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ENVIRONMENTAL SERVICES ENERGY MANAGEMENT PROGRAM UPDATE

The Environmental Services Committee recommends the adoption of the recommendation contained in the following report dated April 8, 2010, from the Commissioner of Environmental Services and the Commissioner of Corporate Services.

1. RECOMMENDATION

It is recommended that this report be received for information.

2. PURPOSE

The purpose of this report is to describe the progress and outlook of the Energy Management Program in the Environmental Services Department. The content of this report is aligned with the Corporate Energy Report received at Finance and Administration Committee on May 6, 2010.

3. BACKGROUND

Formed in 2003, the Corporate Energy Services unit, within the Property Services branch, has a mandate to review and manage energy consumption for the Corporation. The Energy Program Report 2004 and 2005 Work Plan identified the need to expand the focus of the Energy Management Program from reducing energy in buildings to include operations and process related energy in the Transportation and Works Department (now Environmental Services Department).

In 2008 an Environmental Services Energy Management Plan was drafted and incorporated into the Regional Strategic Energy Plan. The Departmental Plan focused on recommendations for process improvements for water and wastewater services within the Environmental Services Department. This plan included a recommendation to embed an Energy Management Program within Environmental Services.

Details of the Energy Management Plan are summarized in Section 4 of this report. Listed below are some other recommendations from the 2008 Plan that Environmental Services is currently working on:

- Support Property Services in the procurement of energy, including green energy at water and wastewater facilities.
- Develop guidelines for incorporating LEED® initiatives in water, wastewater and solid waste facilities.
- Educate and establish the linkage between water use and energy use to promote a shift in conservation.
- Use energy audits as a means to continually improve and provide feedback on how water and wastewater is managing process-related energy use.

The Energy Management Program mandate is to manage the Environmental Services facilities energy portfolio in an economical and sustainable manner. By reducing energy consumption, the Department can enhance facility operations and the environment by demonstrating leadership in energy use while having a substantial impact on operating costs.

The Energy Management Program is aligned with Environmental Services' Strategic Plan and the Water and Wastewater Master Plan. The program also supports priorities identified in the Sustainability Strategy, Vision 2026 and the Corporate Air Quality Strategy.

In 2009 Environmental Services expended \$6.4 million for energy consumption

Energy consumption to operate Environmental Services' facilities costs approximately \$6.4 million, which accounts for up to 60 per cent of York Region'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. Table 1 summarizes Environmental Services energy costs and Table 2 shows energy consumption from 2006 to 2009. Electricity energy costs represent about 30 per cent of Environmental Services direct operating costs for water and wastewater programs.

Table 1
Environmental Services Energy Costs (2006 – 2009, \$ Millions)

Component	2006	2007	2008	2009
Electricity	6.5	6.2	6.5	6.1
Natural Gas	0.1	0.1	0.1	0.1
Fleet Vehicle Fuel	0.1	0.2	0.2	0.2
Totals	6.7	6.5	6.8	6.4
Regional Energy Cost Totals	31.6	32.4	37.2	31.6

Notes from Table 1:

- Electricity and natural gas use is tracked via in-house Energy and Environmental Management System (EEMS) software.
- Fleet vehicle fuel is tracked via Fuel Management system managed by Transportation Services for fleet vehicles.
- Electricity energy costs in 2007 and 2009 are lower as a result of increased water supplied from Toronto and Peel. Toronto and Peel electricity costs to treat and transmit water to York Region are not included in Table 1.
- Energy costs for facilities owned/operated by third parties are not all included.
- Fuel for emergency generators is not included in Table 1.

