval Meters   | NA                                                                                             | 80,000               | 198,000              | 309,000              | NA                   | 587,000                    |
| on Hourly Price   |                                                                                                |                      |                      |                      |                      |                            |
| Fleet Fuel        | NA                                                                                             | NA                   | NA                   | NA                   | 3,600                | 3,600                      |
| Challenge         |                                                                                                |                      |                      |                      |                      |                            |
| Energy Retrofits  | NA                                                                                             | NA                   | NA                   | NA                   | 500                  | 500                        |
| Sustainable       | NA                                                                                             | NA                   | NA                   | 5,800                | 28,000               | 33,800                     |
| Design            |                                                                                                |                      |                      |                      |                      |                            |
| Grants and        | NA                                                                                             | 440,612              | 46,222               | 135,611              | 18,886               | 641,331                    |
| Incentives        |                                                                                                |                      |                      |                      |                      |                            |
| Accounts moved    | Implemented late 2010. Forecasted to yield savings in order of \$50,000/yr in 2011 and beyond. |                      |                      |                      |                      |                            |
| to Weighted       |                                                                                                |                      |                      |                      |                      |                            |
| Average Hourly    | Implemented late 2010. Forecasted to yield savings in order of \$4,300/yr in 2011 and beyond.  |                      |                      |                      |                      |                            |
| Spot Price        |                                                                                                |                      |                      |                      |                      |                            |
| Mount Albert      | Forecasted to yield revenue in order of \$5,000/yr based on securing microFIT contract.        |                      |                      |                      |                      |                            |
| SolarWall         |                                                                                                |                      |                      |                      |                      |                            |
| Stouffville Solar |                                                                                                |                      |                      |                      |                      |                            |
| Photovoltaic      |                                                                                                |                      |                      |                      |                      |                            |
| <b>Totals</b>     | <b>NA</b>                                                                                      | <b>520,612</b>       | <b>244,222</b>       | <b>450,411</b>       | <b>50,986</b>        | <b>1,266,231</b>           |

The Regional Municipality of York successfully secured grants in 2010 from the Federation of Canadian Municipalities, Green Municipal Fund. In total \$68,094 for the energy analysis at York Region water and wastewater facilities project and \$34,513 for the solar photovoltaic feasibility study. This funding is to be received in 2011.

## **6. LOCAL MUNICIPAL IMPACT**

Energy management activities benefit residents and local municipalities by reducing costs and demand on infrastructure, mitigating environmental impacts, providing an advisory outreach role and promoting sustainable practices.

## **7. CONCLUSION**

Significant progress has been made in developing and implementing efficiencies and sustainability initiatives in new and existing Environmental Services facilities in 2010. Environmental Services energy expenditures increased in 2010 due to rising electricity and fuel prices. Environmental Services continues its downward trend in energy consumption and resultant greenhouse gas emissions. Energy reporting will evolve in the near future to meet the new reporting requirements set out under the *Green Energy Act and Water Opportunities and Water Conservation Act*. Rising energy costs and new legislative reporting requirements demonstrate the importance of this program. Efforts to support business units and incorporate sustainable energy initiatives into projects have been increasing. Staff within Environmental Services and Corporate Services are jointly working on the delivery of the Energy Management Program. As technologies are being researched and efficiencies realized, the program will continue to grow along with Environmental Services' commitment to sustainable energy practices.

For more information on this report, please contact Lucas Cugalj, Director, Strategy and Business Planning at Ext. 5041 or Barry Crowe, Director, Property Services Branch at Ext. 1684.

The Senior Management Group has reviewed this report.