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ENVIRONMENTAL SERVICES ENERGY MANAGEMENT PROGRAM UPDATE 2011

The Environmental Services Committee recommends the adoption of the recommendation contained in the following report dated May 4, 2012, 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 provide the annual update to Council on Environmental Services energy management activities for 2011. The content of this report is aligned with the Corporate Energy Report to be received at the Finance and Administration Committee on June 14, 2012.

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 55% of the corporation's electricity consumption. As water and wastewater facilities represent the single largest user of electricity across all services provided by York Region, it is important to ensure that energy is used efficiently at these facilities. Since 2009, an Energy Management Program has been established within Environmental Services to expand the Energy Management Program from reducing energy in buildings to include operations and energy related processes, such as optimized off-peak pumping strategies.

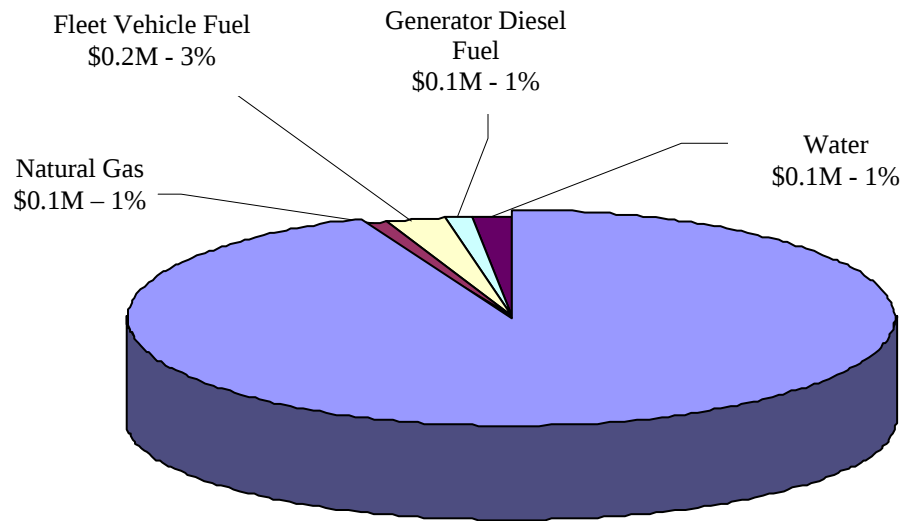
The objective of the Energy Management Program is to manage energy consumption at Environmental Services facilities in an efficient and sustainable manner. Through the program, the department is exploring and implementing enhancements to facility operations to demonstrate leadership in energy use. With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

4. ANALYSIS AND OPTIONS

In 2011, Environmental Services energy costs totalled \$8.2 million

Energy costs to operate Environmental Services' facilities, processes and vehicle fleet were \$8.2 million in 2011. Environmental Services represents 21% of York Region's total energy costs of \$39.7 million. As illustrated in Figure 1, electricity costs represented 94% of 2011 Environmental Services energy costs.

Figure 1
Environmental Services Energy Cost Allocation in 2011



Notes from Figure 1:

- Energy costs associated with water and wastewater services provided by City of Toronto, Region of Peel and Duffin Creek are not included
- As part of continuous improvement, the annual energy management program update will be reviewed to potentially include City of Toronto, Region of Peel and Duffin Creek

Energy rates for electricity and fuel continue to increase

Energy expenditures for electricity and vehicle fuel started to increase in 2010 and continue on that trend. Electricity rates increased by 18% in 2011 compared to 2010. The cost of fuel increased by 14% in 2011 compared to 2010. Natural gas rates continue a long-term downward trend with the 2011 unit cost for natural gas being 38% lower than 2007. Table 1 summarizes the Environmental Services Department average totals from 2007 to 2011.

Table 1
Energy Cost Rates for Environmental Services (2007-2011)

Year	Average Total Electricity Rate (\$/kWh)	Average Total Natural Gas Rate (\$/cubic metre)	Average Total Fleet Fuel Rate (\$/litre)
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
2011	\$0.118	\$0.330	\$1.077

Environmental Services staff is continuing to investigate opportunities to operate using natural gas instead of electricity to leverage downward pricing trends of natural gas. The heating system at the Leslie Street Sewage Pumping Station is being changed from electrical to natural gas. Incrementally increasing the number of facilities being serviced by natural gas will further realize cost savings. Additional effort through the installation of a SolarWall® at the Mount Albert WPCP assists in partially displacing electric heat costs.