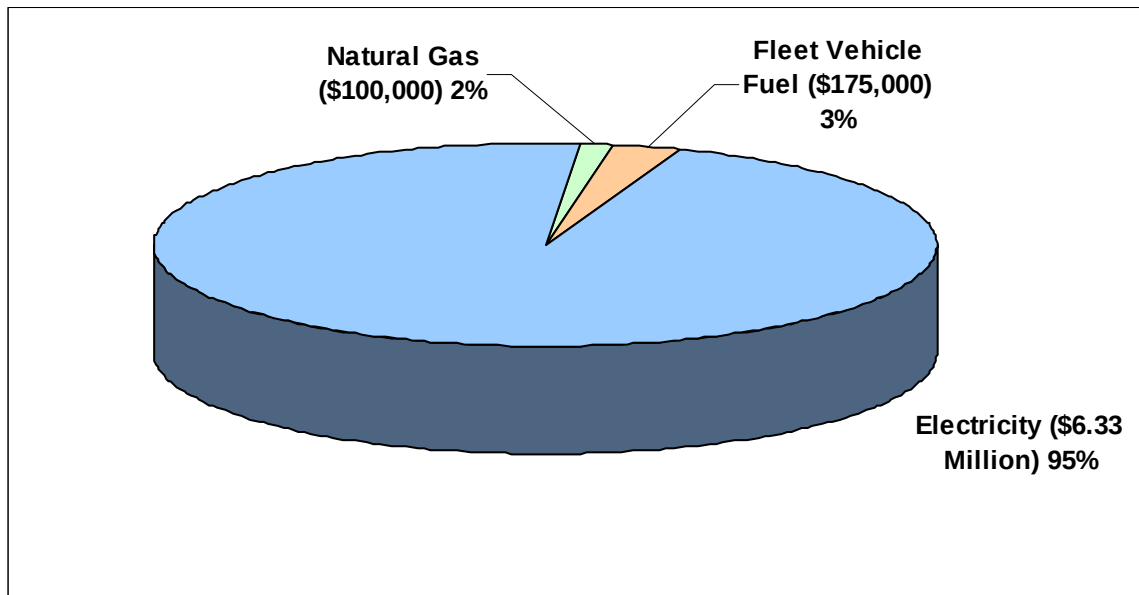
Table 2
Environmental Services Energy Consumption (2006-2009)

Component	Volume Measure	2006	2007	2008	2009
Electricity	kWh	64,324,920	62,492,608	64,944,414	64,148,499
Natural Gas	cu.m.	204,379	225,885	232,657	228,709
Fleet Vehicle fuel	litres	132,972	167,898	158,978	180,880

4. ANALYSIS AND OPTIONS

The following sections describe the Environmental Services Department's energy profile and current energy management and sustainability initiatives. A breakdown of Environmental Services' energy portfolio is presented in Figure 1.

Figure 1
Environmental Services Average Energy Costs (2006 – 2009)



Environmental Services is investigating energy focused key performance indicators

The 2008 Energy Management Plan recommended the establishment of energy key performance indicators (KPIs). This would allow benchmarking at the water and wastewater individual facility level and help to improve efficiencies.

To account for Environmental Services entire water and wastewater system energy intensity, it is necessary to incorporate energy costs for treated water purchased from Toronto and Peel as well as energy costs related to wastewater that is treated in Durham and Peel. Staff are working with Toronto, Peel and Durham to obtain energy costs specifically related to York flows which would allow staff to calculate performance metrics that are comparable against industry benchmarks. Further investigation at a facility level is required to understand York Region facilities energy intensity. Staff are currently developing methodologies for capturing and analyzing water and wastewater energy intensity KPIs to better understand energy use and continue to identify opportunities for increased energy efficiency across all our facilities.

Many of our Solid Waste Management services are contracted out and not all electricity data is available to track consumption. The Energy Management Program is currently investigating opportunities with the Solid Waste Management unit on how to address energy management for solid waste facilities.