Electricity rate increased by 18% since 2010 resulting in an overall increase in energy costs

Electricity rates are based on three distinct components:

- Electricity commodity
- Global adjustment
- Transmission, distribution and market charges

Of these three charges, the Region only manages the commodity portion (27% of the total electricity cost) through procurement activities with the remainder (73% of the total electricity cost) charged by the utility at rates approved by the Ontario Energy Board.

The low spot market price for electricity has resulted in very little difference between on-peak and off-peak pricing. Therefore the benefit of interval metering to Environmental Services' accounts is eroded in the current electricity market.

Overall electricity consumption increased by 2% per capita due to additional infrastructure that supports growth in the Region

One of the significant factors driving Environmental Services' energy consumption and offsetting efficiency gains is population growth in the Region. In 2011 there were a number of new and rehabilitated water and wastewater facilities that were brought online to ensure sufficient capacity for future growth in the Region. Approximately 85% of the consumption increase is due to six new or expanded water and wastewater facilities that include:

- Georgina Water Treatment Plant
- Keswick WPCP
- Kleinburg WPCP
- Mount Albert Water Well
- Nobleton Sewage Pumping Station
- Nobleton WPCP

New water and wastewater facilities have relatively high energy intensities due to the facilities having an oversized capacity for current demand. Sizing for future demand is a common practice to ensure adequate supply and/or treatment capacity. Energy reduction activities, such as staged process expansion and use of variable speed drives are examples of measures taken to help mitigate the impact of oversizing. Increased energy demand can also be attributed to enhanced operational processes required to meet or exceed regulatory compliance.

Table 2 illustrates the significant impact of the electricity rate increase to the energy cost per capita.

Table 2
Environmental Services Per-Capita Energy Trends

	2007	2008	2009	2010	2011
Population	982,900	1,012,000	1,032,600	1,062,000	1,085,600
Total Energy Cost (\$)	\$6.6M	\$7.0M	\$6.5M	\$6.7M	\$8.2M
- \$ Per capita	\$6.7	\$6.9	\$6.3	\$6.3	\$7.6
Electricity Consumption (kWh)	62,367,321	64,913,482	64,203,549	63,105,690	65,460,885
- kWh Per capita	63.5	64.1	62.2	59.4	60.3
Carbon Footprint (tonnes CO ₂ e)	10,239	10,610	10,659	10,545	11,026
- kg Per capita	10.4	10.5	10.3	9.9	10.2

Notes from Table 2:

- Population values are based on year-end estimates from the Planning Department.
- Water and wastewater serviced population estimates in 2008 through 2011 are 3% to 6% lower relative to the reported estimated year end population values.
- Carbon footprint values have been restated lower to reflect adjusted carbon emission factors issued by National Inventory Report 1990 - 2010: Greenhouse Gas Sources and Sinks in Canada by Environment Canada.
- Carbon footprint does not include emissions that are a result of treatment processes.
- Energy costs, consumption and carbon footprint analysis for water, wastewater and waste management facilities owned and/or operated by third parties are not included.
- City of Toronto, Region of Peel and Duffin Creek WPCP total energy costs, electricity consumption and carbon footprint totals, associated with water

and wastewater services, are not accounted for, resulting in relatively lower per capita values.

- Compared to the last five years, the trend for 2011 has maintained consistency regarding energy consumption and carbon footprint. The cost per capita has increased by 20% mainly contributed by an 18% increase in the electricity rate since 2010.

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

The Region's lowest energy cost expenditures since 2007 was in 2009. This was primarily due to moving large hydro accounts from the Regulated Price Plan to the Hourly Ontario Energy Price and Weighted Average Hourly Spot Price.

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. In 2010 and 2011, the average total electricity cost rates for Environmental Services have increased 5% and 18% respectively. In comparison, residential rates increased 14% and 6% for the same period.

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.

As part of continuous improvement within the department's Energy Management Program, a Process Optimization at Wastewater Facilities study will be undertaken in 2012. Ensuring treatment facilities undergo a Process Optimization audit on a periodic basis helps to better understand and subsequently implement energy reduction measures.

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.

Energy from Waste will generate 14 net megawatts of electricity

York Region converts a portion of our residual solid 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 thermally treated in a high-temperature combustion process. The proposed thermal facility, processing 140,000 tonnes per year of residual municipal waste, will generate approximately 14 net megawatts (MW) of electricity, to 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.