Duffin Creek Water Pollution Control Plant applies innovative technologies for energy recovery

York Region is working with Durham Region on the expansion of the Duffin Creek Water Pollution Control Plant. Many sustainable energy technologies are being implemented, such as:

- Biosolids will be processed in fluid bed reactors at a temperature of 850°C. Energy in the form of heat will be recovered from the autogenous incineration process primarily through a heat exchanger, cooling the hot waste gases and heating incoming air. The waste gasses then pass through a waste heat recovery boiler to generate superheated steam is used to run turbine drives for fluidizing air blowers in the incineration process, The remaining heat in the steam and condensate is used to provide building heat for existing Stage 1 and Stage 2 treatment processes.
- The dewatering building was designed in accordance to Leadership in Energy and Environmental Design (LEED®) Silver requirements and certification is being pursued.
- The main component in the off-gas generated during the anaerobic digestion process is methane which is used to fire hot water boilers. This hot water is used to provide heat in the anaerobic digestion process that operates at 37°C. Excess heat is used to provide building heat to the existing administration and laboratory buildings and further expansions. This process is unique to North America and is considered an innovative technology for energy recovery.

Environmental Services applies for LEED® certification for Stouffville Pumping Station

The new Stouffville Zone 2 Pumping Station was built using principles of sustainable design and construction through pursuing LEED® certification. This facility is among the first Environmental Services water and wastewater facilities to pursue LEED® certification.

A key aspect of LEED® is the integrated design approach which brings together all project stakeholders with different perspectives and skills to collaborate on a process that focuses on design, construction, operation and occupancy of a facility over its complete life-cycle. This process involved many Regional stakeholders that contributed to the project's functional goals and objectives. The additional cost to build to LEED® standard for Stouffville Zone 2 Pumping Station was approximately five per cent with an anticipated payback in approximately 15 years.

Key sustainable facility components implemented in the Stouffville Zone 2 Pumping Station facility include:

- Installation of solar panels and purchase of green energy to achieve zero carbon emissions associated with building electricity use.
- Use of local and/or recycled construction materials.
- Site restoration using native species and drought resistant vegetation that was planted in part by Environmental Services staff.
- Diverting construction waste from landfill by recycling materials.
- Use of low-emitting materials for adhesives, sealants and paints.

Community Environmental Centre achieves LEED® Gold certification

The McCleary Court Community Environmental Centre in Vaughan is now LEED® Gold Certified. It is York Region's second LEED® facility. The gold certification exceeds the Region's minimum silver standard.

Key sustainable facility components implemented at the Community Environmental Centre include:

- Storm water collection from the building roof for toilet/urinal flushing and landscape irrigation.
- Approximately 30 per cent recycled content in building materials and over 50 per cent Regional content (Regional materials were extracted and manufactured within 800 km of the project site.).
- The use of ground source heat pumps which is a new technology for York Region.
- Over 90 per cent of construction waste was diverted from landfill.

Sustainability principles integrated into project management and capital delivery process

The Environmental Services Department is investigating ways of incorporating principles of sustainability into its project management and capital delivery process. A project has been initiated to develop an adaptive project sustainability management framework by enhancing the current Capital Delivery Improvement Process (CDIP). This project will produce sustainable practices and an integrated process for the planning, design, construction and commissioning phases of a project. Examples include investigating the installation of renewable technologies and establishing guidelines for the inclusion of renewable forms of on-site power generation at new Environmental Services facilities. Project scope will include evaluation of energy saving technologies that could be employed at each facility during the design phase. This proposed enhancement to the current CDIP framework will take into account social, environmental and economic aspects of project performance and provide staff with a suite of tools to measure, drive and reward sustainable projects. Implementation of LEED® standard is one of the tools being reviewed as part of this project.

An Environmental Design Standards project has also been initiated to revise standards and design criteria to include energy efficiency and sustainability strategies in Environmental Services infrastructure.

Process energy audits help staff understand energy use and identify potential energy savings

Energy audits have been conducted at water and wastewater facilities as part of the water and wastewater Energy Feasibility Study to identify general and site specific energy management opportunities. Building Energy Feasibility Studies have been conducted at six water and wastewater facilities and the Garfield Wright Recycling Centre to assess building energy systems. Recommendations from these studies have been entered into the Infrastructure Improvement Program to be implemented into the capital planning process.

In 2010 process energy audits will be completed at seven water and wastewater facilities. These facilities are:

- Bayview Water Pumping Station,
- Humber Sewage Pumping Station,
- Maple Water Pumping Station,
- Newmarket Sewage Pumping Station,
- Black Creek Sewage Pumping Station,
- Queensville Well No. 3/4, and
- Mount Albert Water Pollution Control Plant.

Environmental Services is looking to expand this initiative further to be part of an ongoing program to ensure all its facilities undergo an energy audit on a periodic basis to understand energy use and identify potential energy saving measures. In creating this program Environmental Services is looking to develop guidelines for regular energy audits at all facilities. Where a standalone audit is not justified, an approach that is being investigated is integrating energy audits with scheduled condition assessments.

Recommendations from energy audits conducted this year will be placed into the Infrastructure Improvement Program to be considered during the capital planning process and used to update Standards and Procedure documents as necessary. Integration of best practices will improve efficiency in facility operations and lead to a reduction in energy use and greenhouse gas emissions.

Green energy plays an increasingly important role in sustainability

Electricity from renewable sources is currently purchased via Bullfrog Power for two Environmental Services facilities: the Household Hazardous Waste Depot in East Gwillimbury and the Stouffville Zone 2 Pumping Station in Whitchurch-Stouffville. The Pumping Station also incorporates 4.8 kW of on-site solar power. An application has

been submitted for the solar photovoltaic system to participate in North America's first feed-in tariff program for renewable energy.

Ontario's feed-in tariff, or FIT program, is North America's first comprehensive guaranteed pricing structure for renewable electricity production. It offers stable prices under long-term contracts for energy generated from renewable sources, including: biomass, biogas, landfill gas, on-shore and off-shore wind, solar photovoltaic and waterpower. The program for renewable energy generation is a cornerstone of the province's *Green Energy Act*. The provincial government launched the program in September 2009, and the Ontario Power Authority (OPA) started accepting applications October 1, 2009. Under the microFIT program York Region will be paid a guaranteed price for all the electricity the system produces for at least 20 years. The potential revenue that could be generated from the Stouffville Pumping Station Solar Photovoltaic System at 80.2 cents/kWh is approximately \$6,200 per year.

Corporate Services is conducting a Solar Photovoltaic Feasibility Study to evaluate the business case for ground and roof-mounted grid-interactive solar photovoltaic installations at nine locations. Photovoltaic refers to a technology which uses a solar panel to produce free electrons when exposed to light, resulting in the production of an electric current (solar power). The feed-in tariff program will be evaluated as part of this assessment. Five of the locations being assessed are Environmental Services' facilities. These facilities are Garfield Wright Recycling Centre, Georgina Water Treatment Plant, Leslie Street Sewage Pumping Station, Schomberg Water Pollution Control Plant and Stouffville Zone 2 Pumping Station. Based on the feasibility study findings, Environmental Services will investigate incorporating solar photovoltaic systems at its facilities.

In late 2008 a feasibility study for a wind turbine at the Sutton Water Pollution Control Plant was concluded. This involved wind resource mapping, wind measurements, an environmental assessment, public consultation and a cost-benefit analysis for three sizes of turbine. Unfortunately the wind resource available at this location and throughout the Region was inadequate. In January 2009 Council decided not to proceed further with the project. Staff are continuing to monitor turbine technology and electricity market pricing.

Use of emergency generators for temporary demand response (to relieve electrical grid loading) received a push in January 2009 with a decision from Ontario's Ministry of the Environment (MOE) that clarified air emission requirements. The generator at the Aurora Sewage Pumping Station could be available for demand response in 2010. The required approvals for the Aurora Sewage Pumping Station Certificate of Approval (Air) are pending. Changing the use of the generator to a combination of standby use and demand response brought the project under Ontario Regulation 116/01 Electricity Projects, which requires an Environmental Assessment Screening Process. Discussions are taking place with the MOE to determine next steps. Demand response capability is being investigated for future capital projects involving large generators.

Water conservation efforts have saved enough water to service an additional 80,000 residents

Water conservation has long been recognized as a social adaptation to climate change. Reducing water use also offers an effective way to reduce electrical energy consumption and greenhouse gas emissions.