In 2011, Ministry of the Environment Certificates of Approval were obtained and environmental monitoring plans were submitted. The detailed facility design is currently in progress and a notice to proceed was issued to Covanta for the Durham York Energy From Waste Facility in June 2011. It is anticipated that the facility will be fully operational in 2014.

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

Stouffville Zone 2 Pumping Station achieved LEED® Silver

Environmental Services continues to implement Leadership in Energy and Environmental Design (LEED®). In 2011 the Stouffville Zone 2 Pumping Station successfully achieved LEED® Silver certification. Currently, the Leslie Street Sewage Pumping Station upgrade project is applying the integrated design process and is pursuing LEED® certification as part of the upgrades. Design of York Regional Forest Stewardship and Education Centre will also incorporate green design principles in order to be an example of building sustainability.

Through updating environmental design standards, opportunities for revising standards and design criteria to include energy efficiency and sustainability strategies into Environmental Services infrastructure continue to be investigated. In 2011, Environmental Services and Property Services Branch continued to work towards finalizing standards and design criteria revisions for 2012.

Process energy audits at Environmental Services facilities identified energy savings valued at approximately \$56,000 per year

Process energy audits completed at seven York Region water and wastewater facilities provided recommendations towards improving facility energy efficiency. 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. Selection of sites was based on consideration of a number of factors: high annual electricity consumption (kWh), range of energy intensity (kWh/m³) for facility type and potential for efficiency gains.

Process energy audits were completed at the following locations in 2011:

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

Audits focused on the examination of large process equipment through observation, on-site power monitoring, identification and quantification of capital, operating and maintenance efficiency improvements. Reports were prepared for each audit, summarizing the analysis and findings at each facility. Individual energy reduction measures were recommended for consideration at each facility, as well as general departmental energy reduction recommendations.

Table 3 summarizes the approximate overall impact of five energy reduction measures currently being implemented that include:

- Adjusting operational procedures to prevent simultaneous starting of equipment at the Mount Albert WPCP
- Comprehensive pump refurbishment of pump 3 at the Humber Sewage Pumping Station
- Optimize air flow to aeration tanks to reduce the dissolved oxygen content by adding a variable frequency drive to each blower motor, at the Mount Albert WPCP
- Install variable frequency drives on well pumps no. 3 and 4 at Queensville Wells No. 3 and 4
- Install variable frequency drive on variable speed pump 3 at the Newmarket Sewage Pumping Station

Future energy reduction measures will be reviewed based on successful implementation of these initiatives and on monitoring of actual cost savings realized.

Table 3
Summary Savings from Top Five Energy Reduction Measures

Demand Savings	Electrical Usage Savings	Electrical Billing Savings	GHG Emission Reduction
(kW)	(kWh/yr)	(\$/yr)	(kgCO₂e)
35	748,000	56,000	127,000

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 is encouraged to make a difference in reducing operating costs by improving energy management strategies as part of daily operations. Operations staff is involved in defining opportunities for improving facility energy management and improving fleet vehicle fuel efficiency.

The 2011 Department Wide Fleet Fuel Challenge focused on improving Environmental Services fleet fuel efficiency (litres/100 km and CO₂e /km). This challenge achieved an improvement in fuel efficiency, compared to 2010, in four of the department's sections that averaged an improvement of 4% per section.

In 2011, the first *Water and Wastewater Annual Energy Report* (for 2010) was developed and issued by Environmental Services. This report tracks energy usage and identifies energy efficiency at water and wastewater facilities by:

- Assessing how much energy is used for water and wastewater systems
- Benchmarking system and facility energy intensity
- Encouraging operations staff involvement in energy management initiatives, including updates on the *Green Energy Act*

The baseline information established in 2011 will be used to evaluate effectiveness of operational and equipment efficiency improvements, further manage energy consumption and inform the use of renewable energy sources.

Renewable energy use reduces greenhouse gas emissions by 13 tonnes per year

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 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. This system is designed to generate and sell enough electricity to provide the Department with an annual income stream of approximately \$7,200. 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 Program for renewable energy in Ontario.