The urban water-use cycle includes source extraction, water treatment, distribution, wastewater treatment, collection and end use. Environmental Services is now including energy conservation aspects in its award-winning public outreach activities, including the Water for Tomorrow Program. The water savings from efficiency and conservation initiatives over the past 10 years is 21.5 ML/day, which is enough water to service a community of about 90,000 people. The current 10 year strategy identifies savings of another 23.4 ML/day which will be enough water to service another 98,000 residents. By quantifying the energy use associated with each component of the water and wastewater system staff are working towards determining the potential energy and greenhouse gas (GHG) emission reductions associated with water conservation strategies achieved through the Water for Tomorrow Program.

Time-of-use rate structure provides substantial savings to York Region

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 the daylight hours on weekdays is more expensive. It is anticipated that York Region will be a net beneficiary because its extensive 24-hour operations will benefit from the less expensive overnight and weekend rates. York Region has already realized substantial savings by proactively installing interval meters on a number of large accounts to take advantage of time-of-use rates. The cost savings from the Environmental Services accounts now exposed to the hourly prices are presented in Table 3.

Table 3
Environmental Services Electricity Interval Meters on Hourly Price

Component	2007	2008	2009
Cost Savings	\$80,000	\$198,000	\$309,000
Number of Facilities	10	14	21

Environmental Services is currently investigating combining operational optimization strategies in water and wastewater services to be able to achieve even more savings. Optimization of pumping station and treatment plant efficiency is a first step towards reducing energy costs in the municipal water sector. These strategies include reducing energy load and managing when the energy load is high through automated control adjustments. One optimization strategy to reduce these costs would be to shift electrical load where possible to off peak hours when the electricity costs are less between 10:00

p.m. and 7:00 a.m. Leslie Street Sewage Pumping Station is a facility where a Model Predictive Program is being utilized to determine control strategies to reduce energy costs. An energy monitoring and tracking program will be established to provide operations with the tools to make decisions on operational improvements.

Staff education and awareness is key to achieving long-term change

Training is an integral part of the Energy Management Program and is critical to the success of projects in terms of 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 savings resulting 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 beginning to address this potential in the following ways:

- Developing an energy management training and communication program for Environmental Services staff; Operations Maintenance and Monitoring will be the pilot branch for this initiative.
- Investigating the development of an Environmental Services Energy Working Group and Energy Policy.
- Energy and Environmental Management System (EEMS) training for Environmental Services staff.
- Energy Management presentations and requesting feedback on ways to reduce energy use without compromising quality of services at Environmental Services meetings.
- Drinking Water Systems training for Environmental Services, Operations Maintenance and Monitoring staff.
- Incorporating GHG/energy co-benefits of water conservation within the Water for Tomorrow Program.
- Articles in Property Services York Energy quarterly newsletter distributed via York Beat.
- Support for 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.

Relationship to Vision 2026

The energy management activities of the Environmental Services Department are in support of Vision 2026. Specifically they address Enhanced Environment under Goal 2 as follows:

- Anticipating and responding to climate change;
- Using energy and water more efficiently in operations of Regional government; and
- Investigating and promoting alternative energy sources.

5. FINANCIAL IMPLICATIONS

Table 4 identifies the key 2010 energy projects within the Environmental Services Energy Management Program. Some energy initiatives are funded as part of the Corporate Energy Services Energy Management Program.

Table 4		
Key Projects within Environmental Services Energy Management Program		
Project	2010 Timeline	Allocated Financial Resources
Solar Photovoltaic Feasibility Study (includes Environmental Services facilities)	Q2 completion	\$57,750
Process Energy Audits at Water and Wastewater Facilities	Q3 completion	\$176,800
Develop Staff Training and Education Program for Environmental Services staff	Q4 completion	Internal ENV Staff Resources

6. LOCAL MUNICIPAL IMPACT

The Energy Management Program's 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. 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 (905) 830-4444 Ext. 5041.

The Senior Management Group has reviewed this report.