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 in 2010. The study concluded that development of a solar project under the Feed-In Tariff program is worthwhile and of financial benefit to the Region to further explore at three of the Environmental Services locations. In 2011, a structural review of roof strength at the three facilities was conducted to ensure adequate load capacity for the installation of the photovoltaic systems. The Garfield Wright Recycling Centre did not pass the structural review, and as a result, is no longer an eligible project based on additional costs that would be required to reinforce the roof.

Staff explored the options on whether York Region should purchase solar photovoltaic systems outright or pursue leasing arrangements to lease out roof area for solar developers. It was concluded that an outright purchase of solar photovoltaic systems for the Georgina Water Treatment Plant and North Markham Reservoir is the best strategy. These two facilities have been included in the 2012 Property Services Branch capital budget and applications will be made to the Ontario Power Authority to move these projects forward. It is important to note that the environmental benefits (i.e. carbon credits and greenhouse gas emission reductions) are assigned to the Ontario Power Authority under the Feed-In Tariff Contract and are not eligible to be claimed by the Region as a reduction under either scenario. As the carbon trading market continues to develop staff will investigate opportunities to participate in carbon credit programs to provide a revenue source.

Feed-in-Tariff Program reduced rates are offset by declining photovoltaic system costs

Ontario is a North American leader in clean energy, with almost 2,000 small and large Feed-In Tariff contracts totalling more than 4,600 MW of power. The Ontario Power Authority recently concluded a two-year review of the Feed-In Tariff Program with a mandate to consider a range of issues including:

- Reducing Feed-In Tariff prices
- Ensuring the long-term viability of clean energy procurement
- Continuing to build on the success of Ontario-based manufacturing and clean energy job creation
- Improving local consultation and renewable energy environmental approval processes
- Developing new technologies and fuel sources

Through this review, solar photovoltaic rooftop rates for Region projects have dropped by 10% to 32%. These rate reductions are expected to be offset by reduced panel and balance of system prices; and therefore it is still financially feasible to move forward with the two Department candidate sites.

Energy reporting evolving to comply with new and pending Regulations

The Province's *Green Energy and Green Economy Act, 2009, O. Reg. 397/11, Energy Conservation and Demand Management Plans*, came into force on January 1, 2012. These regulations require all public agencies to prepare an energy conservation and demand management plan summarizing annual energy consumption and greenhouse gas emissions for each of the public agency's operations and a description of the expected results of current and proposed conservation activities.

The Corporate Services Department will coordinate the annual reporting for the Corporation including the *Green Energy Act*. The Corporate Energy Report to be received at the Finance and Administration Committee on June 14, 2012 provides a more detailed overview on this reporting.

Link to Key Council-approved Plans

The Environmental Services Energy Management Program aligns with the York Region Sustainability Strategy:

- Build 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 Department on an annual basis, and monitor greenhouse gas emissions department-wide

The Environmental Services Energy Management Program also aligns with the following 2011-2015 Strategic Plan goals:

- Manage the Region's Finances Prudently – educating to optimize operational and equipment use to maximize cost benefit for time of use rate
- Strengthen Organizational Capacity – through implementation of best practices, continuous improvement, and efficient use of existing resources

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.

Environmental Services Energy Management Program has realized approximately \$1.3 million in energy cost savings since 2006

Since 2006 Environmental Services has realized \$1.3 million in energy cost savings through the Energy Management Program. This includes savings from various programs, including:

- Electricity interval meters on hourly price
- Energy retrofits
- Sustainable design
- Grants and incentives
- Solar initiatives
- Fleet fuel challenge

Over \$50,000 in grants received in 2011

The Region successfully secured grants in 2010 from the *Federation of Canadian Municipalities, Green Municipal Fund*. In 2011, funding of \$34,513 for the Solar Photovoltaic Feasibility Study was received as well as \$19,474 for the Energy Analysis of York Region Water and Wastewater Facilities project. The remaining funding of \$47,128 for energy analysis at York Region water and wastewater facilities has been received in 2012.

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 strategies and sustainability initiatives in new and existing Environmental Services facilities. As electricity rates and fuel prices continued to rise in 2011, efforts to realize efficiencies and incorporation of sustainable energy initiatives into projects have also increased. As new technologies are researched and efficiencies realized, the program will continue to grow along with Environmental Services' commitment to sustainable energy practices. Environmental Services and Property Services Branch are jointly working on delivery of the Energy Management Program to assist in reducing costs and demands on infrastructure, mitigating environmental impacts and promoting sustainable 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.